PREVALENCE OF HYPERTENSION CONTROL AND FACTORS AFFECTING ADHERENCE TO ANTIHYPERTENSIVE MEDICATIONS IN SAUDI ARABIA: A CROSS-SECTIONAL STUDY

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Abstract

Hypertension is a significant public health concern in Saudi Arabia, with low control rates despite the availability of effective treatments. Adherence to antihypertensive medications is crucial for optimal blood pressure management, yet various factors influence patients' adherence levels. In this study, we aim to measure factors that affect adherence to antihypertensive medications in Saudi Arabia. This study used a cross-section study conducted through an online survey using Google Forms and sharing the survey among adult individuals in Saudi Arabia. Understanding the prevalence of hypertension control and the barriers to medication adherence can guide healthcare policies and interventions to improve hypertension management in Saudi Arabia. Addressing key adherence challenges may enhance treatment outcomes and reduce hypertension-related complications.

Keywords: Hypertension, Health, Antihypertensive, Saudi Arabia

Introduction:

Hypertension is a major health problem that is considered to be responsible for more than 13% of yearly mortality in both developing and industrialized countries, it is a problem for about one billion individuals worldwide and is expected to get worse by 2025 with 1.56 billion adults (1). In the kingdom of Saudi Arabia (KSA), hypertension is one of the leading causes of death and morbidity among adults. It has been estimated that about one in four adults have been diagnosed with hypertension (2). It isconsidered the primary risk factor for cardiovascular disease (CVD) (3), and one of the most significant contributor to atherosclerosis, Recognizing and managing excessive blood pressure are important objectives in vascular patient care (4).

Abnormally high blood pressure may explain the rising number of people who develop other conditions, including coronary heart disease, cerebral thrombosis, stroke, and chronic renal failure (5). In Saudi Arabia the prevalence of hypertension was 15.2%, with 17.8% of men and 12.5% of women affected (6). Poor adherence to antihypertensive medications is a primary cause of uncontrolled blood pressure because of the chronic nature of the condition and the absence of evident symptoms, patients with hypertension may neglect to take their medicine as prescribed (5).

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Nonadherence can be unintentional (for example, forgetfulness) or intentional (for example, patients refusing therapy based on their own personal opinions about their sickness and treatment) (6).

In a recent study which was done in Abha, Saudi Arabia in 2022 revealed low medication adherence practice among hypertensive patients. This low adherence is significantly associated with the age, monthly income, people in village area, and married participants (2). A study was conducted at 2019 in North Central Nigeria found that a low adherence level was observed in the study which needs to be recognized and improved through general adherence advocacy (1). Another study was conducted in Switzerland in 2019 showed that 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 nonadherence of hypertensive medications. Understanding the categories of factors contributing to nonadherence is useful in managing nonadherence (7). In USA in 2017 a study found that adherence to antihypertensive medication remains a key modifiable factor in the management of hypertension, an important, preventable risk factor for cardiovascular disease and death. Timely attention in clinical and research settings to identifying and addressing barriers to low medication adherence and uncontrolled BP for the general population may interrupt the costly cycle of this chronic disease and prevent the declines in quality of life associated with the consequences of uncontrolled hypertension (8).

Even though there are several studies related to hypertension, more studies are still required. In this study we are aiming to measure factors that affect adherence to antihypertensive medications in Saudi Arabia.

Methodology

Study design:

A cross-section study was conducted by an online survey by using (Google Forms) and sharing the survey among adult individuals in Saudi Arabia.

Study population and sample size:

The study was Conducted in Saudi Arabia. The survey was shared on social media like WhatsApp between participants. The survey was collected from participants with different genders and different ages.

The required sample size for this study was calculated by OpenEpi website version

3.0 (AG, KM, 2013), in consideration of the following: the population size Saudi Arabia is about 36 million, keeping the confidence interval (CI) level at 95% and considering 50% prevalence of the sample size was calculated to be 384 participants.

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Inclusion and exclusion criteria:

This study will include:
Adults (Males and females) are hypertensive on medications.
Resident in Saudi Arabia.

And excludes:

Adults who do not have hypertension during the time of the study.

Assessment tool:

An online self-administrated questionnaire survey about hypertension control and factors affecting adherence to antihypertensive medications designed by google forms questionnaire templet.

- The questionnaire form is divided into 3 different parts and it will cover the following: research objectives and a consent form, demographic data of adult individuals.
- The questionnaire idea was quoted from previously published study (1) and the ethical approval and permission was taken from the first author.

Data analysis

The data were collected, reviewed, and then fed to Statistical Package for Social Sciences version 26 (Released 2019. Armonk, NY: IBM Corp). All statistical methods used were two-tailed with an alpha level of 0.05 considering significance if P value less than or equal to 0.05. Descriptive analysis for categorical data was done using frequencies and percentages, whereas numerical data were presented as mean with standard deviation. Also, study cases Hypertension data, knowledge and perception, Antihypertensive medications and their adherence were tabulated. Blood pressure control among hypertensive patients was graphed. Cross tabulation for showing factors associated with blood pressure control among study patients factors affecting adherence to antihypertensive medications using Pearson Chi-Square test and exact probability test for small frequency distributions.

Results

A total of 395 eligible hypotensive patients completed the study survey, patients' ages ranged from 18 to more than 65 years with a mean age of 51.2 ± 11.9 years old. A total of 211 (53.4%) patients were females. As for education, 167 (42.3%) had university level of education, 81 (20.5%) had a post-graduate degree, 95 (24.1%) had secondary level of education but 52 (13.2%) had low level of education (Table 1).

Personal data	No	%
Age in years		
18-35	90	22.8%
36-50	87	22.0%
51-65	123	31.1%
> 65	95	24.1%
Gender		
Male	184	46.6%
Female	211	53.4%
Educational level		
Below secondary	52	13.2%
Secondary	95	24.1%
University	167	42.3%
Post-graduate	81	20.5%

TABLE 1: Personal characteristics of study hypertensive patients, Saudi Arabia (n=395)

As for clinical data, exact of 142 (35.9%) cases were hypertensive for more than 10 years and 132 (33.4%) for less than 5 years. Also, 202 (51.1%) cases suffered from any symptoms of high blood pressure, 173 (43.8%) suffer from any other chronic diseases (other than high blood pressure), and 176 (44.6%) had medications to treat other chronic diseases. Considering consequences, 218 (55.2%) cases were hospitalization due to high blood pressure. Considering perception of their disease, 116 (29.4%) feel unsure of their doctor's diagnosis (Table 2).

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Variables	No	%
How long have you been suffering from high blood pressure?		
< 5 years	132	33.4%
5-10 years	121	30.6%
> 10 years	142	35.9%
Do you suffer from any symptoms of high blood pressure?		
Yes	202	51.1%
No	193	48.9%
Do you suffer from any other chronic diseases (other than high blood pressure)?		
Yes	173	43.8%
No	222	56.2%
Do you take medications to treat other chronic diseases?		
Yes	176	44.6%
No	219	55.4%
Frequency of hospitalization due to high blood pressure		
Never	177	44.8%
1 time	113	28.6%
2 / more times	105	26.6%
Do you feel unsure of your doctor's diagnosis?		
Yes	116	29.4%
No	279	70.6%

Table 2: Hypertension clinical data, consequences and follow-up among study patients, Saudi Arabia

A total of 236 (59.7%) know about the complications of high blood pressure, 172 (43.5%) received education and counseling sessions about high blood pressure and 293 (74.2%) aware of their doctor's instructions. As for practice, 143 (36.2%)

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measure their blood pressure daily, and 207 (52.4%) visited the clinic in less than 3 months (Table 3).

Knowledge and practice	No	%
Do you have knowledge of the complications of high blood pressure?		
Yes	236	59.7%
No	159	40.3%
Have you received education and counseling sessions about high blood pressure?		
Yes	172	43.5%
No	223	56.5%
Are you aware of your doctor's instructions?		
Yes	293	74.2%
No	102	25.8%
Do you measure your blood pressure daily?		
Yes	143	36.2%
No	252	63.8%
When was the last time you visited the clinic (in months)?		
Less than 3 months	207	52.4%
More than 3 months	188	47.6%

Table 3: Hypertensive patients' knowledge, perception and practice regarding their high blood pressure

A total of 173 (43.8%) receive only 1 drug, bit 113 (28.6%) received more than

2 drugs. As for frequency, 187 (47.3%) had the drugs once daily and 114 (28.9%)

receive 3 times daily. The drug is paid among 155 (39.2%) and 225 (57%) reported that they supported by family to have the drugs. Exact of 228 (57.7%) cases know

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the drug by its name while 167 (42.3%) know it by the shape or color of the medicine container (Table 4).

Antihypertensive medications	No	%
How many medications do you take for high blood pressure?		
1 drug	173	43.8%
2 drugs	109	27.6%
> 2 drugs	113	28.6%
How many times do you take your high blood pressure medication (daily)		
1 time daily	187	47.3%
2 times daily	94	23.8%
3 times daily	114	28.9%
Cost of antihypertensive drugs		
Free	240	60.8%
Paid	155	39.2%
Does your family support you to take treatment for high blood pressure?		
Yes	225	57.0%
No	170	43.0%
How do you identify your high blood pressure medication?		
Name of the drug	228	57.7%
The shape or color of the medicine container	167	42.3%

Table 4: Antihypertensive medications among study patients, Saudi Arabia

Exact of 209 (52.9%) of the study patients did not have their medication during th past 2 weeks, 173 (43.8%) reduced or stopped taking their medications without telling their doctor, because they felt worse when took drugs. Also, 179 (45.3%) sometimes forget to bring your medications when travel or leave home and 180

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(45.6%) stop taking medication they feel blood pressure is under control. Exact of 203 (51.4%) cases felt overwhelmed about sticking to your blood pressure treatment plan, 37.3% mostly find it difficult to take high blood pressure medications and 170 (43%) forget to take their high blood pressure medications. Likewise, 140 (35.4%) suffer from any side effects when taking high blood pressure medication and 194 (49.1%) reported that their doctor has changed their high blood pressure medications (Table 5).

With regard to blood pressure control based on the question " Most of the time, is your blood pressure (below 130/90)?", blood pressure was controlled among 182 (46.1%) cases and uncontrolled among others (53.9%) (Figure 1).

Medication adherence	No	%
During the past two weeks, were there days when you did not take your high blood pressure medication?		
Yes	209	52.9%
No	186	47.1%
Have you ever reduced or stopped taking your medications without telling your doctor, because you felt worse when you took them?		
Yes	173	43.8%
No	222	56.2%
When you travel or leave home, do you sometimes forget to bring your medications?		
Yes	179	45.3%
No	216	54.7%
Did you take your high blood pressure medication yesterday?		
Yes	204	51.6%
No	191	48.4%
When you feel your blood pressure is under control, do you sometimes stop taking your medication?		
Yes	180	45.6%
No	215	54.4%
Have you ever felt overwhelmed about sticking to your blood pressure treatment plan?		
Yes	203	51.4%
No	192	48.6%
Do you find it difficult to take high blood pressure medications?		

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Never	124	31.4%
Sometimes	116	29.4%
Often	88	22.3%
Always	67	17.0%
Do you forget to take your high blood pressure medications?		
Yes	170	43.0%
No	225	57.0%
Do you suffer from any side effects when taking high blood pressure medication?		
Yes	140	35.4%
No	255	64.6%
Your doctor has changed your high blood pressure medications		
Never	194	49.1%
Once / more	201	50.9%

Table 5. Adherence to antihypertensive mediations among study patients, Saudi Arabia

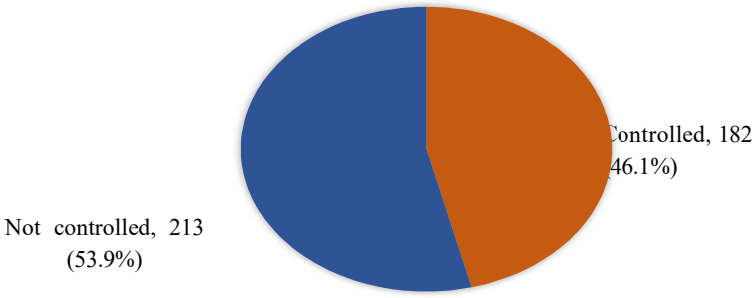

Figure 1. Blood pressure control among hypertensive patients, Saudi Arabia

A total of 59% of those who had only 1 drug had controlled BP versus 32.7% of others who had only more than 2 drugs (P=.001). Also, 55.6% of cases who had

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the drugs once daily had controlled BP versus 33.3% of others who had for 3 times daily (P=.001). Blood pressure control was detected among 52.9% of those who family support them to take treatment for high blood pressure compared to 37.1% of others (P=.002) and among 57.6% of cases who received education and counseling sessions about high blood pressure compared to 37.2% of those who did not (P=.001) besides among 49.8% of cases aware of their doctor's instructions versus 35.3% of those who were not (P=.011) (Table 6).

Factors		Most of the time, is your blood pressure (below 130/90)?				p-value
		Yes		No		
		No	%	No	%	
Age in years	18-35	47	52.2%	43	47.8%	.418
	36-50	41	47.1%	46	52.9%	
	51-65	56	45.5%	67	54.5%	
	> 65	38	40.0%	57	60.0%	
Gender	Male	87	47.3%	97	52.7%	.653
	Female	95	45.0%	116	55.0%	
Educational level	Below secondary	20	38.5%	32	61.5%	.525
	Secondary	42	44.2%	53	55.8%	
	University	83	49.7%	84	50.3%	
	Post-graduate	37	45.7%	44	54.3%	
During the past two weeks, were there days when you did not take your high blood pressure medication?	Yes	101	48.3%	108	51.7%	.342
	No	81	43.5%	105	56.5%	

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Have you ever reduced or stopped taking your medications without telling your doctor, because you felt worse when you took them?	Yes	82	47.4%	91	52.6%	.641
	No	100	45.0%	122	55.0%	
When you travel or leave home, do you sometimes forget to bring your medications?	Yes	84	46.9%	95	53.1%	.757
	No	98	45.4%	118	54.6%	
When you feel your blood pressure is under control, do you sometimes stop taking your medication?	Yes	82	45.6%	98	54.4%	.849
	No	100	46.5%	115	53.5%	
Have you ever felt overwhelmed about sticking to your blood pressure treatment plan?	Yes	97	47.8%	106	52.2%	.484
	No	85	44.3%	107	55.7%	
Do you find it difficult to take high blood pressure medications?	Never	58	46.8%	66	53.2%	.980
	Sometimes	52	44.8%	64	55.2%	
	Often	40	45.5%	48	54.5%	
	Always	32	47.8%	35	52.2%	
Do you suffer from any other chronic diseases (other than high blood pressure)?	Yes	76	43.9%	97	56.1%	.450
	No	106	47.7%	116	52.3%	
Do you suffer from any side effects when taking high blood pressure medication?	Yes	69	49.3%	71	50.7%	.343
	No	113	44.3%	142	55.7%	
How many medications do you take for high blood pressure?	1 drug	102	59.0%	71	41.0%	.001*
	2 drugs	43	39.4%	66	60.6%	
> 2 drugs		37	32.7%	76	67.3%	
How many times do you take your high blood pressure medication (daily)	1 time daily	104	55.6%	83	44.4%	.001*
	2 times daily	40	42.6%	54	57.4%	
	3 times daily	38	33.3%	76	66.7%	
Do you forget to take your high blood pressure medications?	Yes	78	45.9%	92	54.1%	.947
	No	104	46.2%	121	53.8%	
Does your family support you to take treatment for high blood pressure?	Yes	119	52.9%	106	47.1%	.002*
	No	63	37.1%	107	62.9%	
Do you measure your blood pressure daily?	Yes	73	51.0%	70	49.0%	.135
	No	109	43.3%	143	56.7%	
When was the last time you visited the clinic (in months)?	Less than 3 months	96	46.4%	111	53.6%	.900
	More than 3 months	99	57.6%	73	42.4%	
Have you received education and counseling sessions about high blood pressure?	Yes	86	45.7%	102	54.3%	.001*
	No	83	37.2%	140	62.8%	
Are you aware of your doctor's instructions?	Yes	146	49.8%	147	50.2%	.011*
No		36	35.3%	66	64.7%	

P: Pearson X^2 test ** P < 0.05 (significant)*

Table 6: Factors associated with blood pressure control among study patients

A total of 59.7% of cases who difficult to take high blood pressure medications

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were not adherent versus 24.2% of others (P=.001). Also, 53.2% of cases who suffer from any other chronic diseases were not adherent to medications compared to 35.1% of others (P=.001), and 55.7% of cases who suffer from any side effects when taking high blood pressure medication were not adherent versus 36.1% of others (P=.001). Likewise, 60.5% of cases who know their medication by shape or color of the medicine container were not adherent to the medication compared to 30.3% of those who know the drug by its name (P=.001) (Table 7).

Factors		Do you forget to take your high blood pressure medications?				p-value
		Yes		No		
		No	%	No	%	
Age in years	18-35	44	48.9%	46	51.1%	.260
	36-50	41	47.1%	46	52.9%	
	51-65	51	41.5%	72	58.5%	
	> 65	34	35.8%	61	64.2%	
Gender	Male	81	44.0%	103	56.0%	.712
	Female	89	42.2%	122	57.8%	
Educational level	Below secondary	23	44.2%	29	55.8%	.665
	Secondary	39	41.1%	56	58.9%	
	University	77	46.1%	90	53.9%	
	Post-graduate	31	38.3%	50	61.7%	
Do you find it difficult to take high blood pressure medications?	Never	30	24.2%	94	75.8%	.001*
	Sometimes	49	42.2%	67	57.8%	
	Often	51	58.0%	37	42.0%	
	Always	40	59.7%	27	40.3%	
Do you suffer from any other chronic diseases (other than high blood pressure)?	Yes	92	53.2%	81	46.8%	.001*
	No	78	35.1%	144	64.9%	
Do you suffer from any side effects when taking high blood pressure medication?	Yes	78	55.7%	62	44.3%	.001*
	No	92	36.1%	163	63.9%	
How many medications do you take for high blood pressure?	1 drug	75	43.4%	98	56.6%	.900
	2 drugs	45	41.3%	64	58.7%	
	> 2 drugs	50	44.2%	63	55.8%	
How many times do you take your high blood pressure medication (daily)	1 time daily	81	43.3%	106	56.7%	.733
	2 times daily	43	45.7%	51	54.3%	
	3 times daily	46	40.4%	68	59.6%	
Does your family support you to take treatment for high blood pressure?	Yes	101	44.9%	124	55.1%	.393
	No	69	40.6%	101	59.4%	
Do you measure your blood pressure daily?						

When was the last time you visited the clinic (in months)?	Yes	69	48.3%	74	51.7%	.115
	No	101	40.1%	151	59.9%	
Have you received education and counseling	Less than 3 months	93	44.9%	114	55.1%	.426
	More than 3 months	77	41.0%	111	59.0%	
sessions about high blood pressure?	Yes	83	48.3%	89	51.7%	.066
	No	87	39.0%	136	61.0%	
Are you aware of your doctor's instructions?	Yes	125	42.7%	168	57.3%	.798
	No	45	44.1%	57	55.9%	
How do you identify your high blood pressure medication?	Name of the drug	69	30.3%	159	69.7%	.001*
	The shape or color of the medicine container	101	60.5%	66	39.5%	

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P: Pearson X^2 test ** P < 0.05 (significant)*

Table 7: Factors affecting adherence to antihypertensive medications in Saudi Arabia

Discussion

This study explores the prevalence of hypertension control and factors influencing adherence to antihypertensive medications in Saudi Arabia. The duration of hypertension among participants varied, with 35.9% having the condition for over 10 years and 33.4% for less than 5 years. This distribution is consistent with previous research, which suggests that long-standing hypertension is common among patients and often linked to more severe health consequences [9]. Furthermore, 51.1% of participants reported symptoms related to high blood pressure, which contrasts with findings by Gauer et al. (2017), who noted that many hypertensive individuals are asymptomatic [10]. This discrepancy reveals the importance of regular screening and patient education to identify hypertension early and manage it effectively.

Knowledge about hypertension complications was present in 59.7% of patients, while 43.5% received education and counseling. The association between better knowledge and improved blood pressure control supports existing literature that emphasizes the role of patient education in managing chronic conditions [11]. The study's findings align with those of Paterick et al. (2017), who demonstrated that increased awareness and education lead to better health outcomes [12]. However, despite receiving education, a significant proportion of patients still struggled with medication adherence, indicating that knowledge alone may not be sufficient without addressing practical adherence barriers [13].

The study revealed that 52.9% of patients did not adhere to their medication regimen in the past two weeks, with 43.8% reducing or stopping medication without consulting their doctor. These findings are consistent with those of Noreen et al. (2023), who found non-adherence rates of 30-50% among hypertensive patients [14]. Factors contributing to non-adherence included forgetfulness, perceived ineffectiveness, and side effects.

The high rate of non-adherence highlights the need for interventions that address these specific barriers, such as reminder systems and patient support programs [15].

Patients taking only one antihypertensive drug had better blood pressure control compared to those on multiple medications. This finding supports research by Elnaem et al. (2020), which indicates that simplified medication regimens are associated with improved adherence and better clinical outcomes [16]. Patients taking medication once daily had better control compared to those on a three-times-daily regimen. This is consistent with the findings of Youssef et al. (2020), who found that once-daily dosing improves adherence and is preferred by patients [17].

The study found that family support significantly affected adherence, with 57.7% of

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patients who received support having better blood pressure control. This aligns with research by Chacko et al. (2020), which highlights the positive impact of social support on chronic disease management [18]. Similarly, patients who received education and counseling had better control of their blood pressure, reflecting findings by Kalu et al. (2023), who emphasized the importance of patient education in improving health outcomes [19].

Our study also identified several factors affecting medication adherence, including the difficulty of taking medications, presence of side effects, and knowing medication by its shape or color rather than its name. These factors align with findings from previous studies. For example, the impact of medication side effects on adherence was also reported by Kvarnström et al. (2021), who found that side effects significantly decrease adherence rates [20]. The confusion over medication identification was noted by Lenahan et al. (2013), who found that patients who are not familiar with their medication names are more likely to miss doses [21].

Limitations

This study has several limitations. It relies on self-reported data, which can be biased, as patients might not accurately recall or report their medication use and adherence. This study only includes patients from a specific region in Saudi Arabia, which may not represent the experiences of individuals in other areas or countries. It did not account for all possible factors influencing adherence, such as mental health issues or socioeconomic status. Finally, the cross-sectional design only provides a snapshot in time, so it cannot establish cause-and-effect relationships or changes over time.

Future Research

Future research should explore these limitations by using a more diverse sample that includes patients from different regions to see if findings are consistent elsewhere. It would also be beneficial to use objective measures of adherence, like electronic monitoring, to complement self-reported data. Longitudinal studies could help determine how adherence and blood pressure control change over time and identify causal factors. Research should investigate the impact of mental health and socioeconomic factors on medication adherence to develop more comprehensive interventions.

Conclusion

In conclusion, despite efforts to educate patients, numerous factors must still be addressed to achieve full compliance. Strategies such as implementing reminder systems, enhancing family support, and reducing the quantity of antihypertensive medications can be effective. We recommend exploring culturally tailored reminder systems, as these could lead to significant improvements in medication adherence, which in turn improves patient outcomes and reduces mortality and morbidity.

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