Adherence of Adult Hypertensive Patients to Their Medications in Riyadh, Kingdom of Saudi Arabia

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ABSTRACT

Background: The treatment of hypertension depends on pharmacological therapy and non-pharmacological which mean lifestyle modification to decrease blood pressure and prevent the complication. Low-adherent patients have a higher risk of cardiovascular events than high-adherent patients. There is many factors affect antihypertensive patient's adherence.

Objective: To study the adherence states in adult hypertensive patient in Riyadh City as well as to explore the barriers that affect patient adherence.

Methods: This is a cross-sectional study carried out throughout the period June-December, 2016 at the outpatient clinic of Chronic Disease Unit, Al-Morslat Primary Health Care Center, Al-Masef Primary Health Care Center and Al-Iman General Hospital, in Riyadh Region, Saudi Arabia. It included hypertensive patient's prescribed antihypertensive medication at least one year. Qualitative questionnaire was designed to collect data regarding socio-demographic characteristics, medical and therapeutic characteristics and adherence to antihypertensive medications.

Results: The study included 375 hypertensive patients. The age of more than half of them (55.8%) exceeded 50 years. Almost half of them were females (50.9%). Only 17.3% of the participated hypertensive patients had health insurance. The duration of hypertension exceeded 6 years among more than half of them (54.4%). Co-morbid diseases were reported among 56.9% of the patients. Overall, good adherence to anti-hypertension drugs was reported by 20% of patients. Multivariate logistic regression analysis revealed that smoker hypertensive patients were at almost 4-fold increase risk to not adhere to antihypertensive patients compared to non-smokers (Adjusted OR: 4.27 95% CI: 1.69 - 10.76, p=0.002). Patients

with co-morbid diseases were more significantly like to not adhere to antihypertensive drugs opposed to those without co-morbid chronic diseases (Adjusted OR: 3.20 95% CI: 1.73-5.96, p<0.001). Patients who had 4-5 various dugs/day were 32% less likely to be not adherent to anti-hypertensive drugs compared to those who had 1-3 drugs/day (Adjusted OR: 0.68 95% CI: 0.23-0.91, p=0.001). Considering patients who had one daily dose of antihypertensive as a reference category, those on twice daily per day were at lower risk of being not adherent to antihypertensive (Adjusted OR: 0.42 95% CI: 0.22-0.81, p=0.010).

Conclusion: Good adherence to anti-hypertensive medications in Riyadh is suboptimal as only one fifth of patients were highly adherent to anti-hypertensive medications. Our study highlights some factors that may influence adherence levels including smoking status, presence of co-morbid diseases, number of medications taken daily and number of daily anti-hypertensive doses.

Keywords: Adherence, Anti-Hypertensives, Medications, Saudi Arabia.

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INTRODUCTION

Hypertension (HTN) is one of the major chronic diseases worldwide. It is defined as a systolic blood pressure (SBP) of 140 mmHg or higher, or a diastolic blood pressure (DBP) of 90 mmHg or higher according to eighth report of the joint national committee on prevention, detection, evaluation and treatment of

high blood pressure (JNC 8). Hypertension cause cardiovascular disease, also increase risk of Ischemic Heart Disease, Cerebrovascular Disease, Coronary Artery Disease, Congestive Heart Failure, Renal Failure, and Peripheral Vascular Disease. The Etiology of hypertension is usually unknown in primary

hypertension or essential HTN (90% of patients), which is cured, and only control by lifestyle modifications and medication. The other portion of hypertension patient has secondary HTN due to disease or medication.[1]

HTN is called also Silent Disease or Silent Killer because most of patient does not have symptoms. The classification of HTN in adults (18 years and older) is depending the average of two or more blood pressure reading on the many occasions. Blood pressure is classified into four categories: Normal, Pre-hypertension, Stage 1 HTN and Stage 2 HTN.[1]

The goal of therapy to reduce CV risk also reduces HTN-associated morbidity and mortality and target-organ damage (e.g., Cerebro-vascular Events, Heart Failure, and Kidney Disease).[1]

According to JNC - 8 recommendations to achieve blood pressure lower than 140/90 mmHg.or130/80 mmHg in HTN without diabetes, or <130/80 mmHg in patients with diabetes.[1]

The treatment of hypertension depends on pharmacological therapy and non-pharmacological which mean lifestyle modification to decrease blood pressure and prevent the complications.[1]

The lifestyle change include reduce sodium intake less than 1.5 grams per day according to AHA American Heart Association. Also healthy diet with different meal contain fresh, fruits, vegetables, low fat dairy products and regular physical activity like aerobic exercise for example swimming, walking, and biking. The AHA recommended around 30-40 minutes for 3 to 4 time per week.[1]

The JNC-8 guideline recommended four classes for treatment, diuretic, calcium channel blocker (CCB), angiotensin II receptor blocker (ARBs) and angiotensin converting enzyme (ACE) inhibitors. Recommend treatment with drugs taken only once a day and generic where appropriate and minimize cost. However the treatment will not be optimum if patient was not adherent to it.[1]

The term "Adherence" is defined by the World Health Organization (WHO) as the extent to which a person's behavior taking medication, following a diet, and / or executing lifestyle change corresponds with agreed recommendations from health care providers.[2]

Low-adherent patients have a higher risk of cardiovascular events than high-adherent patients.[3] Adherence to medication especially in hypertensive patient is very important for controlling blood pressure also to prevent any complication may happen.

There are many factors affect patient's adherence including demographic characteristics (gender, age, education), psychosocial factors (quality of life), socioeconomic status and disease severity, number of drug prescribe, drug cost, also some of patients are unaware of the disease and its complication, some of them use multiple daily dose of drugs for hypertension and some of these patients have multi disease, forgetfulness and presence of psychological problems, specifically depression.[4]

PATIENTS AND METHODS

This is a cross-sectional study carried out between June and December2016 at the outpatient clinic of Chronic Disease Unit, Al-Morslat Primary Health Care Center, Al-Masef Primary Health Care Center and Al-Iman General Hospital, in Riyadh Region, Saudi Arabia.

Inclusion criteria were adult patients (>30years), diagnosed with hypertension, prescribed antihypertensive medication at least one year and maintain complete sets of answers in the forms. Exclusion criteria included pregnant women.

A qualitative questionnaire was designed to assess the adherence of hypertensive patients to their medication. The questionnaire consisted of 25 closed questions, and was divided into 3 sections: Demographic data (age, gender, educational level, job status, income and marital status, income per month), history of smoking and hypertension-related history (having health insurance, duration of hypertension, history of co-morbid diseases, number of daily medications, types of anti-hypertensive, and number of daily anti-hypertensive doses). Adherence of patients to anti-hypertensive drugs was assessed utilizing an 8-item modified Morisky Medication Adherence Scale (8-MMMAS). The scale was proved to be valid and reliable with sensitivity and specificity of 93% and 53%, respectively [5].

The questionnaire includes socio-demographic characteristics of hypertensive patients. Highly adherent patients were identified with a score of 8 on the scale, medium adherers with a score of 6 or <8, and low adherers with a score of <6 [5]. In the present study high adherence was compared with medium to low adherence.

The questionnaire was developed to get data from patient. The questionnaire was tacked on a pilot group of twenty patients. The chronback alpha was 0.75.The sample size was estimated by Raosoft Inc. for calculating sample size. All files of eligible patients (n=375) were reviewed by the researcher. This study was conducted after approval by ethical committee in Riyadh Collage of Dentistry and Pharmacy [FPRGP/43539010/102].

Data were entered and analyzed using SPSS statistical package versions 20.Data were described in the form of frequency and percentages. Chi-square test was utilized to test for the association between adherence to anti-hypertensive drugs and socio-demographic and medical characteristics of patients.

Multivariate logistic regression analysis was adopted to control for the confounding effect and presents as adjusted odds ratio (OR) and 95% confidence intervals (CI). P-value less than 0.05 was considered statistically significant.

RESULTS

The study included 375 hypertensive patients. Their socio-demographic characteristics are summarized in Table 1. Almost (55.8 %) of the patients their age exceeds 50 years old; whereas only 5.3% of the participants their age between 30 and 35 years. Half of the patients were females (50.9%). About two-thirds (62.1%) of the patients were educated with 25.9% of the respondents has at least University degree. More than one-third of the patients (37.3%) were not working whereas (31.2%) were employees. The income of more than half of the patients (53.9%) was 5000 SR/moth or below. Most of them (70.1%) were married. Almost one-quarter of the respondents (25.6%) were smokers.

Table 2 presents the medical characteristics of the participants. The duration of hypertension exceeded 6 years among more than half of them (54.4%). Co-morbid diseases were reported among (56.9%) of the patients; mainly diabetes mellitus (48.4%). Approximately two-thirds of them (67.2%) reported taking between one and three drugs whereas (10.1%) of the patients reported taking more than 5 drugs daily. More than half of them (51.5%) have taken one dose per day while (9.6%) have taken three doses per day of antihypertensive drugs. Sixty-five patients (17.3%) have health insurance.

Table 1: Socio-demographic characteristics of the participants (n=375)

Socio-Demographic Characteristics	Categories	Frequency	Percentage
Age (Years)	**30-35**	20	5.3
	36-40	23	6.1
	41-45	41	10.9
	46-50	82	21.9
	>50	209	**55.8**
Gender	**Males**	184	49.1
	Females	191	**50.9**
Educational Level	**Educated**	233	**62.1**
	Primary school	45	12.0
	Intermediate school	35	9.3
	High school	56	14.9
	University	59	15.8
	Postgraduate	38	10.1
	Not educated	142	**37.9**
Job Status	**Not working**	140	**37.3**
	Employee	117	**31.2**
	Retired	63	16.8
	Business/trading	55	14.7
Income (SR/Month)	**≤5000**	202	**53.9**
	5001-10000	88	23.5
	10001-20000	61	16.3
	>20000	24	6.4
Marital Status	**Single**	24	6.4
	Married	263	**70.1**
	Divorced	22	5.9
	Widowed	66	17.6

Table 2: Medical-Characteristics of the Participants (n=375)

	Categories	Frequency	Percentage
Duration of Hypertension (Years)	**1-3**	73	19.5
	>3-6	98	26.1
	>6	204	**54.4**
Co-Morbid Chronic Diseases	**Yes**	91	**56.9**
	DM	78	48.4
	Heart disease	17	10.6
	Neurological	8	5.0
	Renal	6	3.8
	Chest	10	6.3
	Rheumatic	17	10.6
	No	69	**43.1**
Number of Drugs Taken Daily	**1-3**	252	**67.2**
	4-5	85	22.7
	>5	38	10.1
Frequency of Doses	**One**	193	**51.5**
	Two	146	38.9
	Three	36	9.6

Table 3 showed that about one third of patients (30.4%) reported history of ever forgetting intake of anti-hypertensive drugs and (13.6%) reported that in the last two weeks. Stopping anti-hypertensive without informing physician or once feeling improved were reported by (14.7%) and (14.9%) of patients, respectively. Stopping antihypertensive once patient got another disease was mentioned by (13.6%) of them. Ever forgetting to take antihypertensive when go out door or during travel were reported by (22.4%) and (11.7%) of the patients, respectively.

History of ever stopping anti-hypertensive whenever feeling hypotension was reported by (13.9%) of patients. Fifty one patients (13.6%) had a problem in remembering drug intake. Most of patients (74.6%) stored anti-hypertension drugs at room temperature.

Overall, complete adherence to anti-hypertension drugs was reported by 20% of patient as demonstrated from figure 1.

From table 4, it is evident that older patients (>50 years) were more likely to adhere to antihypertensive medications compared to younger patients (36-40 years) (24.9% versus 4.3%), p=0.026. Female patients (>50 years) were more likely to adhere to antihypertensive medications compared to male patients (25.1% versus 14.7%), p=0.011. Employed patients tended to adhere to antihypertensive drugs more than those working in business and trading (28.6% versus 9.1%), p=0.005. Non-smoker patients were more likely to adhere to antihypertensive medication compared to smokers (24.7% versus 6.3%), p<0.001. Educational level of patients, their income and marital status were not significantly associated with adherence to anti-hypertensive medications.

Table 3: Adherence to Anti-Hypertension Medication among the Participants (n=375)

	Categories	Frequency	Percentage
Ever forgetting antihypertensive	**Yes**	114	30.4
	No	165	44.0
	Sometimes	96	25.6
Forgetting antihypertensive during the last two weeks	**Yes**	51	13.6
	No	276	73.6
	Sometimes	48	12.8
Ever stopping antihypertensive without informing physician	**Yes**	55	14.7
	No	237	63.2
	Sometimes	82	22.1
Ever stopping antihypertensive once felling improved	**Yes**	56	14.9
	No	244	65.1
	Sometimes	75	20.0
Ever stopping antihypertensive once you get another disease	**Yes**	51	13.6
	No	239	63.7
	Sometimes	85	22.7
Ever forget to take antihypertensive when you go out door	**Yes**	84	22.4
	No	217	57.9
	Sometimes	74	19.7
Ever forget to take antihypertensive during travel	**Yes**	44	11.7
	No	291	77.6
	Sometimes	40	10.7
Ever stopping antihypertensive whenever you feel hypotension	**Yes**	52	13.9
	No	216	57.6
	Sometimes	107	28.5
Having a problem in remembering drug intake	**Yes**	51	13.6
	No	223	59.5
	Sometimes	101	26.9
Place of antihypertensive storage	**Fridge**	82	21.9
	Room	280	74.6
	Others	13	3.5
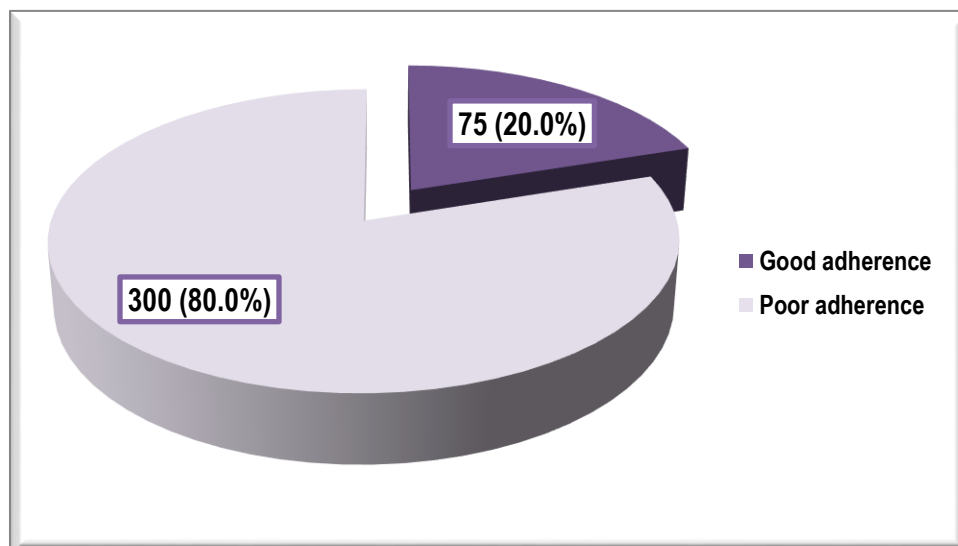
Figure 1: Adherence of Hypertensive Patients to Anti-Hypertensive Drugs.

75 (20.0%)
300 (80.0%)
■ Good adherence
■ Poor adherence

Table 4: Patient's Socio-Demographic Characteristics Associated with Antihypertensive Drugs Adherence

	Adherence to antihypertensive		χ^2	p-value
	No N=300	Yes N=75		
Age (years)				
30-35 (n=20)	19 (95.0)	1 (5.0)		
36-40 (n=23)	22 (95.7)	1 (4.3)		
41-45 (n=41)	36 (87.8)	5 (12.2)		
46-50 (n=82)	66 (80.5)	16 (19.5)		
>50 (n=209)	157 (75.1)	52 (24.9)	11.02	0.026
Gender				
Males (n=184)	157 (85.3)	27 (14.7)		
Females (n=191)	147 (74.9)	48 (25.1)	6.41	0.011
Educational level				
Illiterate (n=142)	104 (73.2)	38 (26.8)		
Primary school (n=45)	37 (82.2)	8 (17.8)		
Intermediate school (n=35)	33 (94.3)	2 (5.7)		
High school (n=56)	46 (82.1)	10 (17.9)		
University (n=59)	47 (79.7)	12 (20.3)		
Postgraduate (n=38)	33 (86.8)	5 (13.2	9.94	0.077
Job status				
Not working (n=140)	100 (85.5)	17 (14.5)		
Employee (n=117)	100 (71.4)	40 (28.6)		
Retired (n=63)	50 (79.4)	13 (20.6)		
Business/trading (n=55)	50 (90.9)	5 (9.1)	12.72	0.005
Income (SR/month)				
≤5000 (n=202)	155 (76.7)	47 (23.3)		
5001-10000 (n=88)	72 (81.8)	16 (18.2)		
10001-20000 (n=61)	54 (88.5)	7 (11.5)		
>20000 (n=24)	19 (79.2)	5 (20.8)	4.31	0.230
Marital status				
Single (n=24)	22 (91.7)	2 (8.3)		
Married (n=263)	204 (77.6)	59 (22.4)		
Divorced (n=22)	19 (86.4)	3 (13.6)		
Widowed (n=66)	55 (83.3)	11 (16.7)	4.03	0.258
Smoking				
Yes (n=96)	90 (93.7)	6 (6.3)		
No (n=279)	210 (75.3)	69 (24.7)	15.25	<0.001

Table 5: Patient's Medical Characteristics Associated with Antihypertensive Drugs Adherence

	Adherence to antihypertensive		χ^2	p-value
	No N=300	Yes N=75		
Having health insurance				
Yes (n=209)	58 (89.2)	7 (10.8)		
No (n=310)	242 (78.1)	68 (21.9)	4.19	0.041
Duration of hypertension (years)				
1-3 (n=73)	62 (84.9)	11 (15.1)		
>3-6 (n=98)	85 (86.7)	13 (13.3)		
>6 (n=204)	153 (75.0)	51 (25.0)	7.08	0.029
Co-morbid chronic diseases				
Yes (n=211)	182 (86.3)	29 (13.7)		
No (n=164)	118 (72.0)	46 (28.0)	11.80	0.001
Number of medications				
1-3 (n=252)	223(88.5)	29 (11.5)		
4-5 (n=85)	50 (58.8)	35 (41.2)		
>5 (n=38)	27 (71.1)	11 (28.9)	37.08	<0.001
Frequency of doses				
One (n=193)	173 (89.6)	20 (10.4)		
Two (n=146)	97 (66.4)	49 (33.6)		
Three (n=36)	30 (83.3)	6 (16.7)	28.24	<0.001

Table 6: Determinate of Non-Adherence to Anti-Hypertensive Drugs:
Results of Multivariate Logistic Regression Analysis

Variables	B	SE	Adjusted OR	95% CI	p-value
Smoking					
No (n=279)[a]			1.0	---	---
Yes (n=96)	1.451	0.472	4.27	1.69-10.76	0.002
Co-morbid chronic diseases					
No (n=164) [a]			1.0	---	
Yes (n=211)	1.164	0.314	3.20	1.73-5.93	<0.001
Number of medications					
1-3 (n=252)[a]			1.0	---	---
4-5 (n=85)	1.738	0.525	0.68	0.23-0.91	0.001
>5 (n=38)	0.278	0.497	1.32	0.50-3.50	0.570
Frequency of doses					
One (n=193)			1.0	---	---
Two (n=146)	-0.861	0.332	0.42	0.22-0.81	0.010
Three (n=36)	0.755	0.593	2.13	0.67-6.80	0.203

[a]Reference category; B: Slope; SE: Standard error; OR: Odds ratio; CI: Confidence interval.
Terms of age, gender, having health insurance, job status and duration of hypertension
were removed from the final logistic regression model (not significant)

As demonstrated in table 5, patients who had health insurance were less likely to adhere to antihypertensive drugs opposed to those without health insurance (10.8% versus 21.9%), p=0.041. Patients with longer duration of hypertension (>6 years) tended to adhere to antihypertensive compared to those with shorter duration (>3-6 years) (25% versus 13.3%), p=0.029. Hypertensive patients without co-morbid diseases adhered more significantly to antihypertensive drugs compared to those with co-morbid diseases (28% versus 13.7%), p=0.001. Patients who had 4-5 medications/day tended to adhere more significantly to antihypertensive compared to those who had 1-3 drugs per day (41.2% versus 11.5%), p<0.001. Patients who had two doses of antihypertensive daily were more likely to adhere to medications than those who had one dose/daily (33.6% versus 10.4%), p<0.001.

Multivariate logistic regression analysis revealed that smoker hypertensive patients were at almost 4-fold increase risk to poorly adhere to antihypertensive patients compared to non-smokers (Adjusted OR: 4.27 95% CI: 1.69-10.76, p=0.002). Patients with co-morbid diseases were more significantly like to poorly adhere to antihypertensive drugs opposed to those without co-morbid chronic diseases (Adjusted OR: 3.20 95% CI: 1.73-5.96, p<0.001). Patients who had 4-5 various drugs/day were 32% less likely to be poorly adherent to anti-hypertensive drugs compared to those who had 1-3 drugs/day (Adjusted OR: 0.68 95% CI: 0.23-0.91, p=0.001). Considering patients who had one daily dose of antihypertensive as a reference category, those on twice daily per day were at lower risk of being poor adherent to antihypertensive (Adjusted OR: 0.42 95% CI: 0.22-0.81, p=0.010). Patient`s age, gender, having health insurance, job status and duration of hypertension were not significantly associated with poorly adherence to antihypertensive drugs.

DISCUSSION

Hypertension control is fundamental in prevention of a wide range of cardiovascular diseases. Non-perfect adherence to antihypertensive medication is associated with adverse disease sequels, waste of healthcare resources, and increases the burden of uncontrolled blood pressure.[3] Therefore the present study was carried out to explore the adherence state in adult hypertensive patient in Riyadh city as well as to identify the factors associated with adherence to antihypertensive therapy.

The overall percentage of perfect adherent hypertensive patients in the present study was 20% which is lower than reported in other study carried out among Lebanese patients (50.5%),[4] Saudi patients (53%),[6] USA (71.6%)[7] and China (65.1%).[8] The lower rate reported in this study could be attributed mainly due to the fact that we depend in our analysis for definition of adherence on the consideration of high adherence of 8-MMMAS which identified with a score of 8 on the scale, however most of these studies depend on a cut-off level of 6 out of 8. If we consider a cut-off level of 6 in the present data, the percentage of adherence would increase to 30.7%. Additionally, the difference between the present study and others could be also attributed to different cultural factors, such as cultural health perception of hypertension, self-care behaviors, and social support.[5]

Concerning socio-demographic characteristics of patients, in univariate analysis, older, female, and working were more adherent to antihypertensive compared to their counterparts. However, in multivariate analysis, only none-smokers remained significant after controlling for the confounding effect. These results are consistent with others who reported that younger patients and males were found to be less adherent.[9] However, the opposite has been reported in another study carried out long time age in Tabuk, Saudi Arabia,[6] and also in other similar studies carried out in Lebanon,[4] and Brazil.[10]

Non-smokers were more adherent to antihypertensive drugs compared to smokers. The same has been observed in a study carried out in Al-Madinah, Saudi Arabia.[11] Saounatsou, et al reported that poor socioeconomic status, illiteracy, and unemployment were important risk factors for poor adherence.[12] However, in the present study, this was not confirmed.

Regarding medication-related factors, in univariate analysis, better adherence was observed among patients without health

insurance, without co-morbid diseases, with longer duration of hypertension, those having between 4 and 5 drugs per day and those treated by two doses of antihypertensive drugs per day. However, in multivariate analysis, only absence of co-morbidity, having more drugs daily (4-5 drugs) and two doses of antihypertensive drugs were more likely to be associated with good adherence to anti-hypertensive medication. In studies carried out in Lebanon[4] and china.[8] The number of antihypertensive medications was not related to adherence behaviors. In France, it has been reported that taking a combination of antihypertensive drugs rather than multiple single drugs may improve adherence levels.[13]

Surprisingly, in the present study having 4-5 drugs per day was associated with better adherence as compared to having between one and three drugs per day and having two doses of anti-hypertensive per day was more likely to be associated with better adherence than taking only one dose. This is opposite to what has been reported that complicated drug regimens is an accepted reason for poor adherence and therapy should be simplified by fewer daily doses of antihypertensive drugs, mono-therapies (preferably combination dosages), and fewer changes in antihypertensive medications for better adherence outcomes. The finding of our study should be further investigated.[14, 15]

It has been documented that patients taking more drugs may have a more severe disease and co-morbidities which necessitates medication adherence.[4] However, in the current study, having co-morbid diseases was significantly associated with lower adherence to medications. This finding could be explained by the cross-sectional design of the study that proves association and not causation as non-adherence to anti-hypertensive medications could be resulted in co-morbid diseases and not the opposite.

One of the important limitations of this study was the non-inclusion of the level of blood pressure in order to associate between adherence to anti-hypertensive medication and blood pressure control. Also, the cross-sectional design of the study proves association and not causation between non-adherence and associated factors. Furthermore, we did not include the relationship between patients and their healthcare providers which could affect their adherence to medication. Self-reporting questionnaire was used as the only method of measuring adherence, which has potential disadvantages regarding recall bias finally, the study was carried out in specific health care facilities in Riyadh which might affect the generalizability of results. Despite of these limitations, the study might have significant implications in identifying the rate of low adherence to antihypertensive medications and factors behind this in Saudi Arabia. The present study concluded that good adherence to anti-hypertensive medications in Riyadh is suboptimal as only one fifth of patients were highly adherent to anti-hypertensive medications. Our study highlights some factors that may influence adherence levels including smoking status, presence of co-morbid diseases, number of medications taken daily and number of daily anti-hypertensive doses.

RECOMMENDATIONS

1. Health promotion and patient education programs in collaboration with pharmacists as well as social support networks should be implemented in order to enhance adherence with drugs for hypertension.

2. Appropriate measures should be conducted to improve patient memory such as planning to have drugs in conjunction with certain activities as eating meals, and recommending the use of pill boxes that facilitate the process of medication intake.

3. Physicians should prescribe generic named of drugs to overcome non-adherence due to cost or non-availability of certain drugs.

4. Further study is recommended including hypertensive patients from different disciplines in Riyadh and investigating level of blood pressure control as well as patient–healthcare provider factors that might influence adherence.

5. As smoking among hypertensive patients appeared as a factor significantly associated with poor adherence, measures to prevent smoking should be encouraged.

REFERENCES

1. Bell K, Twiggs J, Olin B. Hypertension: The Silent Killer: Updated JNC-8 Guideline Recommendation, APA, 2015.
2. Sabate E. Adherence to long-term therapies: evidence for action. Geneva: World Health Organization. (Accessed March 1, 2014) Available at: http://www.who.int/chronic _ conditions/en/adherence_report.pdf; 2003.
3. Mazzaglia G, Ambrosioni E, Alacqua M, Filippi A, Sessa E, Immordino V, et al. Adherence to antihypertensive medications and cardiovascular morbidity among newly diagnosed hypertensive patients. Circulation 2009;120: 1598–605.
4. Yassine M, Al-Hajje A, Awada S, Rachidi S, Zein S, Bawab W, et al. Evaluation of medication adherence in Lebanese hypertensive patients. J Epidemiol Glob Health. 2016 Sep;6(3):157-67.
5. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens (Greenwich) 2008;10:348–54.
6. Al SowielemL.S, El Zubier, AG. Compliance and knowledge of hypertensive patients attending PHC centers in AL-Khobar , Saudi Arabia , EMHJ - Eastern Mediterranean Health Journal 1998; 4 (2), 301-307.
7. Hyre AD, Krousel-Wood MA, Muntner P, Kawasaki L, DeSalvo KB. Prevalence and predictors of poor antihypertensive medication adherence in an urban health clinic setting. J Clin Hypertens (Greenwich) 2007; 9:179-86.
8. Lee GK, Wang HH, Liu KQ, Cheung Y, Morisky DE, Wong MC. Determinants of medication adherence to antihypertensive medications among a Chinese population using Morisky Medication Adherence Scale. PLoS One 2013;8:e62775.
9. Al-Ramahi R. Adherence to medications and associated factors: A cross-sectional study among Palestinian hypertensive patients. Journal of Epidemiology and Global Health 2015 June;5(2): 125–132.
10. Fernandez Arias M, Acuna Villaorduna A, Miranda J et al. Adherence to Pharmacotherapy and Medication-Related Beliefs in Patients with Hypertension in Lima, Peru. Plops One. 2014; 9(12): e112875.
11. Mahmoud, MIH. Compliance with treatment of patients with hypertension in Almadinah Almunawwarah: A community-based study. Journal of Taibah University Medical Sciences 2012 December;7(2): 92–98.
12. Saounatsou M, Patsi O, Fasoi G, Stylianou M, Kavga A,

Economou O, et al. The influence of the hypertensive patient's education in compliance with their medication. Public Health Nurs 2001;18:436–42.

13. Korb - Savoldelli V, Gillaizeau F, Pouchot J, Lenain E, Postel - Vinay N, Plouin P F, et al. Validation of a French version of the 8 - item Morisky medication adherence scale in hypertensive adults. J Clin Hypertens (Greenwich) 2012; 14: 429–34.

14. Iskedjian M, Einarson TR, MacKeigan LD, Shear N, Addis A, Mittmann N, et al. Relationship between daily dose frequency and adherence to antihypertensive pharmacotherapy evidence from a meta-analysis. Clin Ther 2002;24:302–16.

15. George J, Phun YT, Bailey MJ, Kong DC, Stewart K. Development and validation of the medication regimen complexity index. Ann Pharmacother 2004;38:1369–76.