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Predictors of patient non-adherence to antihypertensive medications and its economic burden on the health system of saudi arabia.

Madiha R Mahmoud[1,2*], Hemat E El-Horany[3,4], Amna A Metwaly[5], Halima M Elagib[1], Fahaad S Alenazi[1], Aseenat M Bani Mfrrij[1], Neama R Youssef[6,7], Azza M Fahmy[8], Mohamed E Ghoniem[9,10]

[1]Department of Pharmacology, College of Medicine, University of Ha'il, Ha'il 2440, Saudi Arabia

[2]Department of Pharmacology, TBRI, Ministry of Higher Education and Scientific Research, Giza 12411, Egypt

[3]Department of Biochemistry, College of Medicine, University of Ha'il, Ha'il 2440, Saudi Arabia

[4]Department of Medical Biochemistry, Faculty of Medicine, Tanta University, Tanta 31527, Egypt

[5]Department of Intensive Care Unit, TBRI, Ministry of Higher Education and Scientific Research, Giza 12411, Egypt

[6]Department of Laboratory, King Khalid Hospital, Ha'il, Saudi Arabia

[7]Department of Clinical Pathology, medical college for girls, Al Azhar University, Egypt

[8]Department of Parasitology, TBRI, Ministry of Higher Education and Scientific Research, Giza 12411, Egypt

[9]Department of Internal Medicine, College of Medicine, University of Ha'il, Ha'il 2440, Saudi Arabia

[10]Department of Internal Medicine, Faculty of Medicine, Zagazig University, Zagazig 44519, Egypt

Abstract

Introduction: Non-adherence to antihypertensive drugs is the primary contributor to poor blood pressure regulation, which has resulted in several consequences as well as a significant economic effect ranging from higher financial expenditures of public health services to lost productivity.

Objectives: The purpose of this study was to determine the predictors of non-adherence to antihypertensive drugs in the Hail region, as well as the economic effect factors on Saudi Arabia.

Methods: From October 2020 to March 2021, 270 patients with hypertension were randomly recruited from outpatient Medical University Hail Polyclinics for cross-sectional research in the Hail region. An interview with patients was conducted to gather information regarding their sociodemographic status, medication-related characteristics, clinical data, and completion of the Morisky medication adherence scale.

Results: 36.7 percent of patients reported noncompliance with antihypertensive treatment. Those patients who were no adherent to antihypertensive drugs were as followed; 72.7% of elderly patients (>70 years old), 80% were uneducated. On the other hand, 69.9% of hypertensive patients with good medication adherence follow the physician's instructions and get enough explanation about their medications. Approximately 55% of participants rely on government medical insurance, 5.6% rely on private medical insurance, and 35.5 percent rely on personal funds.

Conclusion: Non-adherence to treatment was found in almost one-third of Hail's hypertensive patients. As a result, policies and interventions that increase patient education and physician-patient relationships in health care settings are required. Future studies should be conducted to identify the hurdles to medication adherence among hypertension patients in the Kingdom of Saudi Arabia.

Keywords: Antihypertensive medications, Economic burden, Non-adherence, Hail region, KSA.

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Introduction

Cardiovascular Disease (CVD) is the leading cause of death globally, accounting for 31% of all fatalities [1]. CVD is also becoming a serious public health problem in the Gulf Council countries, especially Saudi Arabia, where CVD is projected to account for more than 45 percent

of all deaths [2]. Hypertension, diabetes, dyslipidemia, obesity, smoking, lack of physical exercise, poor nutrition, and alcohol use were the most frequent CVD risk factors observed [3].

Hypertension is a worldwide problem since it is one of the top preventable causes of illness and death. It is accountable for 8.5 million deaths globally from stroke, ischemic heart disease, various vascular illnesses, and kidney disease [4]. The prevalence of hypertension has raised dramatically as a result of fast population growth, economic development, population aging, lifestyle changes, and changes in traditional food practices. Hypertension is common in the Arab Gulf region, the Middle East, and across the world. By 2025, it is predicted to affect around 1.56 billion people globally [5]. In Saudi Arabia, cardiovascular disease has continuously ranked as the leading cause of disability-adjusted life years during the previous three decades [6]. According to estimates, hypertension is the top cause of mortality in Saudi Arabia. It was revealed that 15.2 percent and 40.6 percent of Saudis, respectively, were hypertension or borderline hypertensive [7]. Hypertension has a major economic effect extending from therapeutic expenditures to human capital loss and decline in productivity [8].

Hypertension is a disease with an insidious beginning that destroys the delicate capillary beds in numerous organs such as the kidney or may induce fast rupture of blood vessels resulting in bleeding in organs such as the brain [9]. Hypertension may be identified in the community and primary care settings and various effective medications are reasonably priced for treating hypertensive individuals and lowering the risk of associated complications [4]. Untreated hypertension can lead to a variety of major health problems, such as stroke, aneurysms, hypertensive heart disease, coronary artery disease, renal disease, or peripheral artery disease [10].

Antihypertensive drugs are essential for blood pressure regulation. The efficacy of AHMs is widely known and has been quantified in terms of reduced risk of stroke and other cardiovascular disease events [11]. Several variables influence blood pressure regulation. One of the most important variables in regulating blood pressure and minimizing hypertension consequences is the patient's adherence to medication [12].

Despite the availability of effective medicines that regulate blood pressure and lower the risk of stroke, kidney, and cardiovascular disease, uncontrolled blood pressure and low adherence to antihypertensive medications continue to be serious public health and clinical issues [13]. Non-adherence to antihypertensive therapy is a major impediment to Blood Pressure (BP) management and promotes disease progression to consequences [14]. Prior research in Saudi Arabia has found that 63 percent of hypertensive individuals do not have their blood pressure under control [15,16]. As a result, it is critical to assess the level of drug adherence and the aspects manipulating it.

Several variables may influence antihypertensive patient adherence, including patient-related factors such as gender, age, income level, education level, medication side effects, patient knowledge and awareness, and non-patient-related ones such as physicians, illness features, and medications [17]. Because medication adherence is a major aspect of treatment effectiveness, investigating the factors influencing medication adherence in a specific population is vital for developing intervention programs to encourage medication adherence based on these characteristics and raise the rate of hypertension control.

Until recently, there has been a shortage of statistics to analyze the Saudi population's state of health, as well as the supply and quality of health care. As a result, we performed this cross-sectional study to measure antihypertensive medication adherence and identify the factors influencing it among adult patients diagnosed with hypertension who visited Hail University polyclinics in Hail City, Saudi Arabia. The region of Hail is Saudi Arabia's eighth-largest province by area and ninth-largest by population. To the best of our knowledge, no research has been conducted in the Hail Region to assess the prevalence of adherence to antihypertensive drugs among hypertension patients.

Methods

Study design, cross-sectional study was conducted in Hail, Saudi Arabia from October 2020 to March 2021. The study sites were from Medical University Hail Polyclinics. It was carried out in compliance with the Declaration of Helsinki, and the protocol was authorized by the University of Hail institutional review boards under project number (RG–20018) and the project ethical approval number (H-2020-206) that was reviewed and approved by the Research Ethical Committee (REC) at the University of Hail. The minimum sample required for this study was calculated using the formula: n=z2 [P (1 - P)/(D2)], confidence level at 95% (z=1.96), the margin of error (D) is set at 0.05, and (P) is the prevalence of hypertension in adult Saudi population set as 25.5 %. (n=292).

Sample and sampling procedure

Patients with hypertension were chosen at random (using successive sampling) from the registries of the outpatient hypertension clinics in the institutions examined for the study. Patients with hypertension for 5 years or more, both sexes, aged >18 years, no hypertension-related comorbidities, and willing to participate in the study were eligible (total 270 patients). We did not include any patients who were pregnant or nursing.

Data collection

An interview with patients was used to obtain data. The interviewer asked roughly 30 questions on sociodemographic status, medication-related issues, and completed the Morisky medication adherence scale. Also, questions about adherence to antihypertensive drugs and other drugs related to hypertension complications, how

many times you forgot to take medications, and how much it cost you to enter the emergency room, intensive care unit, or surgery department due to hypertension or a complication of hypertension.

Morisky medication adherence scale

We used the structured, validated Morisky Medication Adherence Scale (MMAS-4) to measure patients' adherence to antihypertensive medications [18]. The MMAS-4 is a generic self-reported, medication-taking behaviour scale in which the specific health issue (e.g. high blood pressure) is inserted for the "health concern". The MMAS-4 consists of 4 items with a scoring scheme of yes=0 and no=1. The items are summed to give a range of scores from 0 to 4. The scale items for this survey were: "Do you ever forget to take your antihypertensive medication?"; "Do you have problems remembering to take your antihypertensive medication?"; "When you feel better, do you stop taking your antihypertensive medication?" and "Sometimes if you feel worse when you take your antihypertensive medication, do you stop taking it?" The original English version was translated into Arabic language (forward and backward translation) and tested for validity. The translated Arabic version of the MMAS-4 score was tested for reliability via a procedure that included a review of questions and responses by expert pharmacists (n=6). Furthermore, a pilot study was conducted on a sample of 40 patients with hypertension who were selected based on their similarity to the study sample.

Data analysis

The primary outcome was the scores of MMAS-4 and the interview questionnaire. Respondents with MMAS-4 scores <3 were considered as non-adherent and those with scores of 3–4 were considered adherent to antihypertensive medication. The measurement of the overall non-adherence level to antihypertensive medication was based on the 4 items of the MMAS- 4 score. The data were analyzed using SPSS, version 26. Descriptive statistics were done for demographic data. The chi-squared test was applied to assess the association of different sociodemographic data with adherence to antihypertensive medication. P-value <0.05 was considered to be statistically significant. We used univariate regression analysis to identify the predictors of adherence and to relate adherence to antihypertensive medication with other factors (disease and medication-related, patient-related, and health system-related variables).

Results

From 508 patients who visited the Hail University Medical Polyclinics, 298 recruited hypertensive patients, and 28 were lost to follow-up and therefore the final number of participants who completed the study was 270 (response rate 90.6%).

Table 1 showed that the sociodemographic characteristics of these patients were 60 (22.2%) males and 210 (77.8%) females. As regards, adherence rate, 168 (62.2%) patients were adherent to medications, and 102 (37.8%) were non-adherent. No significant difference in the non-adherence rates between genders (P-value 0.653) and economic status (P-value 0.349). The socio-demographic predictors of adherence great significant difference (P-value 0.000), 72.7% of elderly patients of more than 70 years old are no adherent to drugs compared to only 10% non-adherence rate in patients of ages between 20 and 30 years old. Table 1 also showed significant difference (P-value 0.000), the educational level predictor affected the non-adherence rate, and we found that 80% of uneducated patients are non-adherent to drugs, and this percentage is decreasing with increasing level of education until reaching the university degree; at this level of education, the non-adherence rate was only 25%. The employment status of the patients has an apparent impact on medication adherence with a significant difference at (P-value 0.000). Also, we observed that the non-adherence rate is higher (P-value 0.000) in the patients who are suffering from hypertension for less than 5 years which is 57.6% compared to 25% in patients who have had hypertension for more than 15 years.

Table 1. *Univariate analysis of the association of potential demographic and clinical variables with self-reported adherence among hypertensive patients in the Hail University polyclinic.*

		MMAS category						Chi-Square	
		Group I		Group II		Total sample (270)			
		N	%	N	%	N	%	χ^2	P-value
Age	20-30 Years old	3	10	27	90	30	11.1	43.318	0.000*
	31-40 Years old	6	16.7	30	83.3	36	13.3		
	41-50 Years old	6	22.2	21	77.8	27	10.0		
	51-60 Years old	24	34.8	45	65.2	69	25.6		
	61-70 Years old	39	52	36	48	75	27.8		
	More than 70 Years old	24	72.7	9	27.3	33	12.2		

Gender	Male	21	35	39	65	60	22.2	0.253	0.653
	Female	81	38.6	129	61.4	210	77.8		
Educational level	Uneducated	12	80	3	20	15	5.6	13.198	0.009*
	Elementary	9	42.9	12	57.1	21	7.8		
	Preparatory	60	35.7	108	64.3	168	62.2		
	Secondary	18	33.3	36	66.7	54	20.0		
	University	3	25	9	75	12	4.4		
Employment status	Employee	57	54.3	48	45.7	105	38.9	19.928	0.000*
	Retired	30	27	81	73	111	41.1		
	Unemployed	15	27.8	39	72.2	54	20.0		
Economic condition	Excellent	9	50	9	50	18	6.7	2.210	0.349
	Medium	72	38.7	224	61.3	186	68.9		
	Weak	21	31.8	45	68.2	66	24.4		
Do you suffer from high blood pressure? Since when?	Less than 5 Years	57	57.6	42	42.4	99	36.7	26.193	0.000*
	From 5 to 10 Years	24	25.8	69	74.2	93	34.4		
	From 11-15 Years old	12	28.6	20	71.4	42	15.6		
	>15	9		27		36	13.3		
*Significant difference at $P \leq 0.05$.									

Table 2 showed that about 53.3% of participants were using one medication for hypertensive and most hypertensive patients used one or two medications and showed better adherence 73.6% and 64.4 % respectively. However, hypertensive patients using three or four medications showed poor medication adherence 71% or 72.7% respectively. Our results revealed that 77.5% of good adherent patients know the correct doses of medication, while 94.7% of the non-adherent patient did not know. Our findings showed that 71.1% of good adherent patients rarely forget to take their antihypertensive medications. No person from good adherent patients did not forget to take drugs more than 3 times per week compared to poor adherent patients and 66.7% of hypertensive patients with good medication adherence feel relaxed after taking the anti-hypertensive medication. One hundred and sixty-five (61.1%) of hypertensive participants suffer from other chronic diseases; 67.3% of them with good medication adherence. Our results revealed that 159 (58.8%) of hypertensive participants took multiple medications for diseases other than hypertension; 81.1% of them with good medication adherence, however. Our findings showed that 69.9% of hypertensive patients with good medication adherence follow the physician's instructions and 63.4% got enough explanation about the antihypertensive medications from health care providers and they understood the language of drug information.

Table 3 showed that 55.6% of the participants depend on government medical insurance, 5.6% depend on private medical insurance and 35.5% depend on personal payments (P-value 0.000). Regarding monitoring high blood pressure and obtaining medicine monthly, we found that most of the participants (41.1%) with high blood pressure and obtain their medicine once monthly, 23.3% more than two months,15.6% every two months, 3.3% weekly, and 16.7% never check back (P-value 0.000(. Concerning the cost of visits to the hospital or health centers to follow up high blood pressure or to obtain medicines per month, we found that 54.4% of the patients under the expense of government medical insurance, 5.6% under the expense of private medical insurance, 5.6% spend (>400 riyals), 2.2% (201-400 riyals), 5.6% (151-200 riyals), 7.8 (101 - 150 riyals), 11.1% (51-100 riyals) and 6.7% (1-50 riyals) (P-value 0.001). With respect to the cost of visits to the hospital, Table 3 showed that 61.1% (P-value 0.000) of our participant visit costs depend on governmental insurance. In this study concerning hospitalization of the patients, we found that 5.6% spend (100-500 riyals), 1.1% (501-1000 riyals), 3.3% (1001-3000 riyals), 1.1% (>3000 riyals), 43.3% depend on governmental medical insurance and 6.7% depend on private medical insurance (P-value 0.000).

Table 2. *Univariate analysis of the association of potential clinical variables with self-reported adherence among hypertensive patients in the Hail University polyclinic.*

		MMAS category						Chi-Square	
		Group I		Group II		Total sample (270)			
		N	%	N	%	N	%	χ^2	P-value
How many medications do you take for high blood pressure or its complications such as heart disease or kidney disease?	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4
	One drug	38	26.4	106	73.6	144	53.3	71.4	71.4
	Two medication	26	35.6	47	64.4	73	27.0	71.4	71.4
	Three medications	22	71	9	29	31	11.5	71.4	71.4
	Four medications	16	72.7	6	27.3	22	8.1	71.4	71.4
Do you know the correct doses of high blood pressure medication to take?	Yes	48	22.5	165	77.5	57	21.1	71.4	71.4
	No	54	94.7	3	5.3	213	78.9	71.4	71.4
How often did you forget to take high blood pressure medication?	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4
	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4
	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4	71.4
	Do not forget	36	46.2%	42	53.8%	78	28.9	71.4	71.4
	Rarely	33	28.9	81	71.1	114	42.2	71.4	71.4
	Once a week	9	30	21	70	30	11.1	71.4	71.4
	2-3 times a week	12	33.3	24	66.7	36	13.3	71.4	71.4
	More than 3 times a week	12	100	0	0	12	4.4	71.4	71.4
Do high blood pressure medications make you feel relaxed?	Yes	39	33.3	78	66.7	117	43.3	3.337	0.196
	No	21	35	39	65	60	22.2		
	Sometimes	42	45.2	51	54.8	93	34.4		
Do you suffer from other chronic diseases in addition to high blood pressure?	Yes	54	32.7	111	67.3	165	61.1	4.604	0.039
	No	48	45.7	57	54.3	105	38.9		
Do you do the tests when asked by the doctor?	Yes	66	30.1	153	69.9	219	81.1	30.718	0.000
	No	15	83.3	3	16.7	18	6.7		
	Sometimes	21	63.6	12	36.4	33	12.2		
Do you get enough explanation about the high blood pressure medicines that you take from your health care providers in hospitals and health centers?	Yes	45	36.6	78	63.4	123	45.6	10.642	0.005
	No	42	50	42	50	84	31.1		
	Sometimes	15	23.8	48	76.2	63	23.3		
Is the language in which the drug information is explained an easy and understandable language for you?	Yes	54	36	96	64	150	55.6	13.655	0.001
	No	36	54.5	30	45.5	66	24.4		
	Sometimes	12	22.2	42	77.8	54	20.0		

Table 3. *Univariate analysis of the association of potential clinical variables with self-reported adherence among hypertensive patients in the Hail University polyclinic.*

		MMAS category						Chi-Square	
		Group I		Group II		Total (270)			
		N	%	N	%	N	%	χ2	P-value
What is the approximate cost of the medicines for high blood pressure or its complications that you bear monthly?	Nothing	3	33.3	6	66.7	9	3.3	43.528	0.000*
	From 1- 50 riyals	6	50	6	50	12	4.4		
	From 51-100 riyals	0	0	24	100	24	8.9		
	From 101 - 150 riyals	3	12.5	21	87.5	24	8.9		
	From 151 - 200 riyals	3	25	9	75	12	4.4		
	From 201 - 400 riyals	12	66.7	6	33.3	18	6.7		
	More than 400 riyals	6	100	0	0	6	2.2		
	Government insurance	66	44	84	56	150	55.6		
	Private Insurance	77.8	77.8	77.8	77.8	77.8	77.8		
Are the prices of high blood pressure drugs or their complications a burden on your family?	Yes	33	35.5	60	64.5	93	34.4	0.318	0.599
	No	69	39	108	61	177	65.6		
Have high blood pressure or its complications caused you to lose your job or be unable to work?	Yes	12	30.8	27	69.2	39	14.4	0.953	0.329
	No	90	39	141	61	231	85.6		
How often do the hospital or health centers return periodically to monitor high blood pressure and its complications, or to obtain medicines?	Never check back	30	66.7	15	33.3	45	16.7	27.363	0.000*
	Weekly	6	66.7	3	33.3	9	3.3		
	Monthly	30	27	81	73	111	41.1		
	Every two months	18	42.9	24	57.1	42	15.6		
	More than that	18	28.6	45	71.4	63	23.3		
What is the cost that you of your visit to the hospital or health centers to follow up on high blood pressure or to obtain medicines per month?	Nothing	3	100	0	0	3	1.1	25.027	0.001*
	From 1-50 riyals	6	33.3	12	66.7	18	6.7		
	From 51-100 riyals	6	20	24	80	30	11.1		
	From 101-150 riyals	6	28.6	15	71.4	21	7.8		
	From 151-200 riyals	6	40	9	60	15	5.6		
	From 201-400 riyals	6	100	0	0	6	2.2		
	More than 400 riyals	9	60	6	40	15	5.6		
	Government insurance	57	38.8	90	61.2	147	54.4		
	Private Insurance	3	20	12	80	15	5.6		
How many times do you cause high blood pressure or its complications in your annual visit to the emergency unit in hospitals or health centers?	Nothing	33	40.7	48	59.3	81	30.0	3.534	0.477
	One time	21	29.2	51	70.8	72	26.7		
	Twice	18	37.5	30	62.5	48	17.8		
	Three times	9	42.9	12	57.1	21	7.8		
	More than three times	21	43.7	27	56.3	48	17.8		

What is the cost of your visit to the emergency unit due to high blood pressure disease or its complications every time if it is at your own expense?	Nothing	0	0	9	100	9	3.3	25.240	0.000*
	100-200 riyals	15	45.5	18	54.5	33	12.2		
	201-300 riyals	9	50	9	50	18	6.7		
	301-500 riyals	9	42.9	12	57.1	21	7.8		
	More than 500 riyals	9	100	0	0	9	3.3		
	Government insurance	57	34.5	108	65.5	165	61.1		
	Private Insurance	3	20	12	80	15	5.6		
How many times per year did you enter the intensive care unit due to high blood pressure or its complications?	I did not enter	90	38.5	144	61.5	234	86.7	23.747	0.000*
	One time	3	16.7	15	83.3	18	6.7		
	Twice	0	0	9	100	9	3.3		
	Three times	6	100	0	0	6	2.2		
	More than three times	3	100	0	0	3	1.1		
What is the annual cost of entering the intensive care unit due to high blood pressure or its complications?	Nothing	30	28.6	75	71.4	105	38.9	27.094	0.000*
	100-500 riyals	12	80	3	20	15	5.6		
	501-1000 riyals	3	100	0	0	3	1.1		
	1001-3000 riyals	3	33.3	6	66.7	9	3.3		
	More than 3000 riyals	0	0	3	100	3	1.1		
	Government insurance	51	43.6	66	56.4	117	43.3		
	Private Insurance	3	16.7	15	83.3	18	6.7		
Have you performed certain surgeries due to complications of high blood pressure? What is the annual cost of all surgeries due to complications of high blood pressure?	Yes	15	55.6	12	44.4	27	10.0	4.034	0.059
	No	87	35.8	156	64.2	243	90.0		
	Nothing	40	39.2%	62	60.8%	102	12.6	0.747	0.991
	1000-2000 riyals	4	33.3	8	66.7	12	1.5		
	4001-6000 riyals	3	50	3	50	6	0.7		
	6001-10000 riyals	1	33.3	2	66.7	3	0.4		
	More than 10,000 riyals	0	0	2	100	1	0.4		
	Government insurance	49	37.1%	83	62.9%	132	16.3		
	Private Insurance	4	33.3	8	66.7	4	1.5		

Discussion

The study has revealed several variables that contribute to a lack of adherence to antihypertensive medication in hypertensive patients. Addressing these factors is a crucial step towards the optimal control and management of hypertension. In our study, we found a comparable adherence rate of 62.2% to that reported in previous studies conducted in other countries [19-23]. Our findings are within the range of the World Health Organization's (WHO) (50 to 70 percent), indicating a moderate health environment and culture in our communities. Other studies showed lower percentages of adherence than us in different countries; Upper Egypt, Palestine, China, Ethiopia [24-27]. The differences in our results can be attributed to the diverse procedures employed, the research population, and the surroundings [28]. The non-adherence rate to antihypertensive drugs in our study is regarded lower than in local, Arabic, and worldwide studies [25,29,30].

There were no gender differences in treatment adherence in the current trial, which was consistent with a previous investigation [31,32]. Other studies, on the other hand, found gender differences in antihypertensive drug adherence [31,33-36].

Many variables, including young age, the lack of concomitant diseases, a high income, and a high education level, are predictors of good adherence to antihypertensive medicines [37,38]. Some impediments to therapy adherence are more frequent in elderly patients and require special attention in clinical care [39,40]. In our study, around 73% of older patients were non-adherent to antihypertensive medicines, which was similar to earlier studies in other countries [37,41-44]. It might be explained by the fact that older people often have many comorbidities that necessitate pharmacological therapy and may suffer from potential cognitive deficiencies [45-48] support our findings that medicine number consumption has a negative relationship with adherence. Other authors, however, disagreed with our findings since they observed a clear association between adherence and the number of drugs administered [19,49,50]. They hypothesized that those patients were more conscious of their increased illness

risk and hence adhered better.

In the same line, our data revealed that approximately (61%) of hypertensive participants did not have other chronic conditions; 67.3 percent of them had good medication adherence, whereas 32.7 percent of patients had poor medication adherence. This might be because fewer illness comorbidities reduced the number of drugs needed, resulting in greater medication adherence [37,51]. In contrast, a significant association between the presence of comorbid conditions in hypertensive patients and good adherence to antihypertensive medications can be explained by the fact that patients with concomitant comorbid conditions are more likely to be aware of their increased risk and, as a result, are more likely to adhere to a therapeutic regimen [21,52].

There is no substantial influence of economic status on non-adherence rates. Patients' adherence behaviors are influenced by the quality of the healthcare system. This fact is explained by the strong economic situation of all individuals living in KSA, as well as the medical insurance coverage of the majority of patients. Our findings differed from those of numerous earlier research [53,54].

Education improves health literacy, and better education aids in achieving a higher degree of adherence [55]. This proposal is consistent with the findings of our study as well as earlier studies conducted locally and globally [22,28,55-57]. Education may provide a better awareness of the repercussions of noncompliance with antihypertensive medications [28].

According to our findings, employment status appears to have an impact on adherence; employed patients (54 percent) compared to (approximately 27 percent) of patients non-adherence to antihypertensive medication, which is consistent with the findings of previous studies [58,59], and this finding is explained by a lack of awareness and busy work [58].

The non-adherence rate in this research is greater in patients who have had hypertension since <5 years (57.6%) compared to (25%) in patients who have had hypertension for >15 years, which is consistent with many other studies [58,60,61], this may be due to adaptation of the patients to have hypertension with the acceptance of taking the medications as a part of their daily life, or it could be related to a fear of consequences because the condition is chronic.

In hypertension patients, forgetfulness and medication side effects are the most important predictors of non-adherence [14]. Missed medication dosages were substantially linked to treatment non-adherence [37]. According to our statistics, 71% of excellent adherent patients did not skip a dose of their antihypertensive medication. According to the findings of the current study, around 67 percent of hypertension patients with good medication adherence felt at ease after taking antihypertensive medication.

Consistent with previous research [28], our data revealed that approximately 70% of hypertensive patients with good medication adherence performed the appropriate investigations when their doctor ordered them, whereas 83.3 percent of hypertensive patients with poor medication adherence did not. These data show that the physician-patient interaction is an important determinant in inpatient treatment adherence. Regular clinic follow-ups [62], high education and ongoing counseling by healthcare workers, and understanding of the physician's recommendations [63,64] are all important healthcare system elements related to antihypertensive medication adherence.

According to the cost of medicine for hypertension or its sequelae, we discovered that more than 55 percent of the participants rely on government medical insurance in this study. Patients with higher out-of-pocket expenses were more likely to fail to adhere to antihypertensive drug regimens [65].

Conclusion

Poor adherence to antihypertensive medications impaired Hail's blood pressure regulation. This resulted in increasing illness comorbidity and raised the financial burden on the Kingdom of Saudi Arabia's Ministry of Health. This report should persuade health policymakers to take specific methods to minimize national healthcare spending.

Recommendation

Better communication with healthcare providers in hospitals and health care centers, such as physicians and pharmacists, as well as better patient education and providing them with sufficient knowledge about hypertension and its management, will improve patient adherence to medications through the development of multidisciplinary intervention programs, according to the findings of this study.

Authors' Contribution

Conceptualization, design, supervision and project administration, Principal investigator of project and the corresponding author; M.R.M. Collecting data for the study; H.E.E., M.R.M. and N.R.Y. Formal analysis, development of methodology, investigation, verification and validation; A.A.M., H.E.E., M.R.M and M.E.G. Writing the original draft of the manuscript; H.E.E., N.R.Y., H.M.E., A.M.B., M.R.M., A.M.F. and F.S.A. Review and editing the manuscript; H.E.E., A.A.M., M.R.M, N.R.Y., M.E.G., A.M.F., H.M.E., A.M.B. and F.S.A). All authors read and agreed to the final version of the manuscript.

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Institutional Review Board Statement

The study was carried out following the Helsinki Declaration, and the protocol was authorized by the University of Hail institutional review boards under project number (RG–20018) and project ethical approval number (H-2020-206) that was reviewed and approved by the Research Ethical Committee (REC) at the University of Hail dated: 05/11/2020 and approved by university president letter-number 16784/5/42 dated 23/03/1442H.

Informed Consent Statement

It was made to protect their rights and ensure the security of their information. There is a phrase at the top of the questionnaire that states that completing the questionnaire constitutes acceptance to participate in this study.

Data Availability Statement

The datasets created and/or analysed during the present work will be made available upon request by the relevant author.

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Conflicts of Interest

The authors have reported no conflicts of interest.

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***Correspondence to:**

Madiha R Mahmoud

Department of Pharmacology

College of Medicine

University of Ha'il, Ha'il 2440

Saudi Arabia