

Medication Adherence Among Hypertensive Patients in Kurdistan Region of Iraq: An Observational Follow-Up Study

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ABSTRACT

Background: Adherence to medications is a main concern to hypertension control and incidence of CVD complications. This study aimed to measure the level of medication adherence of hypertensive patients after one month follow-up.

Methods: An observational one-month follow-up study was conducted in 93 hypertensive patients in Kurdistan Region.

Results: Patients' mean age was 55.03 (25-85 years). The mean value of the MARS score of adherences was 7.68 out of 10. The mean values of dimensions of adherence were 3.20 of 4 (medication adherence behavior), 2.92 of 4 (attitude toward taking medication), and 1.55 of 2 (negative side effects and attitudes to medication). We found that the males, single and married, urban, those with no chronic disease, and those with higher levels of education were more likely to adhere to medication. The patients with shorter disease duration and treatment had higher adherence scores. The patients with no experience of the medication side effects had higher levels of medication adherence (8.80 vs. 7.00; $P < 0.0001$) and patients who took fewer tablets/day.

Conclusions: We observed high-adherence level among hypertensive patients. Prolong disease duration, long treatment duration, increase number of tablets/days, and increase number of comorbidities may significantly decrease the medication adherence rate.

Keywords: Medication adherence, Hypertension, Patients

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INTRODUCTION

Cardiovascular disease remains the leading cause of death in developed countries, and hypertension, as the most frequent public health challenge, is not only the leading cause of CVD and premature death. Additionally, it is the most frequent treatable risk factor.¹ Globally, especially in low- and middle-income countries (LMICs), the prevalence of hypertension has considerably increased, affecting more than 31.1% (1.39 billion) of adults worldwide in 2010, while 28.5% of adults (349 million people) in high-income countries had hypertension in the same year.² Data from a global perspective revealed that there were 56.4 million deaths in 2015. Of these deaths, nearly 70% were due to non-communicable diseases, including hypertension, with 75% of those deaths occurring in low-middle-income countries.³ Hypertension is one of the most important public health problems worldwide. Early detection, prevention, treatment, and control of this disease should receive high concern.⁴

Taking blood pressure-lowering medications is one of the measures to manage high blood pressure (BP). Clinical trials have shown that antihypertensive agents have the greatest possibility to reduce the incidence of acute myocardial infarction, hospitalization for heart failure, and stroke events in CVD patients.⁵ Despite the antihypertensive efficacy in preventing complications, adherence to medication has been a growing concern. According to the World Health Organization (WHO), non-adherence to long-term therapy for chronic illness is a global problem of striking magnitude. The average adherence in developed countries is 50%. In developing countries, however, the rates are even lower, undeniably due to the fact that many patients experience difficulty following management recommendations.⁶ Poor medication adherence (MA) is a major issue and can lead to suboptimal management and poor BP control.⁷⁻⁹ Since hypertension is a major modifiable risk factor for CVD and kidney disease⁴, non-adherence results in further medical and psychosocial complications, increases the risk of all adverse medical outcomes, including all-cause mortality and hospitalization for CVD.¹⁰ Thus, identifying patients with a high risk of poor adherence is important because there is enormous evidence indicating that non-adherence is prevalent and associated with poor BP control, adverse outcomes, and higher costs of care. Although there are extensive studies on MA in the literature, no study has been conducted in this region. This study aims to investigate the therapeutic adherence level in hypertensive patients in the Kurdistan Region of Iraq. Moreover, we aim to examine the related medical and demographic factors that contribute to low medication adherence.

METHODOLOGY

Study design and sampling: In this observational

follow-up study, we followed up on patients who were diagnosed with hypertension for one month. To identify eligible participants, the patients attending the Avro City Family Medicine Center underwent medical and clinical screening. Patients who had previously been diagnosed with any type of hypertension met the initial inclusion criteria for this study. The second author, a family doctor, recorded the patients' general and medical information using a pre-designed questionnaire. The patients were instructed by the family doctor to attend the primary healthcare center for the next month.

Eligibility Criteria: The study targeted patients of both genders, aged 18 years and older, who had a confirmed diagnosis of hypertension for more than 6 months and were taking at least one antihypertensive medication, regardless of their socio-demographic aspects. Pregnant women, patients with mental health issues, and dementia were excluded from the study.

Data Collection: The socio-demographic aspects of patients, including age, gender, education level, prescribed medications, occupation, residency, duration of the disease, family history of hypertension, and lifestyle habits such as smoking and physical activity, were collected through direct face-to-face interviews using a pre-designed questionnaire. The data collection was performed between April and Sept 2022.

Assessment of medication adherence: The researchers of the current study adopted the Medication Adherence Rating Scale (MARS) questionnaire to assess both patients' beliefs and barriers to MA that was developed by Thompson, Kulkarni¹¹. It was developed from two existing scales, the 30-item Drug Attitudes Inventory Development and the 4-item Medication Adherence Questionnaire. It has adequate reliability, but validity appears only moderate-weak¹². Internationally, numerous researchers adopted the MARS and the researchers of the current study found that this scale is more appropriate to investigate patients' beliefs and barriers because MARS is more specific to address barriers and self-efficacy, and yet there is no gold-standard MA scale exists¹³. It examines adherence behaviors and attitudes toward medication and general disease control during the past week with relatively simplistic yes/no scoring. It includes 10 items describing three dimensions: 'medication adherence behavior' (items 1-4), 'attitude toward taking medication' (items 5-8), and 'negative side effects and attitudes to psychotropic medication' (items 9-10). Medication adherence behavior refers to the intensity of drug use during the duration of therapy and persistence during the overall duration of therapy. Scores for each dimension are obtained by summing the questions within each dimension. Each item has a yes or no response. A response consistent with non-adherence was coded as 0, whereas a response consistent with adherence was coded as 1. For questions 1-6 and 9-10, a no response is indicative of adherence and is coded as 1, while for questions 7 and 8, a yes re-

sponse is indicative of adherence and is coded as 1. Total scores on the MARS may range between 0 and 10, with a higher score indicating better medication adherence.

Physical activity: The patients who were performing the physical activity since the last one month were considered the physically active. The physical activity types included walking, running, cycling, climbing, swimming, aerobic exercise, and football, volleyball, or tennis.

Statistical Analysis: The general and medical characteristics of the hypertensive patients were presented as mean and standard deviation. The level of adherence and its categories were determined as mean and standard deviation. Adherence levels among patients with different characteristics were compared using an independent t-test or one-way ANOVA. Pairwise comparisons were performed using the Tukey test. The correlations of the MARS adherence score with disease and treatment duration were examined using Spearman's ρ test. A p-value less than 0.05 was considered statistically significant. Statistical analysis was conducted using JMP Pro 14.3.0 (Johannes Matthies Products).

Ethical Aspects: The confidentiality of patients' personal information was guaranteed at the time of publication. Patients were free to refuse participation in the study, and no interventions were applied to the patients. The ethical approval of this study was obtained from the local health ethics committee registered as reference number: 26072023-6-6. The health ethics committee is a joint committee between the Duhok Directorate General of Health and the University of Duhok.

RESULTS

The study found that the mean value of the MARS

score of adherences was 7.68 out of 10. The mean values of dimensions of adherence were 3.20 of 4 (medication adherence behavior), 2.92 of 4 (attitude toward taking medication), and 1.55 of 2 (negative side effects and attitudes to medication). The study found that 36.56% forgot to take their medication since the last month and 18.28% were careless about taking their medications. We also found that 10.75% and 13.98% stopped their medications when they feel better and worse, respectively. The study discovered that 19.36% took the medications when they were sick. Of patients, 40.86% reported that it is unnatural for their mind and body to be controlled by medication and 68.82% reported that their thoughts are clearer on medication. Most patients (83.87%) reported that they can prevent getting sick by staying on medication, and 17.20% reported that they feel weird on medication, and 27.96% reported that the medication makes them feel tired and sluggish (Table 1).

The mean age of the patients included in this study was 55.03 between 25 and 85 years old and categorized into different age groups. The patients were males (46.24%) and females (53.76%) and had different marital statuses. The patients were from urban (60.22%) and rural areas (39.79%). The study found that 32.26% were smokers and 53.76% had chronic diseases. Different categories of education and occupation were included in this study. Most patients had low levels of education and had blue-collar occupations. We showed that the males vs. females, single and married vs. divorced, urban vs. rural, those with no chronic disease vs. those with chronic disease, and those with higher levels of education were more likely to adhere to medication. The level of adherence was not significantly different in patients with different age groups ($P=0.969$), smoker and non-smokers, and different occupations (Table 2).

Table 1: Level of adherence toward the present treatment among hypertensive patients

Adherence	Adherence MARS score Mean (SD)
MARS score (2-10)	7.68 (1.90)
Medication adherence behavior (0-4)	3.20 (1.16)
Attitude toward taking medication (0-4)	2.92 (0.91)
Negative side effects and attitudes to medication (0-2)	1.55 (0.60)
Positive responses	Adherence No (%)
Do you ever forget to take your medication?	34 (36.56)
Are you careless at times about taking your medication?	17 (18.28)
When you feel better, do you sometimes stop taking your medication?	10 (10.75)
Sometimes if you feel worse when you take the medication, do you stop taking it?	13 (13.98)
I take my medication only when I am sick	18 (19.36)
It is unnatural for my mind and body to be controlled by medication	38 (40.86)
My thoughts are clearer on medication	64 (68.82)
By staying on medication, I can prevent getting sick.	78 (83.87)
I feel weird, like a 'zombie' on medication	16 (17.20)
Medication makes me feel tired and sluggish	26 (27.96)

MARS - Medication Adherence Rating Scale

Table 2: General characteristics and level of total adherence of patients with hypertension

Characteristics (n=93)	Cases (%)	MARS -Mean \pm SD	P Value	Pairwise comparisons
Age in years				
Mean age \pm SD yrs.	55.03 \pm 13.73			
Range: min – max yrs.	25-85			
Age category				
20-29	4 (4.30)	7.0 \pm 3.37	0.969	Not applicable
30-39	13 (13.98)	7.77 \pm 2.05		
40-49	14 (15.05)	7.64 \pm 2.06		
50-59	23 (24.73)	7.74 \pm 1.48		
60-69	24 (25.81)	7.79 \pm 1.86		
70-79	12 (12.90)	7.33 \pm 2.31		
80-89	3 (3.23)	8.33 \pm 0.58		
Gender				
Male	43 (46.24)	8.85 \pm 0.80	0.001	Not applicable
Female	50 (53.76)	7.48 \pm 1.81		
Marital Status				
Single	9 (9.68)	8.75 \pm 0.46	0.001	Single vs. Divorced (P=0.010)
Married	70 (75.27)	7.97 \pm 1.64		Married vs. Divorced (P=0.025)
Widowed	12 (12.90)	6.17 \pm 2.08		Single vs. Widowed (P=0.006)
Divorced	2 (2.15)	4.5 \pm 3.54		Married vs. Widowed (P=0.005)
Residency				
Urban	56 (60.22)	8.70 \pm 0.84	<0.001	Not applicable
Rural	37 (39.79)	7.27 \pm 1.91		
Smoking				
Yes	30 (32.26)	7.47 \pm 2.21	0.464	Not applicable
No	63 (67.74)	7.78 \pm 1.75		
Current chronic disease				
Yes	50 (53.76)	7.44 \pm 1.80	0.001	Not applicable
No	43 (46.24)	8.77 \pm 0.88		
Education				
illiterate	36 (38.71)	7.56 \pm 1.86	0.01	Graduate graduates vs. under high school (P=0.014)
under high school	34 (36.56)	7.5 \pm 1.75		Graduate graduates vs. Illiterate (P=0.017)
high school graduate	8 (8.60)	8.57 \pm 0.98		
graduate graduates	15 (16.13)	9.27 \pm 0.47		
Occupation				
unemployed	26 (27.96)	7.65 \pm 2.04	0.084	Not applicable
worker	46 (49.46)	7.84 \pm 1.61		
Free busyness	10 (10.75)	6.8 \pm 1.93		
profession	11 (11.83)	9.0 \pm 0.0		

The mean duration of disease was 7.04 years, mostly between 1 and 3 years (35.48%) and the mean duration of treatment was 6.55 years. The study found that 39.78% experienced the side effects of treatment of hypertension and 56.99% received \leq 2 tablets/day. The patients suffered from comorbidities including one (27.96%), two (31.18%), and three or more (15.05%). The study found that 56.99% had a family history of hypertension. Only 21.51% did physical activity. The patients were included from three religions in Kurdistan Region including Muslim (73.12%), Christian (17.0%), and Yazidi (9.68%). The patients had different sources of paying for the medication.

The study showed that the patients with shorter disease duration and treatment had higher adherence scores. The study showed that the patients who did not experience the side effects of medication had higher levels of MA compared to those who experienced the side effects (8.80 vs. 7.00; $P < 0.001$) and those patients who took fewer tablets/day. The pa-

tients with no and greater comorbidities had higher levels of adherence to medication. The patients who paid for the medication had a higher level of adherence to the hypertension medication. The level of adherence was not significantly different in patients with different family histories of hypertension, physical activity, and religion (Table 3).

The study found that 72.04% of the patients were satisfied with the present treatment of hypertension. We found that 45.16% had hypertension complications and 79.57% of patients are supported by their families. Two-third of the patients reported that the cost of drugs for hypertension is costly. The satisfied patients to the treatment, those without complications had higher levels of adherence (Table 4). The study showed that the level of adherence of patients to the hypertension treatment was decreased with increasing duration of the disease ($r = -0.2$; $P = 0.049$). The correlation of adherence score was not found with patients' age, duration of treatment, and number of drugs (Table 5; Fig 1).

Table 3: Medical characteristics and adherence of patients with hypertension

Characteristics	Cases (n=93)(%)	MARS Mean \pm SD	P value	Pairwise comparisons
Duration of disease (yr.)	7.04 (5.50)			
1 – 3	33 (35.48)	8.68 \pm 0.90	0.014	1-3 vs. >10 (P=0.009)
4 – 5	18 (19.36)	7.78 \pm 1.80		
6 – 10	19 (20.43)	7.68 \pm 1.67		
>10	23 (24.73)	7.22 \pm 2.0		
Treatment duration (yr.)	6.55 (5.32)			
1 – 3	39 (41.94)	8.63 \pm 0.87	0.03	1-3 vs. 6-10 (P=0.031)
4 – 5	14 (15.05)	7.71 \pm 1.98		
6 – 10	24 (25.81)	7.42 \pm 2.04		
>10	16 (17.20)	7.63 \pm 1.59		
Experience of side effects				
Yes	37 (39.78)	7.00 \pm 1.93	<0.001	Not applicable
No	56 (60.22)	8.80 \pm 0.88		
Number of tablets/days				
\leq 2 tablets	53 (56.99)	8.69 \pm 0.82	<0.001	Not applicable
> 2 tablets	40 (43.01)	7.18 \pm 1.96		
Number of drugs (1-4) mean \pmSD	2.38 \pm 0.91			
Number of comorbidities				
none	24 (25.81)	8.71 \pm 0.96	0.002	None vs. Two (P=0.003) three or more vs. Two (P=0.021)
one	26 (27.96)	7.73 \pm 2.03		
two	29 (31.18)	7.0 \pm 1.87		
three or more	14 (15.05)	8.67 \pm 0.89		
Family history of hypertension				
Yes	53 (56.99)	8.02 \pm 1.54	0.162	Not applicable
no	40 (43.01)	7.5 \pm 1.97		
Physical activity				
yes	20 (21.51)	8.11 \pm 1.59	0.326	Not applicable
no	73 (78.49)	7.64 \pm 1.87		
Religion				
Muslim	68 (73.12)	7.89 \pm 1.65	0.659	Not applicable
Christian	16 (17.20)	7.56 \pm 1.75		
Yezidi	9 (9.68)	7.44 \pm 2.55		
Who pays for medications?				
self	30 (32.26)	8.8 \pm 0.71	0.004	Self vs. Multiple-way (P=0.032) Self vs. Family (P=0.004)
family	30 (32.26)	7.3 \pm 1.90		
government/free	21 (22.58)	8.05 \pm 1.66		
Multiple-way	12 (12.90)	7.25 \pm 1.86		

Table 4: Satisfaction and family support and adherence of hypertensive patients with present treatment

Satisfaction and family support	Cases (%)	Adherence MARS Mean \pm SD	P Value	Pairwise comparisons
Satisfaction with present treatment				
satisfied	67 (72.04)	8.65 \pm 0.83	<0.001	Satisfied vs. Dissatisfied (P<0.001) Satisfied vs. Neutral (P=0.041)
neutral	11 (11.83)	7.54 \pm 2.11		
dissatisfied	15 (16.13)	6.8 \pm 2.04		
Hypertension complication				
yes	42 (45.16)	7.26 \pm 1.94	<0.001	Not applicable
no	51 (54.84)	8.71 \pm 0.89		
Cost of the drug for a patient				
economic	31 (33.33)	8.67 \pm 1.0	0.002	Not applicable
costly	62 (66.67)	7.35 \pm 2.07		
Family Support				
yes	74 (79.57)	7.88 \pm 1.64	0.378	Not applicable
no	19 (20.43)	7.47 \pm 2.17		

Table 5: Correlations of adherence MARS score with disease and treatment duration

Variable	by Variable	Spearman ρ	Prob> ρ	Presentations*
patient age	MARS score	0.0	0.861	
Duration of disease	MARS score	-0.2	0.049	
duration of treatment	MARS score	-0.14	0.176	
number of drugs	MARS score	-0.16	0.115	

Nonparametric: Spearman's ρ was performed for statistical analyses.

*The presentation shows the strength of the correlation between MARS score and variables.

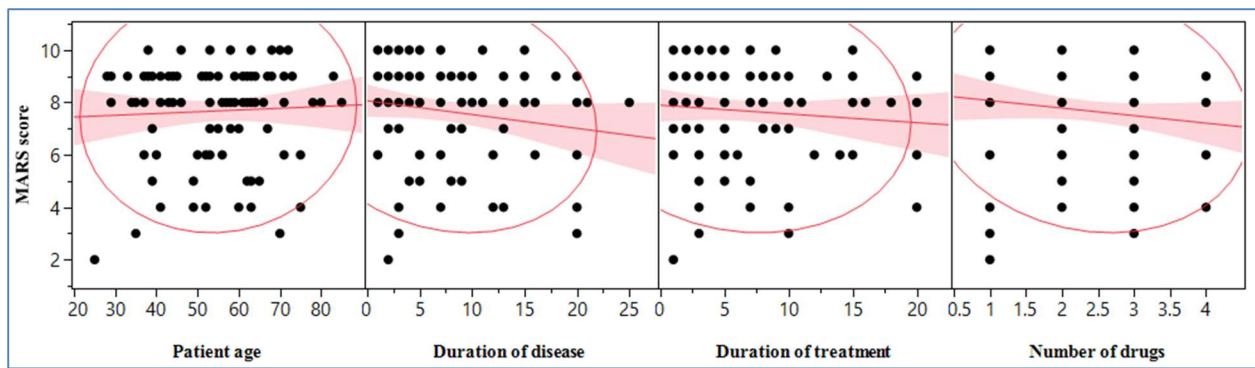


Figure 1: Scatter plot of correlations of adherence MARS score with disease and treatment duration

DISCUSSION

The findings of this study showed that the patients had good levels of MA and scored high points in the mean value of the MARS score and the mean values of the adherence dimensions. Several studies have addressed MA and blood pressure (BP) control in hypertensive patients. However, it has been reported that the rate of MA in hypertensive patients can differ from study to study based on the methodology, target population, and method of assessing adherence.⁷ In this study, the adherence level was found to be higher than what was reported by the World Health Organization (WHO) for some other developing countries.¹⁴ This is consistent with several studies done in the Middle East that found low MA among hypertensive patients in Turkey, Lebanon, Saudi Arabia¹⁵⁻¹⁷, and suboptimal MA and BP control in Asian countries including China, Hong Kong, Taiwan, Malaysia, and India^{7,8,18-23}. Moreover, an earlier systematic review in the Philippines by Gutierrez and Sakulbumrungsil²⁴ found that out of the 15 studies, only two reported high baseline MA. Similarly, in Africa, several articles revealed a high prevalence of uncontrolled BP among hypertensive patients due to poor adherence, mainly in Ethiopia and Nepal.²⁵⁻²⁸ In contrast, studies conducted in developed countries suggest that patients generally adhere to their antihypertensive medications, and the adherence rate is high. In countries such as Canada, Germany, the United Kingdom, and the United States, nearly 70% to 85% of hypertensive patients have controlled BP and good adherence levels.^{3,29-31} Factors such as cultural beliefs, education about chronic illnesses, patient-nurse telephone support, and social support, among many others, may significantly affect rates of MA in developed countries.³²

Our findings revealed high mean values in the dimensions of adherence that address MA behavior, attitude toward taking medication, and negative side effects and attitudes toward medication. All these dimensions play a crucial role in the level of MA. Regarding MA behavior, several factors affect a hypertensive patient's behavior, including the support received from healthcare services, knowledge about the disease and its treatment, patients' beliefs about treatment, and the relationship between the patient

and the healthcare provider.³³ Therefore, patients' behavior in respect to taking medication is crucial for the success of drug therapy.²⁵ Attitude about taking antihypertensive medications is an important factor that influences adherence rate.³⁴ A more recent systematic review by Gutierrez and Sakulbumrungsil²⁴ found that three studies concluded that a positive attitude leads to a higher adherence rate. Negative side effects and attitudes toward medication are other factors that may adversely affect adherence rate. It has been reported that patients who experience no or limited adverse effects are more likely to adhere to treatment than patients who experience adverse effects.³ Negative attitudes toward treatment are belief barriers toward MA and should be changed by healthcare providers. They should spend time reassuring patients and explaining to them the benefits and drawbacks of their treatment. This would not only improve the therapeutic relationship between healthcare providers and their patients but also help convince patients about the necessity of consuming the prescribed medications effectively.¹⁹

Consistent with the literature, the prevalence of hypertension is higher in women than men after menopause.³⁵ In terms of marital status, married patients may have care providers who remind them to follow physician instructions and maintain MA. According to the findings, the majority of the patients had chronic diseases, but this did not affect the rate of adherence. This is in agreement with a study done by Li, Wang⁸ who concluded that the influence of comorbidities on MA was not statistically significant but associated with poor BP control, owing to the fact that patients with such conditions are very frequently encountered in routine clinical practice, particularly among those with hypertension. We also found that patients with higher levels of education were more likely to adhere to medication.³⁶

We found that as the duration of the disease, duration of treatment, number of tablets per day, and number of comorbidities increase, the adherence rate decreases. These findings are congruent with previous studies. Factors such as the duration of treatment, side effects, and higher cost of medications have been reported as contributing factors to low adherence.^{28,37,38} For example, this study revealed that the adherence rate of patients who took

≤2 tablets per day was higher compared to patients who took multiple tablets per day. Similar results were observed in a study done by Ramli, Ahmad⁷ who concluded that increasing the daily dose frequencies of the prescribed medications negatively affected adherence. This might be due to the fact that taking more tablets in a day might confuse patients in taking the right drug at the right time. It is worth noting that, according to the literature, in most hypertensive patients, BP control can be achieved with a combination of at least two drugs³⁹; thus, it could be justifiable to decrease the number of tablets per day to increase the adherence rate. The patient's age may contribute to worse adherence³⁶, in contrast with our findings. Occupationally active people were more likely to have high adherence compared to retired patients, regarding appointment keeping and taking medications.

Patient satisfaction is an important factor that can affect adherence to prescribed medications. Low treatment satisfaction has been regarded as a barrier to achieving high rates of adherence.⁴⁰ In our study, we found that the majority of the patients were satisfied with the present treatment of hypertension. This could be due to the fact that in this area of research, there is no health insurance, and all healthcare services are free for the public in the Kurdistan Region. However, they may need to purchase medications due to either the unavailability of all treatments at a given time or low quality of medications. The cost of treatment is another factor that reduces MA and should be seriously taken into consideration.⁴¹ Family support not only includes financial support but also support to remind patients to take their medicines at the precise time and dosage as prescribed, as supported by our study.²³

STRENGTHS, LIMITATIONS, AND RECOMMENDATIONS

To our knowledge, this is the first study to prospectively examine the rate of MA among hypertensive patients in the Kurdistan Region of Iraq. Since this was an observational follow-up study for one month, it enabled us to explain the causal correlations between variables and adherence. However, the patients were recruited from northern Iraq and came from one health center, not a community-based sample; therefore, the findings cannot be generalized. Second, the one-month follow-up period might not have been sufficient. Third, the MA rate was assessed using the MARS questionnaire, which may have the disadvantage of recall bias. Thus, we recommend further studies, including more health centers, a larger sample size, and at least 6 months follow-up. To avoid recall bias, it would be better to involve other adherence methods such as motivational interviewing, pill counting, patient-nurse telephone support, and drug blood estimation.

CONCLUSION

This study demonstrated high adherence rates among hypertensive subjects. However, prolonged disease duration, long treatment duration, increased number of tablets per day, and a higher number of comorbidities were found to significantly decrease the level of medication adherence.

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