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Factors affecting hypertensive patients' compliance with healthy lifestyle

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Qais Alefan[1]
Dima Huwari[1]
Osama Y Alshogran[1]
Mohamad I Jarrah[2]

[1]Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, Irbid, Jordan; [2]Department of Internal Medicine, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan

Purpose: This study aimed to identify factors correlating with hypertensive patients' compliance with lifestyle recommendations in north of Jordan.

Patients and methods: A cross-sectional survey and face-to-face interview methods were used to collect the data from 1000 adult Jordanian hypertensive patients (>18 years old). A questionnaire was developed based on previous literature and professional consultation.

Results: Only 23% of the patients were fully compliant with healthy lifestyle behaviors. About 95% were knowledgeable on hypertension and 86% had positive beliefs about the management protocols of their disease. Gender, physician counseling on a healthy lifestyle, patients' beliefs about hypertension management, and their knowledge on hypertension and its management have an independent effect on compliance with lifestyle recommendations.

Conclusion: Patients' compliance with lifestyle recommendations was low. Receiving counseling from physicians about healthy lifestyle and self-care; being informed about hypertension and its management; and having positive beliefs about managing this disease are significant predictors of patients' compliance with lifestyle recommendations.

Keywords: blood pressure, adherence, diet, exercise

Introduction

Hypertension, also called high blood pressure (BP), is a chronic disease that is defined as persistently elevated arterial BP.[1–3] Hypertension is divided into primary hypertension, also called essential hypertension (90%) which results from unknown pathophysiologic etiology and has no cure; and secondary hypertension (10%) which results from specific causes such as chronic kidney disease, Cushing syndrome, hyperparathyroidism, primary aldosteronism, hyperthyroidism, and some medications (eg, corticosteroids, estrogens, nonsteroidal anti-inflammatory drugs, amphetamines, cyclosporine, erythropoietin, venlafaxine). Secondary hypertension can be mitigated or potentially cured.[3,4] Elevated BP is a major risk factor for cardiovascular, cerebrovascular, kidney, and eye diseases.[1]

Around the world, the overall prevalence of raised BP in adults 18 years or older was nearly 22% in 2014. Within the World Health Organization (WHO) regions, the prevalence of elevated BP was the lowest in the USA (18%). The highest prevalence of elevated BP was in Africa (30%). In the Eastern Mediterranean countries, it was around 27% for both sexes. In all WHO regions, men have a slightly higher prevalence of elevated BP than women. Based on income levels, the prevalence was lower in middle-income and high-income countries compared to low-income countries.[5,6]

According to the Eighth Joint National Committee (JNC 8) guidelines for the management of hypertension, hypertensive patients aged 60 years or older should

Correspondence: Qais Alefan
Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan
Tel +962 7 7214 8171
Fax +9 622 720 1075
Email qmefan@just.edu.jo

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be treated to a BP goal of less than 150/90 mmHg and hypertensive patients 30 through 59 years of age to a BP goal of less than 140/90 mmHg. The same goals are recommended for hypertensive adults with diabetes or chronic kidney disease as for the general hypertensive population younger than 60 years.[1]

Lifestyle changes can be used as an initial treatment before the start of antihypertensive medications and as an adjunct to medications in persons already on drug therapy. Lifestyle changes include weight loss if overweight; adoption of the Dietary Approach to Stop Hypertension eating plan; dietary sodium restriction; moderate alcohol consumption; regular aerobic physical activity; smoking cessation; and stress reduction.[3,7–9]

Over the past decade, the prevalence of hypertension has significantly increased in Jordan. Between 1994 and 2009, the prevalence rate increased from 29% to 32%. The prevalence was higher among males, elderly, least educated, obese, and diabetic patients than their counterparts. A large number of hypertensive patients in Jordan have uncontrolled BP.[3,10]

The main aims of the study were to estimate the rate of compliance with lifestyle change recommendations; assess the extent of patients' knowledge and beliefs about hypertension; and identify factors correlating with hypertensive patients' compliance with lifestyle recommendations in the north of Jordan.

Materials and methods

This was a cross-sectional survey which was conducted in between October 2016 and December 2016. A total of 1000 adult Jordanian patients (>18 years old) with hypertension, defined as a systolic BP ≥140 mm Hg and/or diastolic BP ≥90 mm Hg; diagnosed for at least 1 month; on antihypertensive drugs; and attending the hypertensive clinic in King Abdullah University Hospital (KAUH), were randomly selected and included in this study. Based on previous literature on the prevalence of hypertension in Jordan which indicated that about one-third of adult Jordanians are affected with hypertension, 0.05 margin of error, and confidence interval of 95%, the minimum required sample size was calculated to be 385. However, we recruited more participants to avoid missing information that may result from incomplete responses.

The study was conducted at KAUH. KAUH was built within the Jordan University of Science and Technology campus, which is located in the north of Jordan, on the highway linking Jordan to Syria. It is about 20 km east of Irbid and 80 km north of Amman. This carefully chosen location allows the hospital to provide primary, secondary, and tertiary health-care services to more than 1 million inhabitants of Irbid, Ajloun, Jarash, and Mafraq governorates, in particular, and to all of the Hashemite Kingdom of Jordan population in general. The hospital bed capacity is 683 beds, which can be increased to 800 beds in any emergent situation. In addition, it is a training hospital that provides training for junior medical doctors and pharmacists.[11]

The institutional review board of KAUH, Jordan University of Science and Technology, Irbid, Jordan, approved the study protocol before implementation.

The study was conducted according to the criteria set by the declaration of Helsinki, and each subject signed an informed consent before participating in the study. Patients were interviewed by a trained pharmacist using a standard questionnaire to obtain data related to their sociodemographic and medical characteristics, general behaviors, counseling on lifestyle behaviors and self-care, and knowledge and beliefs about hypertension. The interview was administered in 10–15 min. The questionnaire was developed based on previous literature[12–22] and with the help of experts in the field of hypertension. The developed questionnaire was piloted with 20 patients. Their comments on the questionnaire were taken into consideration and were discussed by the research team.

Study measures

The outcome variable of the study was health behaviors. Independent variables in this study were distributed into four parts:

1. Socio-demographics and medical characteristics: age, gender, family status, education, country of origin, place of residence, presence of maids, education level, monthly income, height, weight, BMI, level of blood pressure, time since hypertension diagnosis, and medication use.
2. Counseling on lifestyle behaviors and self-care: appropriate diet, physical activity, smoking cessation, body weight, self-measurement of blood pressure, risks and complications of hypertension, and signs of deterioration in the patient's health status.
3. Knowledge about hypertension.
4. Beliefs about hypertension management.

Every patient was given a score[12,14,17,18] based on his/her answers to the following parts:

1. Lifestyle and self-management counseling (seven questions): Patients who answered (yes) to 0–4 items were scored as (low) in this measure, whereas who answered (yes) to more than four items were scored as (high).
2. Knowledge on hypertension (five questions): Patients with 3–5 correct answers ("True" for the first four questions and "False" for the last question) were scored as (high) in this measure, whereas those with 0–2 correct answers were scored as (low).
3. Beliefs about hypertension management (four questions): Patients with 3–4 correct answers ("Agree") were scored as (high) in this measure, whereas those with 0–2 correct answers were scored as (low).
4. General behavior (physical activity, diet, and smoking status): Patients who reported a full adherence to healthy behaviors (exercise regularly, have never smoked or used to smoke, and follow a diet for hypertension) were defined as (compliant).

Then, based on their answers on the general behaviors questions and based on their scores, in all parts, patients were divided into compliant and non-compliant groups.

Data analysis

Statistical analyses were carried out using the SPSS® Version 23. Descriptive statistics were calculated, and chi-square tests were conducted to find bivariate correlations with the outcome variables. All variables significant at the $p<0.05$ level were entered into the binary logistic regression model as potential predictors of adherence to lifestyle recommendations.

Results

A total of 1000 patients were interviewed, and all provided complete responses. Table 1 shows that 48% (n=480) of the sample were over 60 years and more than half (n=570, 57%) were female. About two-thirds (n=630, 63%) were city residents, and the majority (n=900, 90%) were married. Only one-third (n=340, 34%) of respondents completed tertiary education, and a majority (n=920, 92%) reported that they do not have maids in their homes. A majority of respondents (n=800, 80%) were either overweight (n=350, 35%) or obese (n=450, 45%). Slightly more than half of the patients (n=530, 53%) reported that their BP was less than 140/90 mmHg at the last measurement, and half (n=490, 49%) reported that their BP was controlled (Table 1).

Table 1 Sociodemographic and medical characteristics of patients

	N=1000 (%)
Age (years)	
19–40	50 (5)
41–60	470 (47)
>60	480 (48)
Gender	
Male	430 (43)
Female	570 (57)
Place of residence	
City	630 (63)
Village	370 (37)
Family status	
Single	30 (3)
Married	900 (90)
Divorced	0 (0)
Widowed	70 (7)
Education level	
Illiterate	170 (17)
Primary school	180 (18)
Secondary school	310 (31)
Tertiary school	340 (34)
Work status	
Governmental employee	100 (10)
Private business	100 (10)
House wife	450 (45)
Non-employed	30 (3)
Retired	320 (32)
Monthly income (JD)	
<150	180 (18)
150 to <500	460 (46)
500 to <850	160 (16)
850 to <1200	110 (11)
>1200	90 (9)
Presence of maids	
Yes	80 (8)
No	920 (92)
BMI	
Underweight (<18.5)	0 (0)
Normal (18.5–24.9)	200 (20)
Overweight (25–29.9)	350 (35)
Obese (≥30)	450 (45)
Systolic and diastolic blood pressure when last checked	
<140/90 mmHg	530 (53)
140/90–159/99 mmHg	340 (34)
≥160/100 mmHg	130 (13)

(*Continued*)

Table 1 (Continued).

	N=1000 (%)
Is your blood pressure controlled nowadays?	
Yes	490 (49)
Sometimes	230 (23)
No	280 (28)

A majority of respondents received counselling on physical exercise (n=690, 69%), on desirable weight (n=700, 70%), and on diet (n=770, 77%). However, less than half (n=430, 43%) received counseling on smoking cessation. Also, about two-thirds received education on complications of high BP and signs of deterioration (n=580, 58%) and (n=630, 63%), respectively, while less than half received education on how to measure BP (n=470, 47%) (Table 2).

Table 2 Patients' reports on lifestyle and self-management counseling

	N=1000 (%)
Current physician recommended physical activity?	
Yes	690 (69)
No	310 (31)
Current physician discussed smoking cessation?	
Yes	430 (43)
No	570 (57)
Current physician discussed the need for a suitable diet – what you may and may not eat?	
Yes	770 (77)
No	230 (23)
Current physician discussed your desirable weight?	
Yes	700 (70)
No	300 (30)
Current physician explained the risks and complications of high blood pressure?	
Yes	580 (58)
No	420 (42)
Current physician explained how to measure blood pressure by yourself?	
Yes	470 (47)
No	530 (53)
Current physician explained about signs for deterioration?	
Yes	630 (63)
No	370 (37)

Less than half (n=470, 47%) of the patients exercise regularly and more than half never smoked (n=590, 59%) and adhere to a special diet (n=580, 58%) (Table 3).

The majority of the patients responded with "True" to the following statements "unbalanced BP can damage blood vessels and lead to heart attacks and strokes" (n=920, 92%); "being overweight does affect BP" (n=940, 94%); and "salt consumption raises BP" (n=970, 97%); "physical exercise helps reduce blood pressure" (n=890, 89%); and that "medication is not the only modality needed to treat hypertension" (n=830, 83%) (Table 4).

Most of the patients agreed that antihypertensive medications help them to feel better (n=920, 92%), a diet to reduce hypertension will help them feel better (n=810, 81%), they should be treated constantly (n=880, 88%), and that it is possible to control their blood pressure (n=730, 73%). Also, more than half (n=540, 54%) of the patients reported that ensuring a balanced BP is their responsibility (Table 5).

It was found that only 23% of the patients were adherent to health behaviors, whereas (77%) were not, and most of the patients (n=560, 56%, n=950, 95%, n=860, 86%) got high scores in counseling, knowledge, and beliefs about hypertension parts, respectively (Table 6).

From the results of chi-square tests, significant associations were found between compliance and gender (χ^2= 10.499, p=0.001), work status (χ^2= 10.856, p=0.028), lifestyle and self-management counselling (χ^2= 9.143, p=0.002), knowledge (χ^2= 8.129, p=0.004), and beliefs (χ^2= 18.228, p=0.000). Female patients were more likely to be compliant with health behaviors than their male

Table 3 Patients' reports on general behaviors

	N=1000 (%)
Do you exercise regularly?	
Yes	470 (47)
No	530 (53)
Do you smoke or have you in the past?	
I smoke	230 (23)
I used to smoke	180 (18)
I have never smoked	590 (59)
Do you follow a special diet for your hypertension (low calorie, low fat, salt-free, etc.)?	
Yes	580 (58)
Sometimes	170 (17)
No	250 (25)

Table 4 Patients' knowledge about hypertension

	N=1000 (%)
Unbalanced blood pressure can damage blood vessels and lead to heart attacks and strokes?	
True	920 (92)
False	0 (0)
I don't know	80 (8)
Being overweight does affect blood pressure?	
True	940 (94)
False	0 (0)
I don't know	60 (6)
Salt consumption raises blood pressure?	
True	970 (97)
False	0 (0)
I don't know	30 (3)
Physical exercise helps reduce blood pressure?	
True	890 (89)
False	0 (0)
I don't know	110 (11)
Medication is all that is needed to treat hypertension?	
True	130 (13)
False	830 (83)
I don't know	40 (4)

Table 5 Patients' beliefs about hypertension

	N=1000 (%)
I believe that medication to reduce hypertension will help me feel better?	
Agree	920 (92)
Don't entirely agree	60 (6)
Disagree	20 (2)
Don't know	0 (0)
I believe that a diet to reduce hypertension will help me feel better?	
Agree	810 (81)
Don't entirely agree	80 (8)
Disagree	80 (8)
Don't know	30 (3)
A hypertension patient has to be treated constantly, whether or not his/her health improves?	
Agree	880 (88)
Don't entirely agree	30 (3)
Disagree	80 (8)
Don't know	10 (1)
I believe that it is possible to control my blood pressure?	
Agree	730 (73)
Don't entirely agree	110 (11)
Disagree	140 (14)
Don't know	20 (2)
Who is responsible for ensuring your blood pressure is balanced?	
Full/main responsibility is with the doctor and/or nurse	60 (6)
Full/main responsibility is with the patient	540 (54)
Full/main responsibility is with the patient and the doctor	400 (40)

counterparts. Patients who were housewives were found to be more compliant than those who were working, non-employed, or retired. Participants with high scores on the lifestyle and self-management counseling, on the patients' knowledge about hypertension, and on the patients' beliefs about hypertension were found to be more compliant than those with low scores (Table 7).

According to binary logistic regression results, gender, lifestyle and self-management counseling, high knowledge, and beliefs scores were found to be independent predictors of compliance. Being female increased the odds of compliance with lifestyle recommendations about 2 times (OR 1.9 [1.2–3.1]). Patients who got high scores in lifestyle and self-management counseling, knowledge, and beliefs about hypertension were OR 1.5 [1.1–2.1], OR 2.9[1–8.4], and OR 2.7[1.4–4.9] times, more compliant than those who got low scores, respectively (Table 8).

Discussion

This study has shown that 23% of the patients were fully compliant with healthy lifestyle behaviors, about 95% were knowledgeable about hypertension, and 86% had positive beliefs about the management protocols of their disease. Gender, physician counseling on a healthy lifestyle, patients' beliefs about hypertension management, and their knowledge on hypertension and its management have an independent effect on compliance with lifestyle recommendations.

Several studies have defined compliance as the willingness of the patients to change their lifestyle according to physician recommendations and take responsibility for their health.[23–25] Factors that affect the compliance rate can be divided into external and internal factors. External factors include the impact of health education, the support from the family and friends, and the relationship between the patient and physician. Internal factors include socio-demographic characteristics, attitude, and emotions caused by the disease.[24,25] In this study, only 23% of the patients

Table 6 Overall patients' scores

	N=1000 (%)
Health behavior	
Non-compliant	770 (77)
Compliant	230 (23)
Patients' reports on lifestyle and self-management counseling (score)	
Low	440 (44)
High	560 (56)
Patients' knowledge about hypertension (score)	
Low	50 (5)
High	950 (95)
Patients' beliefs about hypertension (score)	
Low	140 (14)
High	860 (86)

Table 7 Association between compliance and various factors

Factors	*Pearson chi-square value	*df*	*P*-value
Age	0.536	2	0.765
Gender	10.499	1	0.001
Place of residence	3.679	1	0.055
Family status	6.074	3	0.108
Education level	4.413	3	0.220
Work status	10.856	4	0.028
Monthly income	0.712	4	0.950
Presence of maids	0.007	1	0.935
BMI	5.974	3	0.113
SBP and DBP diastolic blood pressure when last checked	4.540	2	0.103
BP control	3.535	2	0.171
Responsibility for ensuring balanced blood pressure	2.008	2	0.366
Lifestyle and self-management counseling score	9.143	1	0.002
Knowledge about hypertension score	8.129	1	0.004
Beliefs about hypertension score	18.228	1	0.000

Note: *Pearson chi-square test, $p<0.05$.

were fully adherent to healthy lifestyle behaviors. This low rate could be due to the poor relationship between the patient and the physician and/or lack of support from family and friends.[26,27] In another study, it was found that somewhat hypertensive patients did not follow healthy lifestyle behaviors.[23]

The effect of knowledge and beliefs about hypertension and its management is concordant with the known theoretical model relating attitudes to changes in lifestyle behaviors, as well as results of former studies reporting that patient education about hypertension and lifestyle changes and physician counseling improved blood pressure control.[2,28–30] Based on the previous studies, patients who are more knowledgeable can play an active role in the management of hypertension and therefore are more effective in controlling their BP. In this study, the overall knowledge and beliefs scores were high (95% and 86%, respectively). This finding was similar to another study's finding that showed that the scores of hypertensive patients' knowledge and beliefs were also high.[17] However, another study found the low rate of knowledge about hypertension.[31] Despite the high score of patients' knowledge and their positive beliefs, the compliance rate was low. The low compliance rate may be due to the weak relationship between patients and physicians and lack of support by the family and friends or maybe the patients not following the recommendations in the correct way.[32]

The role of gender in compliance with disease management among hypertensive patients is still unclear. The majority of the studies found that female gender was associated with better compliance.[33] The nature of being female, her life, and her fears about the disease may play a role. This study reported that there was a significant association between patients' compliance with lifestyle recommendations and gender. Female patients were more compliant than male patients (p=0.005). In Japan, similar findings were found.[8] However, a study conducted in Turkey did not find gender to be an independent predictor of compliance with hypertension management.[15]

Lifestyle counseling by the physician about diet, weight loss, physical activity, and smoking can play an important role in promoting a healthy lifestyle.[34] In this study, lifestyle and self-management counseling was found to be an independent predictor of patients' compliance with lifestyle recommendations (p=0.008). Patients who got high scores (56%) in the counseling section of the survey were more adherent than those who got low scores (44%). This finding was similar to another study which found that 88% of the patients who were received counseling reported adherence to healthy lifestyle recommendations.[35]

Table 8 Independent predictors for compliance

Factors	*P* (chi-square)	OR	95% CI for EXP(B)		**P* (logistic regression)
			Lower	Upper	
Gender (female)	0.001	1.961	1.228	3.130	0.005
Lifestyle and self-management counseling score (high)	0.002	1.530	1.116	2.098	0.008
Knowledge about hypertension score (high)	0.004	2.961	1.037	8.453	0.043
Beliefs about hypertension score (high)	0.000	2.709	1.485	4.941	0.001

Note: *Binary logistic regression.

Knowledge about hypertension disease is an integral part of the chronic care model which requires patients with chronic diseases to be knowledgeable and active partners in the management of their conditions.[36] Also, patients' beliefs about the effectiveness of hypertension treatment were related to different hypertension self-management behaviors.[37,38] In this study, knowledge about hypertension was found to be an independent predictor patients' compliance with lifestyle recommendations (p=0.043). Patients who got high scores in the knowledge section of the survey (95%) were more compliant than those who got low scores (5%). Also, patients' positive beliefs about hypertension management were found to be another independent predictor (p=0.001). Patients who got high scores (86%) in the beliefs section were found to be more compliant with healthy lifestyle recommendations than those who got low scores (14%). These findings were similar to another study conducted in Israel which found that beliefs and knowledge about hypertension and its management were independent predictors of compliance with lifestyle recommendations.[17]

In this study, age was not found to have a significant association with hypertensive patients' compliance with lifestyle recommendations. This finding contrasts with the finding of a previous study which was carried out in Saudi Arabia and found that patients who were <65 years old were more adherent to a healthy diet than older patients.[14]

There was no statistically significant association between compliance with lifestyle recommendations and the level of monthly income in this study (p>0.05). A contrary finding was reported in other studies[8,14,15] where the level of monthly income affected the adherence to healthy lifestyle behaviors. Education level was not found to have any association with hypertensive patients' compliance with lifestyle recommendations in this study (p>0.05). This finding contrasts with the findings of similar studies which found that education level was associated with better adherence.[14,39]

Limitations

This study had several limitations. First, all information in this study was obtained through a self-report method. The information may be inaccurate because of "social desirability" responses or recall difficulties. However, there is no alternative source of information regarding patients' behaviors and physicians' lifestyle counseling as this is not recorded in the medical files. Also, patients are considered a reliable source for this type of information. Second, the cross-sectional nature of the design prohibits conclusions about cause and effect, and therefore, we refer only to an association between compliance to lifestyle behaviors and the independent variables in the binary regression model. Third, this study was conducted in one hospital in the north of Jordan. The study participants may not be an accurate representative of all hypertensive patients in the community, and henceforth, the study findings are not generalizable to the general population. However, it should be noted that the hospital serves as a referral hospital and provides primary, secondary, and tertiary health-care services to more than one million inhabitants.

Conclusion

This study showed that despite the high level of patients' knowledge about their hypertension disease and their positive beliefs about their disease management, the rate of compliance with recommended lifestyle behaviors was low. Compliance with lifestyle recommendations was significantly associated with female gender, being a housewife, lifestyle and self-management counseling, and patients' knowledge and positive beliefs about hypertension.

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Disclosure

The authors report no conflicts of interest in this work.

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