Factors associated to treatment adherence in elderly people with hypertension: A cross-sectional study in Ho Chi Minh city

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A B S T R A C T

Background: Treatment of hypertension should be continuous, and patients should be closely monitored for treatment adherence. However, non-compliance still exists globally. This study aimed to determine treatment adherence among patients aged ≥60 years with hypertension and its associated factors in an urban district of Ho Chi Minh City, Vietnam.
Methods: A cross-sectional study evaluated treatment adherence in two areas: medication and non-pharmacological adherence. Medication adherence was measured using the 8-item Morisky Medication Adherence Scale. Non-pharmacological adherence was based on the Ministry of Health guidelines for hypertension treatment and assessed by lifestyle changes, including smoking cessation, alcohol consumption restriction, reduced salt intake, increased physical activity, and regular follow-up visits.
Results: A total of 537 people participated in the study, of whom females accounted for the majority (63.7%), and patients aged 60–70 years old accounted for 50%. The proportion of patients with medication adherence was 11.7%. The percentages of patients who adhered to non-smoking and limited alcohol intake were 93.5% and 92.9%, respectively. A total of 76.9% of patients underwent regular check-ups. The proportion of patients who adhered to moderate and high levels of physical activity was 64.3%. Patients who were compliant with salt intake reduction accounted for 63.1%. Factors related to antihypertensive drug adherence included disease duration and chronic comorbidities. Factors associated with non-drug adherence included health insurance, comorbidities, and nutritional status.
Conclusions: Intervention programs to increase hypertension treatment adherence among elderly patients should focus on educating drug adherence and salt reduction, especially in long-standing and comorbidities patients.

1. Introduction

Hypertension is a major cause of premature death worldwide. The 2019 World Health Organization (WHO) report estimated that 1.13 billion people worldwide suffer from high blood pressure, two-thirds of whom live in low- and middle-income countries.[1] Vietnam is currently facing an increasing number of non-communicable diseases (NCDs), including hypertension. From 2009 to 2019, the prevalence of hypertension in Vietnam increased by 16.4% and became one of the ten leading causes of morbidity and mortality in Vietnam.[2]

Despite the increasing incidence of hypertension, rates of awareness, treatment, and controlled BP are low, especially in low- and middle-income countries.[3] According to the 2019 WHO report, less than 20% of patients with hypertension have controlled BP.[1] A study in sub-Saharan Africa showed that only 7% of patients treated for hypertension achieved BP control.[4] According to a 2012 national survey in Vietnam, only 29.6% of patients with hypertension received treatment and only 10.7% achieved their target BP.[5] Reasons for poor BP control included the absence of treatment guidelines or non-compliance with the physician's instructions for medication usage or lifestyle changes.[6]

Treatment of hypertension should be continuous, and patients should be closely monitored for treatment adherence. However, non-compliance still exists globally (e.g., 41.6% in the United Kingdom and 31.5% in the Czech Republic).[7] In Vietnam, a cross-sectional study

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was performed on 783 patients aged ≥60 years at District 7 Hospital, the adherence rate for drug therapy was only 25.0%.[8] Factors related to compliance were health insurance, marital status, age, accompanying chronic illnesses, doctor's consultation, and application of non-drug measures. According to a study in 2017 in Tien Hai district, Thai Binh province, the compliance rate of hypertensive patients was only 28.4%.[9] Another study showed that an unhealthy lifestyle, including salty food intake (51.7%), alcohol consumption (22.6%), cigarette smoking (17.4%), and a lack of physical activity (60.0%), was an obstacle to controlling hypertension.[10]

District 10 (in Ho Chi Minh City) is densely populated, with diverse levels of education, and working, making it difficult to address health status and compliance. In 2017, the prevalence of adults with hypertension in the district was 33.8%. In the elderly (≥60 years), this rate was up to 66.8%.[11] However, there were no data on how these patients were treated for hypertension or whether they achieved their target BP. Therefore, we asked the following research questions: What is the rate of treatment adherence in people aged ≥60 years with hypertension in District 10, Ho Chi Minh City? What factors affect patient adherence to treatment? The results of this study will form the basis for intervention programs to improve treatment adherence and help patients maintain target BP levels, thereby improving their quality of life.

2. Methods

2.1. Study design

A cross-sectional study of hypertensive patients aged ≥60 years was conducted from November to December 2020 in District 10, Ho Chi Minh City (HCMC), Vietnam.

2.2. Sample size

This study used a formula to estimate sample size for a one-sample comparison of proportion to the hypothesized value where p = 28.4%,[9] accuracy of measurement = 5%, and estimated response rate = 80%, using a 0.05 significance level test. At least 392 people were required for the survey; the study included 537 people.

2.3. Sampling

A judgment sample was used. The enumerators visited all patients aged ≥60 years in each ward according to their listed address (taken from the census source of the District 10 Health Office) to determine, by interview, if they had hypertension.

All patients aged ≥60 years previously diagnosed with hypertension for more than 3 months at the time of the study were eligible for inclusion. Individuals who had declining cognition were excluded.

2.4. Data collection

Medication adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS-8).[12] Morisky scale has been validated and found to be reliable in many countries. In Vietnam, it has been translated and widely used in many studies. The scale is based on the patients' self-response and consists of eight questions: seven items with yes or no responses, and one item with a 5-point Likert scale response option. The total score ranges from 1 to 8, and patients with adherence scores of 6 or more were considered adherent.

Non-pharmacological adherence was based on the Ministry of Health (MOH) guidelines for treating hypertension with lifestyle changes, including smoking cessation, alcohol and salt intake reduction, and increased physical activity[13] as follows:

- Patients were considered compliant with follow-up if they received a follow-up examination for hypertension in the past 3 months,

according to their doctor's instructions, or an early/delayed examination within 3 days of the original appointment.[13]
- Patients were considered compliant with smoking if they did not smoke or completely quit smoking (including e-cigarettes) in the past three months.[13]
- Patients were considered compliant with alcohol consumption if they drank ≤2 standard drinks/day (men) or ≤ 1 standard drink/day (women), and their weekly total was ≤10 standard drinks/week (men) or ≤ 5 standard drinks/week (women).[13]
- Patients were considered compliant with salt reduction if they used <5 g salt/day (corresponding to < 1.9 g sodium (Na)/day).[13] Daily sodium intake was calculated based on the food frequency questionnaire (FFQ) of high-salt foods according to the formula: [portion size in grams] × [reported consumption frequency (converted to times per day)] × [nutrient per gram].[14] This is the first FFQ specifically developed and validated for the assessment of dietary intakes of major nutrients by Vietnamese adults.
- Physical activity compliance was assessed using the International Physical Activity Questionnaire-Short Form (IPAQ-SF),[15] which is a suitable instrument for monitoring habitual physical activity in older Vietnamese adults.[16] This questionnaire is publicly available, it is open access, and no permissions are required to use it. The IPAQ-SF includes four questions about physical activity in the previous 7 days regarding vigorous and moderate activity, walking and sedentary behaviors, and units in metabolic equivalents of task (METs)-minutes/week. Patients were considered compliant with moderate and high levels of physical activity according to the IPAQ-SF assessment guidelines.

Additionally, anthropometric indicators were measured, including weight, height, waist circumference, and hip circumference.

The investigators are 6th-year general medical students. They had completed a training program that oriented them both on the aims of the study and the specific instruments and methodologies employed.

2.5. Data analysis

Data were entered using Epidata 3.01 software and analyzed using Stata 14.0 and R software. Frequency and percentage were used to describe all variables.

A Bayesian Model Averaging (BMA) approach was used to determine the association between "drug adherence" and "non-pharmacological adherence" (dependent variables) with other independent variables. The metrics used for the comparison of competing models were the Bayesian information criterion (BIC) and posterior probability (of a particular model being the correct model). The best model displayed the lowest BIC and highest posterior probability.

2.6. Ethical consideration

Participation in this study was voluntary. Written informed consent was obtained from all patients. Patients could withdraw from the study at any time without giving a reason.

The study was approved by the Research Ethics Committee of the University of Medicine and Pharmacy at Ho Chi Minh City (Decision No. 373/HDDD-DHYD, dated June 2, 2020).

3. Results

3.1. Demographic, socioeconomic, and clinical characteristics of participants (Table 1)

A total of 537 people aged ≥60 years with hypertension were enrolled. Of these, 63.7% were women. The majority of participants belonged to groups aged 60–70 (50.8%) and 71–80 (31.1%) years. More than 70% of the participants had a middle school diploma or above.

Table 1

Demographic, socioeconomic and clinical characteristics of participants (n = 537).

	Frequency	Percentage
Gender		
Male	195	36.3
Female	342	63.7
Age group		
60–70	273	50.8
71–80	167	31.1
More than 80	97	18.1
Educational level		
No formal education	11	2.1
Elementary school	114	21.2
Middle school	121	22.5
High school	167	31.1
College	74	13.8
University or above	50	9.3
Past occupation		
Government employee	153	28.5
Merchant	118	22.0
Worker	49	9.1
Daily laborer	97	18.1
Retired/Housewife	120	22.3
Health insurance		
Yes	521	97.0
No	16	3.0
Hypertension duration (n = 537)		
< 1 year	26	4.8
1–5 years	156	29.1
5–10 years	135	25.1
> 10 years	220	41.0
Complications (n = 537)	123	22.9
Comorbidities (n = 537)	252	46.9
Diabetes (n = 537)	72	13.4
Dyslipidemia (n = 537)	123	22.9
Nutritional status (n = 535)		
Underweight	28	5.2
Normal	162	30.3
Overweight	118	22.1
Obese	227	42.4
At-risk waist circumference[a] (n = 534)	285	53.4
At-risk waist-hip ratio[b] (n = 534)	409	76.6

[a] Waist circumference is at risk when ≥90 cm in men or ≥80 cm in women.
[b] The waist/hip ratio is at risk when ≥0.90 in men or ≥0.85 in women.

Most of the participants were government employees (28.5%),

merchants (22%), and housewives (22.3%), and most had health insurance (97%).

Many of the patients had hypertension for >10 years (41%). The rate of complications from hypertension and other chronic diseases was 22.9% and 46.9%, respectively. Of the participants, 13.4% had diabetes mellitus and 22.9% had dyslipidemia.

The proportion of patients with normal nutritional status was 30.3%, while the rate of overweight and obesity was 64.5%. Patients with an at-risk waist circumference and waist/hip ratio were 53.4% and 76.6%, respectively.

3.2. Treatment adherence of patients (Fig. 1)

The proportion of patients with drug compliance was only 11.7%.

Among the non-pharmacological adjustments for managing hypertension, non-smoking and limiting alcohol were the most applied modifications, accounting for 93.5% and 92.2% of cases, respectively.

The rate of having recommended follow-up visits was 76.9%, and the non-drug adherence behavior of salt intake reduction had the lowest rate (63.1%).

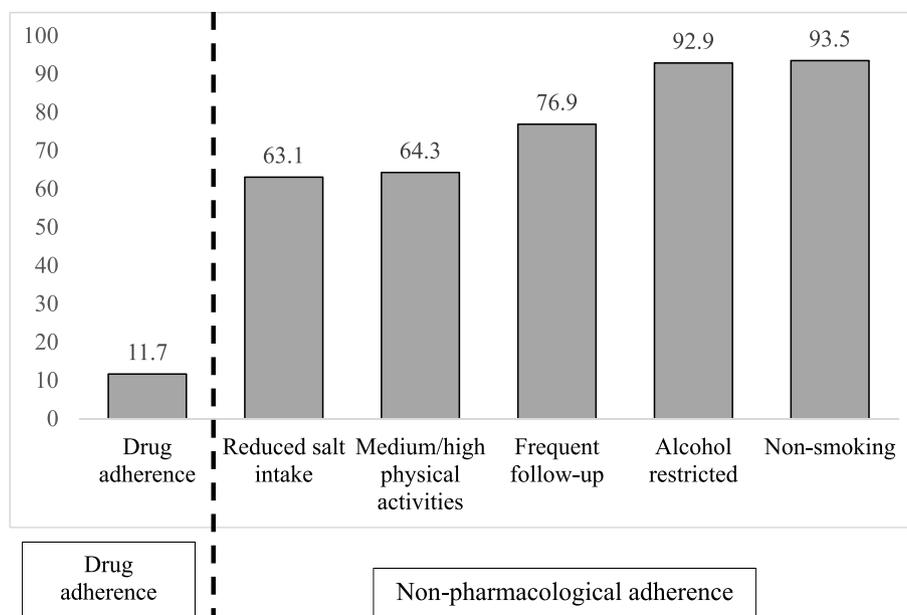### 3.3. Factors related to patient adherence

3.3.1. Factors related to drug adherence

The BMA process suggested ten models, among which the five best models for drug adherence are shown in Table 2. We chose the first model with the highest posterior probability (nearly 50%), which consisted of two variables: hypertension duration and comorbidities. In particular, the proportion of patients with drug compliance decreased by 0.66 times every five years of illness, and those with chronic comorbidities presented with 2.21 times the rate of drug compliance.

3.3.2. Factors related to non-pharmacological adherence

The BMA process suggested eleven models, among which the five best models for salt intake reduction are shown in Table 3. We chose the first model with the highest posterior probability (39.4%). This study found a statistically significant association between adherence to salt reduction and the presence of chronic comorbidities. People with chronic comorbidities had a compliance rate of only 0.52 times compared to those without comorbidities.

There was no statistically significant association between physical

Fig. 1. Patient adherence rate (n = 537).

Table 2
Factors related to drug adherence of patients using BMA.

Model	Drug adherence	OR (95% CI)	p-value	BIC	Posterior probability
1	Hypertension duration	0.66 (0.50–0.88)	0.004	– 2963.9	0.468
	Comorbidities	2.21 (1.28–3.83)	0.005		
	Intercept	0.29 (0.12–0.69)	0.005		
2	Comorbidities	2.15 (1.25–3.70)	0.006	– 2961.8	0.161
	Intercept	0.09 (0.06–0.13)	<0.001		
3	Hypertension duration	0.67 (0.50–0.89)	0.006	– 2961.6	0.147
	Intercept	0.42 (0.18–0.96)	0.039		
4	Intercept	0.13 (0.10–0.17)	<0.001	– 2959.9	0.062
5	Hypertension duration	0.66 (0.50–0.88)	0.005	– 2958.5	0.030
	Comorbidities	2.25 (1.29–3.90)	0.004		
	Nutritional status	1.15 (0.86–1.52)	0.344		
	Intercept	0.19 (0.05–0.68)	0.011		

Table 3
Factors related to reduced salt intake of patients using BMA.

Model	Reduced salt intake	OR (95% CI)	p-value	BIC	Posterior probability
1	Comorbidities	0.52 (0.37–0.75)	<0.001	– 2650.8	0.394
	Intercept	2.35 (1.83–3.03)	<0.001		
2	Dyslipidemia	0.48 (0.32–0.72)	<0.001	– 2648.8	0.151
	Intercept	2.04 (1.66–2.51)	<0.001		
3	Past occupation	0.89 (0.80–0.99)	0.041	– 2648.4	0.118
	Comorbidities	0.52 (0.36–0,74)	<0.001		
	Intercept	3.30 (2.17–5.04)	<0.001		
4	Gender	0.72 (0.50–1.03)	0.075	– 2647.6	0.082
	Comorbidities	0.51 (0.36–0.73)	<0.001		
	Intercept	2.70 (1.98–3.67)	<0.001		
5	Comorbidities	0.65 (0.42–1.00)	0.052	– 2647.0	0.059
	Dyslipidemia	0.64 (0.39–1.06)	0.084		
	Intercept	2.35 (1.83–3.03)	<0.001		

Table 4
Factors related to follow-up compliance of patients using BMA.

Model	Follow-up compliance	OR (95% CI)	p-value	BIC	Posterior probability
1	Health insurance	5.67 (2.05–15.67)	0.001	– 2786.3	0.362
	Nutritional status	1.50 (1.21–1.87)	<0.001		
	Diabetes	2.93 (1.30–6.61)	0.010		
	Intercept	0.17 (0.05–0.56)	0.004		
2	Health insurance	6.33 (2.30–17.44)	<0.001	– 2784.7	0.166
	Nutritional status	1.49 (1.20–1.85)	<0.001		
	Intercept	0.18 (0.05–0.57)	0.004		
3	Educational level	1.19 (0.99–1.44)	0.062	– 2784.2	0.130
	Health insurance	5.98 (2.20–16.23)	<0.001		
	Nutritional status	1.48 (1.20–1.84)	<0.001		
	Diabetes	3.11 (1.36–7.14)	0.007		
	Intercept	0.09 (0.02–0.35)	<0.001		
4	Health insurance	5.30 (1.95–14.40)	0.001	– 2782.4	0.053
	Nutritional status	1.51 (1.21–1.87)	<0.001		
	Diabetes	3.04 (1.34–6.88)	0.008		
	Dyslipidemia	1.51 (0.88–2.58)	0.137		
	Intercept	0.17 (0.05–0.53)	0.002		
5	Gender	1.40 (0.90–2.19)	0.137	– 2782.3	0.049
	Health insurance	5.54 (1.96–15.65)	0.001		
	Nutritional status	1.50 (1.21–1.86)	<0.001		
	Diabetes	2.94 (1.30–6.66)	0.010		
	Intercept	0.16 (0.05–0.52)	0.003		

activity compliance and other characteristics in any of the models which the BMA process suggested (Supplement file, Table S1).

The BMA process suggested 13 models, among which the five best models for follow-up compliance are shown in Table 4. We chose the first model with the highest posterior probability (36.2%). There was a statistically significant relationship between follow-up compliance and health insurance, diabetes, and obesity. The rate of follow-up compliance increased 5.67 times in patients with health insurance. Additionally, patients with diabetes or obesity adhered to follow-up visits 2.93 and 1.50 times, respectively, compared with those without these diseases.

4. Discussion

4.1. Demographic, socioeconomic, and clinical characteristics of participants

The duration of hypertension in study participants was mostly over ten years (41%). This result is much higher than that reported by Tran Thi My Hanh in some communes in Thai Binh, Hung Yen (2.6%).[9] This difference may be due to the different study times and locations: one was in the countryside, and one was in the city. Furthermore, the difference may be owing to the sampling method used in the Hung Yen study where the author used a list of patients visiting the clinic to increase the chances of meeting eligible patients to enroll in the study, which could have led to a lower percentage in group ten years duration of hypertension.

The proportion of patients with hypertension complications accounted for approximately 23%. Moreover, the percentage of people in the study with chronic comorbidities was high (47%). We found that this rate was different in other studies. In a study conducted at Trung Vuong Hospital, the proportion of patients with diabetes and kidney failure was 26.7% and 7.7%, respectively, which was lower than the rates in our study.[10] However, a study at Vinh City General Hospital revealed a much higher rate (73.7%) of patients diagnosed with other

diseases,[17] perhaps because only diabetes and kidney failure were investigated, while studies that investigated general diseases, such as COPD, asthma, dyslipidemia, overweight, obesity, diabetes, and kidney failure, had higher rates of comorbidities.

The proportion of patients with normal nutritional status was approximately 30%, while those with overweight and obesity accounted for 64.5%. Additionally, other risk indicators, such as waist circumference and waist-hip ratio, were high among the participants at 53.4% and 76.6%, respectively. These rates were higher than those in the previous study in District 10 by Vo Thi Xuan Hanh where the rates of overweight/ obesity, at-risk waistline, and at-risk waist/hip ratio were 47.5%, 31,9%, and 52.1%, respectively.[11] The difference may be because our study evaluated people with hypertension aged ≥60 years, whereas Vo Thi Xuan Hanh evaluated people aged ≥18 years. However, compared to a similar study in elderly patients with hypertension in Ukraine, the obesity rate (25.4%) was also lower than that in our study[18]; this could be owing to different countries using different criteria for determining overweight and obesity.

4.2. Patient treatment adherence

4.2.1. Drug adherence

The proportion of patients who complied with the Morisky-8 scale in this study was less than that in other studies, although the pharmacology adherence rates in these studies varied. In studies in Vietnam, this ratio ranged from 26.3%[19] to 28.4%[9] to 87.5%.[17] The compliance rate in the studies conducted in the community was low compared to that of studies conducted in hospitals. This difference may be because of a greater disease awareness among patients at the hospital. Pharmacology compliance rates in other countries also varied. A study in 2019 in sub-Saharan African countries revealed compliance rates ranging from 15% to 55%,[20] while in Saudi Arabia[21] and Ukraine[18] rates were 42.2% and 51.8%, respectively. According to a meta-analysis of drug adherence rates in hypertensive patients aged ≥60 years using the MMAS-8 scale, this rate ranged from 18.2% to 90.4%, with an average of 68.8%.[22] The reason for the relatively low compliance in our study was because a large proportion of patients missed taking their medication or quit taking medication when they felt that their BP was stable. Additionally, a few patients purchased medication using other patients' prescriptions or previous prescriptions, without follow-up or consultation with a physician.

4.2.2. Non-pharmacological adherence

Among the non-pharmacological compliance assessments using the MOH recommendations, we found that compliance with smoking cessation and alcohol consumption restriction were the highest, possibly owing to the high rate of female participants in our study. A study at Vinh General Hospital also reported a similar rate of smoking cessation, but the rate of participants who applied alcohol restriction was less than that in our study.[17] However, according to a Ukraine study, the percentage of smokers was 26.3%,[18] which was higher than that in our study. These differences may be because of the high proportion of men in this study. According to research at Quang Ninh General Hospital, only half the participants adhered to these two behaviors.[23] This difference may stem from the age and gender characteristics of the study participants. Most of the patients in our study and Nguyen Thu Hang's study were elderly female patients, while the Quang Ninh province study contained a higher proportion of men aged 45 years.

A total of 76.9% of patients had regular follow-up visits, which was higher than the 60.4% reported by Quang Ninh.[23] This can be explained by the presence of many medical facilities and highly qualified medical staff in District 10 to help patients access medical services and obtain advice on the benefits of timely medical follow-up. Moreover, research is conducted on the elderly. Because most elderly patients are retired, it is easier to schedule follow-up visits. However, this level of compliance needs to be maintained and further improved through communication and patient mobilization to prevent hypertension complications.

The proportion of people with moderate and high physical activity was high (64.3%). Until now, physical activity in hypertension studies was not evaluated, or was assessed by the patient's participation in exercise ≥30 min/day and ≥5 times/week. Therefore, accurate results of the patients' physical activity were not provided. Moreover, it would be difficult to make comparisons between studies when disagreeing on the evaluation method. To evaluate physical activity in this study, we used the IPAQ-SF scale, a proven and reliable tool for measuring and monitoring the physical activities of elderly patients in Vietnam.[16] The scale included only four questions and was easy to implement and suitable for community surveys. The results will form the basis for future comparisons between studies and intervention programs to enhance physical activity in elderly patients with hypertension.

Among all non-pharmacological adherence behaviors, reducing salt intake had the lowest compliance rate (63.1%). This rate was higher than that reported by Nguyen Thi Thom (54.8%)[23] but lower than that reported by Nguyen Thu Hang (70%).[17] The special feature of our study is that daily salt consumption was assessed through the FFQ questionnaire, while in these studies it was only evaluated through patient interviews. By assessing patient food consumption frequency, we calculated the average amount of sodium consumed each day by the patient. Therefore, this result was more accurate in reflecting the patient's salt reduction compliance. According to the 2015 national survey on the risk factors for non-communicable diseases in Vietnam, over 90% of Vietnamese people regularly consumed too much salt; the average salt consumption of Vietnamese adults was 9.4 g/day (10.5 g for men and 8.3 g for women), which is two times higher than the WHO's recommendation of less than 5 g/person/day.[24] However, although research has shown that 90% of Vietnamese people regularly eat excess salt, only 69.3% of participants believed that they consumed the recommended amount of salt, and only 16.1% (19.7% men and 12.4% women) believed they consumed more salt than recommended. These findings should be considered when conducting an intervention in this group because it is necessary to help the patients realize their excessive daily salt intake and ways to reduce it.

4.3. Factors related to patient adherence

4.3.1. Factors related to drug adherence

We included the BMA analysis to determine the factors that influence drug compliance to make recommendations for intervening.

According to our results, individuals with a longer hypertension duration were more likely to be less adherent to medication, and participants with chronic comorbidities had a compliance rate 2.21 times those without other chronic diseases. It can be reasoned that the longer the patients had the disease, the more neglectful they were to not take medication or voluntarily stop medication when they felt that their BP had stabilized. Prolonged treatment also affected the patients psychologically and they did not maintain compliance at the time of diagnosis. Because patients with additional comorbidities require other medications, this may help maintain medication compliance. Moreover, anxiety and fear of disease risks from not taking medication may increase patient compliance.

When compared with other studies in Vietnam, our study results coincided with those of the study by Nguyen Thi My Hanh on associated diabetes, but the time factor of treating hypertension was different.[10] My Hanh's study showed age as a factor, which may be because subjects aged ≥18 years were evaluated. Young patients may have different compliance behaviors than the elderly, thereby leading to discrepancies in results. According to a Hanoi study conducted by Vu Xuan Phu, after incorporating variables into the multivariate model, only gender and knowledge of hypertension were the variables related to treatment adherence.[25] Although this study controlled for confounding factors, it is reasonable for the subjects to have different ages than those of ours.

4.3.2. *Factors related to non-pharmacological adherence*

Our research identified factors that were related to the variables of patient non-drug adherence by using BMA. In previous studies, authors mainly focused on identifying factors related to drug adherence but did not consider factors affecting patients' recommended behaviors.

In this study, the results showed that for salt reduction compliance, people with chronic comorbidities had poorer adherence rates than those without other chronic diseases. This may be due to behaviors that do not reduce daily salt intake as recommended, which can lead to other chronic diseases. Moreover, our study only measured salt consumption through high-salt foods; hence, the percentage of patients who adhered to salt reduction may actually be higher than the reality. The rate of salt reduction adherence in hypertensive patients has also been reported worldwide, ranging from 57% to 80%.[26] Having comorbidities is considered one of the factors that reduces the patient's adherence to lifestyle modification. Thus, salt reduction has not been given much attention in elderly patients with hypertension, which is likely to increase the risk of complications as well as other chronic diseases. Conversely, in patients with multiple comorbidities, salt reduction adherence may be more difficult to achieve. Therefore, clinicians should pay more attention to salt consumption when implementing treatment guidelines in these patients.

Our study also found an association between higher follow-up compliance and having health insurance, diabetes, or obesity. This is because health insurance will pay for a doctor's consultation, diagnostic tests, medicine cost, and hospitalization expenses; therefore, the patient may return to the hospital more frequently and have regular check-ups. Moreover, when there are several comorbidities, the patient will need close monitoring and periodic tests; thus, a higher compliance rate is influenced. Frequent follow-up visits help doctors assess treatment effectiveness, detect adverse drug reactions, or detect early complications.[27] However, in Vietnam, the cost of hypertension examination and treatment is still a burden. In a recent study, the total cost of one treatment for hypertension was 199,019 VND.[28] Although not too expensive, hypertension is a disease that requires lifelong treatment, plus monthly follow-up visits or other costs, making the total cost incalculable. Therefore, health insurance is considered a solution to help patients not only financially, but also to better adhere to treatment to achieve high efficiency.

Non-adherence to medication is prevalent in patients with hypertension. Therefore, interventions to improve adherence in both pharmacological and non-pharmacological treatments are necessary. A program which includes continuous monitoring of regular medication use, salt intake reduction, physical activity enhancement, weight loss, ideal weight maintenance, and regular follow-up visit attendance is needed. In particular, the intervention program should pay attention to patients who do not have health insurance and those with additional long-term illnesses.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cegh.2022.101099.

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