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RESEARCH ARTICLE

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Predictors of poor medication adherence of older people with hypertension

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Abstract

Aims: To explore the risk factors for poor medication adherence in older people with hypertension.

Design: A cross-sectional study.

Methods: Participants were administered with a self-report questionnaire about their demographic characteristics; additionally, their four-item Morisky Medication Adherence Scale scores were calculated. The STROBE checklist was applied as the reporting guideline for this study (File S1).

Results: Univariate analysis indicated that the following five factors were statistically significantly associated with medication adherence: education level ($\chi^2 = 8.073$, $p = .045$), co-living ($\chi^2 = 11.364$, $p = .010$), hypertension complications ($\chi^2 = 10.968$, $p = .001$), admission blood pressure ($\chi^2 = 8.876$, $p = .003$), and falls ($\chi^2 = 6.703$, $p = .010$). Multivariable binary logistic regression analysis showed that there were four statistically significant predictors, such as people who lived with spouses and offspring (OR = 3.004, $p = .017$), and those who had high admission blood pressure (OR = 1.910, $p = .003$) had a greater risk of poor medication adherence, whereas those without hypertension complications (OR = 0.591, $p = .026$) and those without falls (OR = 0.530, $p = .046$) had a lower risk.

Relevance to clinical practice: We believe that these findings contribute to the identification of high-risk people with poor adherence, allowing nurses to identify people with poor adherence in a timely manner, and pay attention to the people's medication.

KEYWORDS
blood pressure, hypertension, medication adherence, older people, predictors

1 | INTRODUCTION

Medication adherence is defined as the degree to which a patient's behaviour corresponds to the agreed recommendations from a medical staff member. Good medication adherence is critical for maintaining the health of people, especially for chronic diseases (Asche et al., 2011; Han et al., 2014). Hypertension is a global public health problem, and it is the most important risk factor for all-cause mortality and disability worldwide (Collaborators, 2016). In 2010, hypertension was considered as a major risk factor for the global burden of disease (Lim et al., 2012). Studies have shown that controlled blood pressure may reduce 50% of cardiovascular events compared to uncontrolled blood pressure in people with hypertension (Kohlman-Trigoboff, 2016); thus, hypertension is a major modifiable risk factor

for cardiovascular diseases. A pooled analysis of 1201 population-representative studies with 104 million participants from 1990 to 2019 indicated that the global number of people aged 30–79 years with hypertension doubled during this period, from 331 million women and 317 million men in 1990 to 626 million women and 652 million men in 2019 (Collaboration, 2021).

In 1999, the older population over 60 years in China accounted for 10% of the total population, indicating that China has officially entered an ageing society. The incidence of hypertension increases with age (Bavishi et al., 2016). Obviously, ensuring the quality of life for elders with hypertension is urgent because of the serious situation of hypertension in China. An effective way to achieve this is to ensure that the people take their medication as prescribed. Predictors affecting medication adherence have been reported, such as age, sex, level of education, place of residence, income, family support, knowledge about hypertension, attitude about antihypertensive treatment, alcohol consumption, patient–provider relationship, cost of medication and comorbidities (Dego & Bobasa, 2016; Demisew et al., 2018; Gebreyohannes et al., 2019; Mekonnen et al., 2017). In order to achieve better drug effects in older people with hypertension, we selected older people with hypertension to study predictors affecting the medication compliance.

What does this paper contribute to the wider global clinical community?

- Co-living, hypertension complications, falls, and blood pressure were associated with medication adherence.
- This study aids nurses in the identification of people with poor adherence, which can improve their health.

2 | BACKGROUND

The Profiles of Aging 2015 by the United Nations report predicts that the population aged ≥60 years will double and the population aged ≥80 years will triple by 2050. In addition, older people with hypertension have a high risk of cardiovascular diseases, including myocardial infarction, stroke, coronary heart disease, and congestive heart failure, and would have more health benefits with controlled blood pressure (Bavishi et al., 2016). Up to now, antihypertensive drugs are still the main choice for the treatment of hypertension. However, studies have revealed that medication adherence in people with hypertension is low (Lee et al., 2019; Shi et al., 2019). A systematic review concluded that >45% people with hypertension have poor medication adherence (Abegaz et al., 2017). A cohort study indicated that a failure in hypertension control has resulted in a huge burden on health in China, which contributed to nearly one-third of cardiovascular deaths among the Chinese aged 35 to 79 years (Li et al., 2017). In order to ensure the effectiveness of medication, it is necessary to focus on the predictors affecting the medication adherence. In this study, we focused on the predictors that affect poor medication adherence to hypertension in older people or reveal the medication adherence.

3 | METHODS

3.1 | Study design

This observational cross-sectional study was conducted in people with hypertension who were recruited from 1 June 2019 to 31 December 2019 from geriatric department inpatients at a hospital in Wuhu, China. The study was approved by the Ethics Committee for Institutional Research, and informed consent was obtained from all the people included in the study. The survey was conducted using a questionnaire.

The inclusion criteria were as follows: (a) age ≥60 years, (b) willingness to participate in research and clarity of thought, and (c) diagnosis of hypertension.

The exclusion criteria were as follows: (a) age <60 years, (b) unwillingness to participate in research or confusion, and (c) no diagnosis of hypertension.

Hypertension was defined as systolic blood pressure ≥140 mmHg, diastolic blood pressure ≥90 mmHg, or taking medication for hypertension. The criteria of classifying the level of hypertension were as follows: (a) 140–159 mmHg systolic and/or 90–99 mmHg diastolic; (b) 160–179 mmHg systolic and/or 100–109 mmHg diastolic; and (c) 180 mmHg or greater systolic and/or 110 mmHg or greater diastolic.

3.2 | Four-item Morisky Medication Adherence Scale

The four-item Morisky Medication Adherence Scale is a self-reported reliable scale that consists of four validated items that indicate adherence levels and related factors that may influence medication adherence. The adherence scores ranged from 0 to 4. A score of 0 or 1 was assigned to the response of yes or no respectively. Based on the score, people with hypertension were categorized into the poor adherence group (score ≤2) and good adherence group (score ≥3).

3.3 | Data collection

Trained personnel were recruited to distribute and collect the questionnaires. The researchers explained the items and recorded the questionnaire for illiterate participants. The questionnaires were collected immediately and were used to build the database using the EpiData 3.1 software.

3.4 | Statistical analysis

Statistical analysis was performed using the software SPSS 23.0. Categorical variables are presented as numbers or percentages.

Univariate analysis was performed using the Chi-square test to compare the categorical variables. Multivariate analysis was performed using a logistic regression analysis. Statistical significance was set at $p < .05$. Multivariate binary logistic regression was used for the analysis. Medication adherence (good adherence and poor adherence) was the dependent variable, and the independent variables included age, sex, smoking status, drinking status, marital status, education level, registered residence, self-funded medicine bill, co-living, hypertension complications, duration of hypertension, hypertension level, fall, number of prescribed antihypertensive drugs, BMI, and blood pressure at admission.

4 | RESULTS

4.1 | Patient characteristics

In this study, 400 questionnaires were distributed and 388 questionnaires were completed; the response rate was 97%. There were 190 (49.0%) men and 198 (51.0%) women; 88 (22.7%) individuals aged 60 to 64 years; 119 (30.7%) individuals aged 65 to 69 years; 11 (2.8%) individuals aged 70 to 74 years; 112 (28.9%) individuals aged 75 to 79 years and 58 (14.9%) individuals more than 80 years old. Additionally, 10 (2.6%) individuals had a body mass index (BMI) lower than 18.5, 198 (51.1%) individuals had a BMI of 18.5 to 24, 155 (39.9%) individuals had a BMI of 24 to 28, and 25 (6.4%) had a BMI of more than 28. A total of 176 (45.4%) individuals were admitted with normal blood pressure, and 212 (54.6%) individuals were admitted with elevated blood pressure. Other sociodemographic characteristics are presented in Table 1.

4.2 | Responses to the four-item Morisky Medication Adherence Scale

The mean score was 2.79 (*SD* =1.46). In addition, 60.1% ($n = 233$) of the participants had good medication adherence and 39.9% ($n = 155$) participants had poor medication adherence. The responses for each item are presented in Table 2.

4.3 | Univariate analysis

As shown in Table 3, sex, age, smoking status, drinking status, the number of prescribed antihypertensive drugs, marital status, registered residence, self-funded medicine bill, duration of hypertension, hypertension level, and BMI were not statistically significantly associated with medication adherence. However, the education level, co-living, hypertension complications, falls due to physical discomfort in the last 6 months, and admission blood pressure were statistically significantly associated with medication adherence.

TABLE 1 Sociodemographic characteristics of the sample ($N = 388$)

Items	*N*	%
Ages (years)		
60–64	88	22.7
65–69	119	30.7
70–74	11	2.8
75–79	112	28.9
≥80	58	14.9
Gender		
Male	190	49.0
Female	198	51.0
Smoking status[a]		
No	363	93.6
Yes	25	6.4
Drinking status[b]		
No	349	89.9
Yes	39	10.1
Marital status		
Married	357	92.0
Unmarried	5	1.3
Divorced or widowed	26	6.7
Education level		
Primary and below	220	56.7
Junior middle school	121	31.2
High school	36	9.3
Junior college and above	11	2.8
Registered residence		
Countryside	169	43.6
Town	106	27.3
Urban	113	29.1
Self-funded medicine bills last year		
0–999	71	18.3
1000–4999	154	39.7
5000–5999	123	31.7
≥10,000	40	10.3
Co-living		
Alone	38	9.8
Spouse	217	55.9
Offspring	75	19.4
Spouse and offspring	58	14.9
Hypertension complications		
Yes	137	35.3
No	251	64.7
Duration of hypertension (years)		
0–5.9	111	28.6
6–10.9	141	36.3

(Continues)

TABLE 1 (Continued)

Items	N	%
11–15.9	75	19.3
16–20.9	33	8.5
≥21	28	7.3
Hypertension level		
I	80	20.6
II	227	58.5
III	81	20.9
Number of prescribed antihypertensive drug		
1	161	41.5
2	182	46.9
≥3	45	11.6
BMI		
<18.5	10	2.6
18.5~	198	51.1
24~	155	39.9
28~	25	6.4
Admission blood pressure		
Normal	176	45.4
High[c]	212	54.6

[a]Smoking was defined as those who smoked more than 1 cigarette per day in the last 6 months.

[b]Drinking was defined as those who drank more than once per week in the last 6 months.

[c]Systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg.

4.4 | Multivariate analysis

Covariates with *p*-values <.05, as determined by univariate analysis, were included in the multivariate analysis. The covariates included the education level, co-living, hypertension complications, falls due to physical discomfort in the last 6 months, and admission blood pressure.

Co-living, hypertension complications, falls due to physical discomfort in the last 6 months, and admission blood pressure were the statistically significant independent predictors of medication adherence in the forward binary regression model (Table 4). People who lived with offspring (odds ratio [OR] = 2.355, 95% confidence interval [CI] = 1.001–5.541) and those who lived with their spouse and offspring (OR = 3.004, 95% CI = 1.221–7.388) were more likely to have poor adherence than those living alone. People without hypertension complications were more likely to have good adherence than those with hypertension complications (OR = 0.591, 95% CI = 0.371–0.940). People with high admission blood pressure were more likely to have poor adherence than those with normal admission blood pressure (OR = 1.910, 95% C I = 1.240–2.943). People without falls due to physical discomfort in the last 6 months were more likely to have good adherence than those with falls (OR = 0.530, 95% CI = 0.285–0.988).

5 | DISCUSSION

Medication adherence is a complex process involving the interaction of several factors. This study aimed to explore the factors influencing medication adherence among older people with hypertension. Poor medication adherence results in uncontrolled blood pressure in people with hypertension, which leads to more adverse health effects (Abegaz et al., 2017; Beune et al., 2019; Lee et al., 2019; Xue et al., 2019). This enhances the importance of promoting medication adherence for risk reduction. Thus, the identification of people who are more likely to have poor adherence and predictive factors of medication adherence are pivotal in reducing the burden of disease. This study was designed to document poor adherence and blood pressure control among people by identifying the factors affecting medication adherence.

In our study, 60.1% of the participants showed good medication adherence. This result was in accordance with an international pooled percentage of adherence of 68.86% (95% CI: 57.80%–79.92%) (Uchmanowicz et al., 2019) reported in studies by Berni et al. (2011), Kang et al. (2015), and Teshome et al. (2017). However, the percentage was lower than that reported in studies by Solomon et al. (2015), Hedna et al. (2015), Jankowska-Polanska et al. (2017), and Al-Ruthia et al. (2017) and higher than those reported by Hou et al. (2016), Okello et al. (2016), and Shi et al. (2019). The most probable causes for this difference include the methods used to assess medication adherence and the demographics of the participants. In our study, all the participants were aged ≥60 years, 56.7% participants had an education level of primary school or below, and 43.6% participants lived in the countryside. All the participants were recruited from a single hospital.

TABLE 2 Responses for each question in MMAS-4 (*N* = 388)

Items	Answered "yes"	%
1. Do you sometimes forget to take you pills?	162	41.8
2. Do you sometimes fail to take your medication in time?	154	39.7
3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt better when you took it?	81	20.9
4. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	73	18.8

TABLE 3 Results of Chi-square test for exploring the variables associated with medication adherence ($N = 388$)

Variate	Good adherence	Poor adherence	χ^2	p
Ages (years)			3.450	.486
60–64	57	31		
65–69	71	48		
70–74	4	7		
75–79	67	45		
≥80	34	24		
Sex			0.000	.984
Male	114	76		
Female	119	79		
Smoking status[a]			0.183	.669
No	219	144		
Yes	14	11		
Drinking status[b]			0.021	.885
No	210	139		
Yes	23	16		
Marital status			2.246	.325
Married	218	139		
Unmarried	3	2		
Divorced or widowed	12	14		
Education level			8.073	.045
Primary and below	119	101		
Junior middle school	80	41		
High school	26	10		
Junior college and above	8	3		
Registered residence			4.432	.109
Countryside	97	72		
Town	59	47		
Urban	77	36		
Self-funded medicine bills last year			6.514	.089
0–999	48	23		
1000–4999	81	73		
5000–5999	77	46		
≥10,000	27	13		
Co-living			11.364	.010
Alone	26	12		
Spouse	142	75		
Offspring	39	36		
Spouse and offspring	26	32		
Hypertension complications			10.968	.001
Yes	67	70		
No	166	85		
Duration of hypertension (years)			5.715	.221
0–5.9	77	34		
6–10.9	79	62		
11–15.9	43	32		

(Continues)

TABLE 3 (Continued)

Variate	Good adherence	Poor adherence	χ^2	p
16–20.9	18	15		
≥21	16	12		
Hypertension level			4.325	.115
I	56	24		
II	132	95		
III	45	36		
Falls due to physical discomfort in the last 6 months			6.703	.010
Yes	27	33		
No	206	122		
Number of prescribed antihypertensive drug			2.653	.269
1	103	58		
2	107	75		
≥3	23	22		
BMI			5.826	.120
<18.5	6	4		
18.5~	129	69		
24~	87	68		
28~	11	14		
Admission blood pressure			8.876	.003
Normal	120	56		
High[c]	113	99		

[a]Smoking was defined as those who smoked more than 1 cigarette per day in the last 6 months.
[b]Drinking was defined as those who drank more than once per week in the last 6 months.
[c]Systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg.

TABLE 4 Results of multivariate binary logistic regression for exploring the predictors of medication adherence ($N = 388$)

Predictors	*B*	*SE*	Wals	Sig.	Exp(*B*)	95% CI	
Co-living							
Alone (as reference)			10.320	0.016	1.000		
Spouse	0.320	0.395	0.658	0.417	1.378	0.635	2.987
Offspring	0.857	0.437	3.850	0.050	2.355	1.001	5.541
Spouse and offspring	1.100	0.459	5.738	0.017	3.004	1.221	7.388
Hypertension complications (yes as reference)	−0.526	0.237	4.929	0.026	0.591	0.371	0.940
Falls due to physical discomfort in the last 6 months (yes as reference)	−0.634	0.318	3.987	0.046	0.530	0.285	0.988
Admission blood pressure (normal as reference)	0.647	0.220	8.618	0.003	1.910	1.240	2.943
Constant	0.087	0.707	0.015	0.902	1.091		

Our logistic regression model showed that the participants with high admission blood pressure were more likely to have poor medication adherence than those with normal blood pressure. High admission blood pressure indicated poor blood pressure control. This result was consistent with that of studies performed in Ethiopia (Ambaw et al., 2012) and Greece (Tsiantou et al., 2010), which showed that controlled blood pressure was related to good medication adherence. A possible explanation for this association may be confidence in the positive outcomes of antihypertensive therapy (Ambaw et al., 2012).

The most notable finding of our analysis was that the participants who lived with their offspring or their offspring and spouse were more likely to have poor adherence than those living alone. A study by Abbas et al. (Abbas et al., 2020) showed that married

and widowed people were more likely to have poor medication adherence than single people. Although marital status is considered as family support, people can be supported by other family members. In addition, Osamor (Osamor, 2015) found that people who were supported by friends had better medication adherence than those who did not. Finally, people who live alone are completely responsible for themselves and pay more attention to their health.

This study highlighted people without hypertension complications were more likely to have good medication adherence than those with hypertension complications. However, different outcomes have been reported in the literature. The findings reported by Mahmood et al. (Mahmood et al., 2020), Khayyat et al. (Khayyat et al., 2017) and Al-Ramahi et al. (Al-Ramahi, 2015) were consistent with our findings. However, some studies have reported no association between medication adherence and hypertension complications (Kang et al., 2015; Yue et al., 2015). The inconsistent results may be attributed to the demographic differences in the participants.

Similarly, participants without falls due to physical discomfort in the last 6 months were more likely to have good medication adherence than those with falls. This finding was consistent with that reported by Berry et al. (Berry et al., 2010), which showed an increased risk of falls in people with poor medication adherence, possibly because the risk of falls increased with a gradual rise in blood pressure resulting from poor medication adherence (de Leeuw et al., 2017). Few studies have indicated a higher risk of falls at the start of pharmacotherapy (Butt et al., 2012, 2013; Shimbo et al., 2016). However, studies have reported conflicting findings owing to the different drugs and doses administered (Ham et al., 2014, 2017; Marcum et al., 2015). We will explore these associations in future studies.

The current study has several limitations. First, the participants were recruited from a single hospital, which may have resulted in a selection bias. Second, this was a cross-sectional study, which could not prove a causal relationship. Third, awareness of the disease and psychological factors were not recorded.

6 | CONCLUSIONS

Poor medication adherence represents a challenge in the management of hypertension; additionally, its importance is increasingly recognized. According to our study results, co-living, hypertension complications, falls, and blood pressure were the factors that affect medication adherence to antihypertensive therapy. These predictors can help identify high-risk people with poor adherence so that effective measures can be taken to minimize the global burden of hypertension.

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CONFLICTS OF INTEREST

All authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

XBT and ASW: Study design. JJW, YYW, and YM: Data collection. ASW and JJW: Data analysis. XBT and ASW: Study supervision. ASW and JJW: Manuscript writing. ASW, XBT, and JJW: Critical revisions for important intellectual content.

RELEVANCE TO CLINICAL PRACTICE

The study contributes to identifying high-risk people with poor adherence, which aims not only at improving people health but also to reduce the social and economic burden through specialized care.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study can be provided by the corresponding author upon reasonable request.

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