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IN THIS ISSUE

- Cardiovascular Changes During Ear Syringing
- Antihypertensive Treatment Adherence
- Occupational Stress Among Healthcare Workers
- Use Of Self-Prescribed Medications in Pregnancy
- Sedentary Time, and Pain Intensity In Dysmenorrhoea
- Academic Achievements In Adolescents With Anxiety
- Adverse Lipidaemic Effects of Some Medicinal Plants
- Thrombogenic Parameters in Type 2 Diabetes Mellitus
- Myths And Misconceptions About Caesarean Section
- Awareness on Breast Cancer Screening Mammogram
- Spontaneous Papillary Muscle Rupture

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ORIGINAL RESEARCH

Effects of Comorbidities and Family History of Hypertension on Antihypertensive Treatment Adherence

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Abstract

Background: Treatment adherence is the sine qua non to optimal treatment outcome in managing chronic illnesses.

Objective: To determine the effects of comorbidities and family history of hypertension on treatment adherence among patients receiving antihypertensive care.

Methods: This study utilised a quasi-experimental design where 290 patients with hypertension responded to a questionnaire comprising 14 items of the Hill-bone Compliance High Blood Pressure Therapy Scale (Cronbach's alpha = 0.70).

Results: The results showed that treatment adherence was not significantly different for individuals with a family history of hypertension ($F = 0.32$, $p = 0.720$) and those with comorbidities ($F = 0.62$, $p > 0.05$). However, a significant interaction between family history and comorbidity was observed ($F = 6.338$, $p = 0.002$), as adherence appeared to be better where patients had comorbidities and knew there was a positive family history of hypertension than where patients reported the absence of a family history of hypertension. Additionally, older adults showed significantly better adherence than younger adults ($F = 3.38$, $p = 0.035$), but no significant gender difference in treatment adherence was found ($t = 0.78$, $p = 0.217$).

Conclusion: The combined effects of comorbidities and family history of hypertension improved adherence to antihypertensive treatment. Information about comorbidities and family history can help patients develop a proper understanding and health beliefs to enhance treatment adherence.

Keywords: Antihypertensive treatment, Comorbidities, Family history, Hypertension, Treatment adherence.

Introduction

A fundamental challenge of antihypertensive treatment is the inability of patients to adhere to the treatment as required. ^[1] This is

particularly challenging because treatment non-adherence adversely affects treatment outcomes, [2] makes complications more likely, and increases the cost of care in hypertensive management. [3] Regarding medication, adherence means the extent to which patients use their medications as prescribed by their physicians. [4] In a broader application, treatment adherence encompasses following medical advice on recommended lifestyle changes and taking medication as prescribed. The effectiveness of any treatment hinges heavily on the degree to which a patient complies with or actively follows the agreed-upon recommendations and responsibilities, which could include using medications as prescribed or making necessary adjustments in lifestyle. It is logical to say that a drug will not work in any individual who does not use it.

Some of the complications associated with poor adherence in chronic illnesses, which often require long-term treatment, drive home the importance of patients' compliance, most especially among individuals with hypertension. [2-4] For example, non-adherence to treatment is common among people living with cardiovascular diseases, with a prevalence of 24%. [4] One-third (32.7%) of patients with hypertension and diabetes showed non-adherence in another report. [5] Some systematic reviews have shown prevalence rates ranging from 7% to 83.5%. [6]

Arguably, the morbidity and mortality associated with hypertensive complications such as cardiovascular and cerebrovascular diseases [3, 7, 8] should serve as warning signs for patients receiving antihypertensive care to ensure they adhere to treatment. However, as empirical data continue to show an increase in non-adherence to treatment [5], questions were raised about reasons why patients with chronic illnesses, especially those with hypertension, are not adhering to treatment despite its associated life-threatening complications. In psychotic disorders, previous empirical data showed that forgetting to take medications is a

predictor of non-adherence among patients receiving antipsychotic treatment. [9]

Depressive symptoms, lower insight, history of suicide attempts, younger age, and alcohol use disorder have also shown predictive effects on poor adherence among some patients with schizophrenia. [10] Among individuals with HIV/AIDS, running out of medication, not being at home, and involvement with other things were found to be predictors of non-adherence. [11] Individuals who are older adults, employed, socially supported, and have good overall functioning appear to show better adherence to treatment in some cases. [9]

In hypertensive cases, poor adherence was reported to be nearly 2.4 times more likely among women than men, 4.2 times more likely with polypharmacy (use of more than 3 tablets), and 7 times more likely with a low socio-economic level. [12] Forgetfulness, living in a city, and the use of multiple medications (polypharmacy) and drug side effects have also been reported as significant predictors. [13] In a Nigerian study, patients with hypertension who earn a monthly income of more than ₦13,600 and are using a single medication were reported to be more likely to adhere than those who earn less and use more than one medication. [14]

Comorbidities in hypertension refer to the presence of another illness and the primary diagnosis of hypertension in the same individual. [15, 16]. Patients with hypertension might also have coronary artery bypass grafting, diabetes mellitus, and percutaneous coronary intervention. [17] There are cases of co-existing depressive symptoms as well. [18] Comorbidities increase disease burden and care because the individual is treating more than one illness at a time. Invariably, this could increase treatment costs, length of stay on admission, number of medications, and the likelihood of medication side effects.

One of the non-modifiable risk factors of hypertension is a family history of hypertension.^[19] A family history of hypertension might occur in first-degree biological relatives (biological parents, siblings, and children) or second-degree biological relatives (uncles, aunts, nieces, nephews, or half-siblings). Family history is an essential factor in hypertension due to the shared genetic coding among family members, which can enhance patients' understanding of their susceptibility and behavioural response to treatment.

The health belief model (HBM) explains that people are more likely to engage in health-related behaviour if they believe their condition is severe and understand that they are susceptible to the illness.^[20] Treatment adherence is a health behaviour that could influence the perception of susceptibility and comorbidity, as established in HBM. On this premise, the present study examined areas of treatment adherence that are often overlooked in many adherence studies, such as comorbidities and family history. These are important areas because comorbidity of other illnesses is common in hypertensive conditions, and family history often plays a role in its aetiology.

In light of the HBM, first, we hypothesised that adherence would be significantly better among patients who report a family history of their hypertensive condition. Second, we hypothesised that treatment adherence would be considerably better among patients with comorbidities. Lastly, we hypothesised that a family history of hypertension and comorbidities would have significant interactive effects on patients' treatment adherence. In the light of this backdrop, the aim of the study was to examine the influence of comorbidities and family history of hypertension on anti-hypertensive treatment adherence.

Methods

Setting

This study was conducted in four different hospitals: Apex Care Hospital, Ibadan; Oyo State Hospital, Oyo; West Wind Hospital and Maternity, Ibadan and Opabode Memorial Hospital, Oyo, all located in Oyo State, southwest Nigeria. These hospitals were selected because they had many patients with hypertension on ambulatory care.

Design

This is a quasi-experimental study where participants were not randomly assigned to experimental or control groups.

Ethical Consideration

The Oyo State Hospitals Management Board, State Hospital, Oyo State, Nigeria, approved the conduct of this study. Additional permissions were obtained from the various hospitals selected for the study. A statement of informed consent was included in the research instrument for the participants to ensure informed consent. Participants had the freedom to withdraw or decline participation without any consequences. Participation was voluntary, and no financial inducement was involved.

Study participants

This study involved a purposive sample of 290 outpatients receiving antihypertensive treatment. Included in the study were participants with hypertension who were receiving antihypertensive medications. The inclusion criteria were: (1) diagnosis of hypertension for at least three months and (2) antihypertensive treatment for at least three months.

Sample size

The sample size was determined using Slovin's formula, $N/(1+Ne^2)$, with estimated population size (N) of 1000 patients receiving antihypertensive treatment, as obtained from all the selected hospitals combined, and a level of significance (e) of 0.05. Based on this formula, the calculation $1000/(1+1000(0.052)$

yielded a minimum sample size of 285, but eventually, only 290 participants who completed their questionnaires were studied.

Data collection

A questionnaire comprising items from the Hill-Bone Compliance High Blood Pressure Therapy Scale [21] was used for measuring treatment adherence. Participants' responses were rated on a 4-point Likert scale, ranging from 1 (Not at all) to 4 (Almost always). Total scores range from 14 (minimum) to 56 (maximum) after item number 6 is reverse-scored. The instrument comprises three subscales: sodium intake (items 3 and 4), doctor visits and prescription refills (items 6, 7, and 8), and medication taking (items 1, 2, 5, 9, 10, 11, 12, 13, and 14). The sum of scores represented the participants' treatment adherence. Item-total analysis was used to determine the instrument's reliability, which showed an internal consistency (Cronbach's alpha) of 0.70. The average score was 37.19 (SD = 5.88). A sample item was "How often do you forget to take your high blood pressure (HBP) medication?" Information about the socio-demographic factors such as gender, age, blood pressure, duration of illness from diagnosis, educational qualification, religion, comorbid illnesses, and presence of hypertension in family history (heredity) were also obtained.

Data analyses and management

Participants were naturally grouped according to the levels of the independent variables (comorbidity and family history). Comorbidity naturally occurred in two levels: absent *vs* present, and family history of hypertension naturally occurred in three levels: no known family history, first-degree biological relatives, and second-degree biological relatives. This produced a 2 x 3 quasi-experimental design. The dependent variable is treatment adherence, which was measured as a continuous variable.

All statistical analyses were conducted using IBM SPSS version 29 software. Participants' responses to the questionnaire were coded and summed to obtain composite scores for each participant on all variables. The composite scores were analysed using a two-way (2x3) analysis of variance (ANOVA). We first tested the individual effects of comorbidity (present *vs*. absent) and family history (no known family history, first-degree biological relatives, and second-degree biological relatives) on treatment adherence as stated in the first and second hypotheses. Then, we tested the interactive effects of comorbidity and family history on treatment adherence, as stated in the third hypothesis. All effects were tested at a 95% confidence interval ($p < 0.05$).

Results

The 290 participants comprised 160 (55.2%) males, 123 (42.4%) females, and 7 (2.4%) did not indicate gender. The mean age was 52 years (SD = 16.5). Most participants (63.4%) were married, belonged to the Yoruba ethnic group (63.6%), had tertiary education (65.5%), and were business owners (59.3%), while 47.6% were employees of government or private organisations. Additionally, the average blood pressure was 145/93 mmHg, and the average duration of illness from diagnosis of hypertension was 3 years. Table I shows the demographic distributions of the participants.

In addition, 79 (27.2%) had no known family history, 122 (42.1%) had hypertension in first-degree biological relatives, and 89 (30.7%) had hypertension in second-degree biological relatives. Comorbidity data showed 93 (32.1%) had only hypertension, while 197 (67.9%) had at least one comorbidity. The most prevalent chronic comorbidities were diabetes mellitus (21.7%), peptic ulcer (23.1%), rheumatoid arthritis (5.2%), and ocular disorders (3.7%).

Table I: Descriptive analysis of socio-demographic variables of the study participants

<i>Parameter</i>		<i>Frequency (n =290)</i>	<i>Percentage</i>
Sex	Male	160	55.2
	Female	123	42.4
	Preferred not to say	7	2.4
Age (years)	< 39	73	25.2
	40 – 59	128	44.1
	>60	89	30.7
Marital status	Single	84	29.0
	Married	184	63.4
	Divorced/Separated	22	7.6
Education	Primary	21	7.2
	Secondary	97	33.4
	Tertiary	172	59.3
Ethnicity	Yoruba	190	65.5
	Igbo	55	19.0
	Hausa	45	15.5
Occupation	Civil/Private Employee	124	42.8
	Business Owner	138	47.6
	Unemployed	28	9.7

Contrary to the first and second hypotheses, Table II shows that treatment adherence was not significantly different across the three levels of family history ($F = 0.32$, $p = 0.720$) and the two levels of comorbidity ($F = 1.13$, $p = 0.290$). However, the result shows a significant interaction between family history and comorbidity, as stated in the third hypothesis ($F = 6.34$, $p = 0.002$), which suggests that family history differentiates how comorbidity of other illnesses influences patients' adherence to treatment. Figure 1 shows this interaction effect.

The plot in Figure 1 shows that treatment adherence takes a downward turn with the comorbidity of other illnesses when participants do not have a history of hypertension in their family. However, treatment adherence tends to increase despite comorbidity, where participants reported a positive family history of hypertension in either first-degree biological relatives or second-degree biological relatives. Tables III and IV show the difference in treatment adherence across age and gender groups.

Table II: Two-way ANOVA Test of Effects of Family History and Comorbidity on Treatment Adherence

<i>Variables</i>	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Family History (FH)	23.862	2	11.931	.329	0.720
Comorbidity (Co)	40.783	1	40.783	1.126	0.290
FH × Co	459.164	2	229.582	6.338	0.002
Error	10287.754	284	36.224		
Total	10896.003	289			

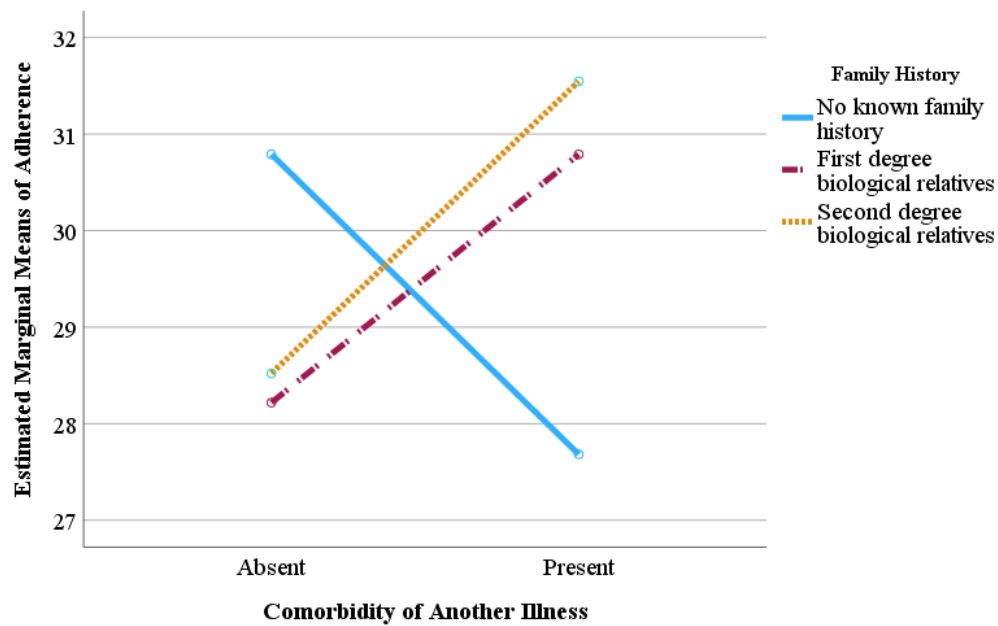


Figure 1: Interactional Effects between comorbidity and family history

Table III: Influence of age on treatment adherence using One-way ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	250.950	2	125.475	3.383	0.035
Within Groups	10645.053	287	37.091		
Total	10896.003	289			

Table III shows that treatment adherence differed significantly across age groups in this study ($F = 3.38$, $p = 0.035$). Figure 2 shows the pattern of treatment adherence across the age groups. Table IV shows that the significant difference in treatment adherence was between young adult patients and older adult patients, with older adult patients showing better

adherence. Additionally, gender differences in treatment adherence show that male and female participants were not significantly different ($t = 0.78$, $p = 0.217$), as shown in Table V. Table IV shows the output of Tukey's Highest Significant Difference (HSD) to ascertain the significantly distinct age group from the others.

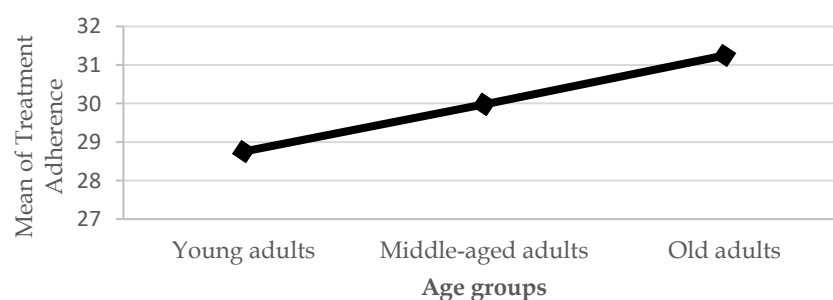


Figure 2: Pattern of adherence across age groups

Table IV: Multiple comparisons of treatment adherence in age groups using Turkey's Highest Significant Difference (HSD)

Age Groups	N	Mean	Std. Dev.	Mean Differences		
				Young adults	Middle-aged adults	Older adults
Young adults	73	28.75	6.195	-		
Middle-aged adults	128	29.98	5.881	1.223	-	
Older adults	89	31.25	6.296	2.494	1.271	-

Table V: Influence of gender on treatment adherence using T-test for Independent Groups

Dependent Variable	Sex	Mean	Std. Deviation	T	df	p
Treatment adherence	Male	30.21	6.26	0.784	281	0.217
	Female	29.63	6.06			

Discussion

The empirical findings of the present study showed that comorbidity and family history of hypertension may not independently influence adherence except when there is an interaction. According to the Health Belief Model (HBM), treatment adherence may be poor if individuals do not believe they are susceptible to an illness or do not perceive the disease as severe. The interaction found between comorbidity and family history showed that adherence was better among patients with comorbidity when there was a family history of hypertension. In line with the HBM, patients with comorbidity in this study might have perceived that their condition was severe, and the fact that they had a family history of hypertension could have suggested to them that they were, in fact, susceptible to having hypertension. Hence, they became more adherent to treatment recommendations.

The impact of comorbidity could be three-fold. One is the additional emotional or physical pain the patients experience. Another is that it increases the number of drugs the patients use. This, in turn, could increase the economic burden of spending more money on drugs. This explains why some patients with comorbidity

may have difficulty adhering. The third implication of comorbidity is the possibility of polypharmacy, which brings on concerns about drug interactions. Drug interactions may increase patients' experience of side effects. One drug may even counter the effects of another. This could increase patients' frustration and make them less adherent to treatment altogether.

A previous study showed that an increase in comorbidities correlated with a proportional decrease in adherence [22]. While it is true that comorbidity increases the number of medications, some evidence has also shown that several medications could be associated with high medication adherence [23]. An association between medication adherence and comorbidity could not be established in this study. Still, most participants had health insurance, which could explain why most adhered to medication. This underscores the importance of economic support in adherence. However, patients who have the understanding that they are not just susceptible but have an actual diagnosis of hypertension and that it is a serious illness that requires appropriate health behaviour response will show better adherence.

Arukala [24] also found an association between comorbidities and adherence to treatment, and patients with hypertension and cerebrovascular accident showed higher non-adherence than those with hypertension only. In addition, the current findings showed that when family history interacts with comorbidity, patients are more likely to adhere to treatment because they understand that they are genetically susceptible. Their comorbid condition is an indication of illness severity. Similar to the current finding, previous studies showed that age predicts adherence in chronic illnesses. [9, 10] For gender, the results are not conclusive. A study reported that poor adherence was nearly 2.4 times more likely among women than men who were receiving antihypertensive treatment. [12] However, the data from the current study did not show any significant gender difference in adherence to treatment.

Conclusion

This study concluded that comorbidity and family history of hypertension interact in shaping how individuals receiving antihypertensive care adhere to their treatment. Consequently, it is recommended that clinicians bear in mind the potential interactive impact of comorbidity and family history and use this information to help patients develop an appropriate understanding and health belief that will lead to a more adhering health-behavioural response. Additionally, in cases where an adherence intervention program is designed, comorbidity and family history should be a significant focus because of the interactive impact these factors could have on treatment adherence.

Suggestion for future study

In a future study, self-reported adherence could be supplemented with blood or urine drug tests or records from electronic medication monitoring devices to provide a more accurate and objective assessment of adherence. Additionally, more studies are needed to show

other factors that play a role in people's treatment adherence, especially in managing chronic illnesses, and how these patients can be assisted to improve their treatment adherence.

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