Nurse Media Journal of Nursing
e-ISSN: 2406-8799, p-ISSN: 2087-7811
https://medianers.undip.ac.id
12(3):353-366, December 2022
https://doi.org/10.14710/nmjn.v12i3.46219

ORIGINAL RESEARCH

Individual Characteristics, Adherence, and Barriers to Medication Adherence of Hypertensive Patients at the Indonesia - Timor Leste Border

Pius A. L. Berek[1,2], Bambang Budi Siswanto[3,4], Dewi Irawati[5], Wisnu Jatmiko[6]

[1]*Doctoral Program of Nursing, Faculty of Nursing, Universitas Indonesia, Indonesia*
[2]*Nursing Program at Universitas Timor, Atambua Campus, Atambua, East Nusa Tenggara, Indonesia*
[3]*Department of Cardiology and Cardiovascular, Faculty of Medicine, Universitas Indonesia, Indonesia*
[4]*National Cardiovascular Center - Harapan Kita Hospital, Jakarta, Indonesia*
[5]*Departmen of Medical-Surgical Nursing, Faculty of Nursing, Universitas Indonesia, Indonesia*
[6]*Faculty of Computer Science, Universitas Indonesia, Indonesia*

Article Info

Article History:
Received: 16 May 2022
Revised: 27 November 2022
Accepted: 29 November 2022
Online: 28 December 2022

Keywords:
Adherence; barriers to adherence; hypertensive patient; individual characteristics

Corresponding Author:
Pius Almindu Leki Berek
Doctoral Program of Nursing, Faculty of Nursing, Universitas Indonesia, Indonesia
Email:
francisdomin2018@gmail.com

Abstract

Background: Until the last decade, the incidence of hypertension has increased sharply. It has been reported that individuals with hypertension show a low level of adherence to their therapy management. Moreover, there has been no previous research evaluating individual characteristics, adherence, and barriers to medication adherence among people with hypertension at the border of Indonesia and Timor Leste.
Purpose: This study aimed to identify individual characteristics, adherence, and barriers to medication adherence among hypertensive patients.
Methods: A total of 112 hypertensive patients recruited using a quota sampling method at the border of Indonesia and Timor Leste participated in this cross-sectional study. Data were collected using the Hill-Bone Questionnaire to identify adherence and the Adherence Barrier Questionnaire (ABQ) to identify barriers to medication adherence. Individual characteristics were also collected. To confirm the hypertension condition at the time of data collection, measurements of blood pressure were retaken. Descriptive statistics and Chi-square analysis were used for data analysis.
Results: The average of systolic blood pressure was 163.85(18.24) mmHg, and the diastolic blood pressure was 99.30(11.57) mmHg. The Chi-square test showed that education and occupation had a significant relationship with adherence (p<0.05) and barriers to medication adherence (p=0.000). Meanwhile, other characteristics, including age, gender, and marital status, were not significantly related to adherence (p>0.05) and barriers to medication adherence (p>0.05).
Conclusion: There is a relationship between education and occupation with adherence and barriers to medication adherence, but there is no relationship when viewed from such individual characteristics as age, gender, and marital status. Further research is needed to identify effective educational methods to increase the knowledge, motivation, and self-efficacy of hypertensive patients to improve blood pressure control.

How to cite: Berek, P. A. L., Siswanto, B. B., Irawati, D., & Jatmiko, W. (2022). Individual characteristics, adherence, and barriers to medication adherence of hypertensive patients at the Indonesia - Timor Leste border. *Nurse Media Journal of Nursing, 12*(3), 353-366. https://doi.org/10.14710/nmjn.v12i3.46219

1. Introduction

Hypertension (HTN) is a global health problem that requires long-term management and therapy (Berek et al., 2021; Ernawati et al., 2020). More than 20% of the world's population has hypertension, which most often leads individuals to cardiovascular diseases (CVDs) and various complications such as stroke, kidney failure, disability, and even premature death (Jahan et al., 2020). As a major modifiable risk factor for CVDs, hypertension accounts for approximately 45% of the global CVD morbidity and mortality (Zeng et al., 2020). Eighty percent of this burden occurs in low- and middle-income countries.

Awareness of the disease and its prevention and treatment in low- and middle-income countries remains poor compared to that in developed countries (Tsadik et al., 2020). Most hypertensive patients who were aware of HTN received medical treatment (90.5%), but only

37.6% of those receiving medical treatment had their blood pressure (BP) controlled (<140/<90 mmHg) with the rate being higher in urban (39.6%) than in rural (32.4%) communities (Lamelas et al., 2019). Despite the availability of adequate amounts of HTN treatment, less than 25% of the patients treated for HTN achieved optimal blood pressure, and only 8% had awareness of the treatment (Tsadik et al., 2020). The Basic Health Research in Indonesia showed that HTN has increased; in 2013, it was 25.8%, and in 2018, it was 34.1%, whereas in East Nusa Tenggara, the prevalence of hypertension was 23.3%, and in Belu Regency, it was 25.9% (Riskesdas, 2018). This condition requires efforts to reduce the incidence of hypertension to avoid the various unexpected complications.

Major efforts such as early detection, treatment, and control of HTN are considered inadequate in many high-income countries, whereas in low-income countries, awareness of HTN is generally low, making the situation even worse (Khanam et al., 2014). As reported in India, there were 56% of people with HTN whose BP was not in control. The determinants of uncontrolled BP include overweight, obesity, and disease severity, while the determinants that support BP control are low salt consumption and family support (Mon et al., 2022). Therefore, adequate adherence or compliance is needed to enable the control of patient's BP according to the target.

Adherence is defined as a circumstance in which a person follows a rule that is related to the company's behavior and adherence to its rule (Nascimento et al., 2021). Patients receiving medication need to understand that medications are critical to achieving BP control (Tsadik et al., 2020). In Venezuela, only 4.5% of treated patients had good BP control (González-Rivas et al., 2016). It was also reported from Bangladesh that among the elderly hypertensive patients taking medication, only 10% were well controlled (Paul et al., 2021). Based on the Riskesdas report in Indonesia, 45.6% of hypertensive patients did not comply with antihypertensive medication (Riskesdas, 2018).

Barriers to adherence or poor adherence has been identified as the main cause of failure to control HTN (Iqbal et al., 2021). Poor adherence to antihypertensive treatment is a significant cardiovascular risk factor. This is frequently left unnoticed since HTN rarely shows specific symptoms (Geevar et al., 2022; Berek & Afiyanti, 2020). Poor adherence to antihypertensive therapy and self-management can increase the risk of stroke in people with hypertension (Xu et al., 2017). The most important goal for adequate HTN control is adherence to daily therapy and long-term therapy (Dobrynina et al., 2022; Berek & Orte, 2022).

Individual characteristics that can increase the risk of hypertension include older age, low education level, family history of hypertension, overweight/obese status, and consumption of sweet foods >3 (three) times/week (Nisa et al., 2022). Multiple factors including patients' beliefs about health, illness, and treatment contribute to antihypertensive medication adherence therapy Tsadik et al., 2020). Understanding patient's beliefs about medication adherence is fundamental because HTN is silent and asymptomatic. Patients might have misperceptions pertaining to HTN, its severity, and the significance of its management. Socioeconomic status (poverty), low level of education, unemployment, lack of effective family/social support, and forgetfulness are also associated with adherence (Nascimento et al., 2021; Tsadik et al., 2020). The patients' illness representations also have a direct influence on adherence to treatment (Tsadik et al., 2020). Although a previous study has recognized the importance of compliance with HTN in Atambua, it was limited to a small number of patients taken from one health center which only described the demographics (Baso et al., 2019). Independent factors, including individual characteristics of people with HTN that can affect adherence and barriers to adherence, are barely studied at the Indonesia - Timor Leste border. In other areas in Indonesia, there were various reports regarding adherence and barriers to adherence to treatment and management of hypertension. In urban areas, the adherence tends to be high and barriers to adherence are relatively low, whereas in rural areas, on the contrary, adherence is low and barriers to adherence are high (Alfian et al., 2020).

Efforts to prevent and control HTN begin with increasing public awareness and changing to a healthier lifestyle. Such strategic efforts as the healthy community movement (Germas) and the Healthy Indonesia program based on a family approach (PIS-PK) have been excellently launched, but they have yet to be able to suppress the incidence of hypertension. The result of a study in Bengkulu regarding Germas behavior in adults indicates that there is no intention to perform Germas, there is a lack of awareness of the importance of Germas, and Germas

behavior/actions remain lacking (Ilahi, 2021). The same situation also occurred at the border of Indonesia and Timor Leste, thus making these efforts having been unable to reduce the incidence of hypertension. Baso et al., (2019) identified the adherence of hypertensive patients in Atambua, but it was only limited to the adherence in one public health center with a small sample size. No similar research was found in the border areas of Indonesia - Timor Leste that examined hypertension management practices as well as adherence and barriers to medication adherence associated with the characteristics of people with hypertension at the border between the two countries. Therefore, a more in-depth study in this topic is required. This study aimed to identify the individual characteristics, adherence, and barriers to medication adherence of the hypertensive patients at the border of Atambua East Nusa Tenggara (Indonesia) and Timor Leste.

2. Methods

2.1 Research design

This was a cross-sectional study that explored the correlation between individual characteristics and adherence and barriers to medication adherence of the hypertensive patients at the border of Indonesia and Timor Leste.

2.2 Setting and samples

This study was conducted among the people living with hypertension at the border of Indonesia (6 public health centers) and Timor Leste (3 public health centers) between November 2021 and February 2022. The samples were recruited using a quota sampling method with the inclusion criteria being >18 years old, having a history of hypertension (>140/90 mmHg) for more than 5 years, not being in a critical period, and having the ability to communicate in Indonesian. The exclusion criteria were pregnant women and hypertensive patients with mental disorders and severe physical conditions. One hundred and twelve respondents completed the data collection forms. Research assistants provided explanations regarding the aims and objectives of the research. People with HTN who met the inclusion criteria were led to complete the available Google form. The determination of the sample size employed the Lemeshow formula. By using a degree of confidence (Z) of 95%, the proportion of the population (P) of 50% and the distance in both directions (d) of 10%, a sample of 96 people is obtained. After adding 10% in anticipation of the possibility of dropping out, the minimum sample is 106 people. In this study, there were 112 respondents who completed the questionnaire. All respondents were taken for further analysis as there were no drop outs.

2.3 Measurement and data collection

The research data were collected through a Google form containing the Hill-Bone questionnaire (adherence) and the Adherence Barrier Questionnaire (ABQ) (barriers to medication adherence). Each questionnaire had been tested for validity and reliability. The Indonesian version of the Hill-Bone questionnaire had been translated and tested for validity and reliability using the forward and backward translation methods by health experts with Indonesian and English language competencies (Fauziah, 2019). The validity test was 0.845. The Hill-Bone questionnaire reliability test was conducted on 30 hypertensive patients. The results showed a Cronbach's alpha value of 0.742 in the study. It was declared reliable and therefore could be used (Fauziah, 2019). The questionnaire consisted of 11 items with two factors related to medication adherence and one factor for salt intake. The answers were rated on a 4-point Likert scale, ranging from "always" (4) to "never" (1). The total score was classified into two levels based on the mean as a cut-off point for adherence (>mean) and non-adherence (<mean).

The Adherence Barriers Questionary (ABQ) is used to measure the adherence barriers for people with hypertension; it has been developed in English by Muller et al. since 2015 (Müller et al., 2015). This questionnaire was translated into Indonesian in 2019 (Putri, 2019). The translation used the forward-backward translation method performed by health experts who were fluent in Indonesian and English. Both experts had checked the content validity of the Indonesian version. The reliability test of the ABQ questionnaire was conducted on 30 hypertensive patients. The results showed that the Cronbach's alpha value was 0.685 and the validity test score was 0.709. It was declared reliable to be used (Putri, 2021). It consisted of 16

questions with four answer options rated on 4-point Likert scale including strongly disagree (4), disagree (3), agree (2), and strongly agree (1) (Putri, 2019). The total score was classified into two levels based on the mean as a cutoff point of have no barriers (<mean) and yes, have barriers (>mean). The individual characteristics were comprised of age, gender, marital status, occupation, education level, and family history of HTN as risk factors. The categories of assessment of individual characteristics in this study were as follows: age was categorized into late adolescence (17-25), early adult (26-35), late adult (36-45), early elderly (46-55), late elderly (56-65), and senior (>65); gender consisted of male (1) and female (2); education level comprised none (1), elementary school (2), junior high school (3), senior high school (4), and university (5); marital status was divided into married (1), single (2), and widow/widower (3); and occupation consisted of civil servant/soldier/police (1), retired (2), private (3), farmer (4), housewife (5), unemployed (6), and student (7).

The data were collected using the Google form for one time only. The research assistants had identified people with HTN based on their medical records at the community health center "by name by address". The activities carried out by the research assistants were home visits. As this research was conducted during the COVID-19 pandemic, during the home visit, the research assistants and respondents continued to maintain health protocols. The respondent's BP was documented on the Google form as the systolic and diastolic BP. All participants with a history of hypertension who met the inclusion criteria and agreed to be involved in the study were given a Google form link to complete. Ethical aspects were still considered by ticking the section containing approval. The last BP was filled out by the research assistants themselves. After that, the research assistants guided these people with HTN to answer the questions in the prepared questionnaire. During the completion of the questionnaire, the research assistants only completed the data based on what the patients said without any correction or intervention. If they found obstacles, they were guided by the researchers and research assistants. The process of filling out the Google form took approximately 20 minutes per participant. No data were lost from this study.

The research assistants were the people in charge of the non-communicable disease program at the community health center and knew the patients by their names and addresses, so the data collection was carried out door to door to complete the predetermined quota sampling. Blood pressure measurements were carried out by the research assistants at the patient's home according to the operational standards. Every patient whose BP was above 140/90 mmHg met the study inclusion criteria.

Hypertensive patients from Timor Leste were fluent in Indonesian. They were accompanied by some research assistants (nurses) from Timor Leste who also understood Indonesian. The patients with HTN who met the inclusion criteria received an explanation of the benefits and objectives of the study. After agreement from the patients to be research respondents, the research assistants read the questions to the respondents according to the questionnaire on the Google form. The research assistants filled out the answers from the respondents on the available Google form. In this case, the research assistants filled out the Google form according to the respondent's answer without any coercion or intervention. The demographic data, including the age, gender, education level, occupation, and marital status, were filled in according to the instructions on the Google form.

2.4 Data analysis

The data obtained from the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS) program, version 25. The continuous variables were presented in mean and standard deviation. The categorical variables were expressed as numbers and percentages. The relationship between each variable in this study was analyzed by a Chi-square analysis. Data is considered statistically significant if it has a p-value <0.05.

2.5 Ethical considerations

Before the study was undertaken, the ethics committee approval was granted (Decision No.: Ket-221/UN2.F12.D1.2.1/PPM.00.02/2021) and permission was received from the National Unity Body and Politics of Belu Regency, East Nusa Tenggara Province where the study was conducted. The researcher was assisted by four research assistants, who were the people in charge of the non-communicable disease program at the community health center. The research

assistants selected the patients according to the inclusion criteria, and then they explained the benefits and objectives of the study. Hypertensive patients were informed of the purpose of the study. Every hypertensive patient who agreed to participate in the study proceeded to answer through the Google form. Patients who agreed to be the respondents in this study filled out the valid and reliable Indonesian version of the Hill-Bone and ABQ questionnaires.

3. Results

3.1 Characteristics of the participants

In the current study, 67.86% participants come from Indonesia. The participants had an average age of 53.93 years (SD=11.44) with a slight female dominance (51.8%). The majority were married (58.6%), completed university (32.1%), and were housewives (28.6%). The detailed information on the individual characteristics of the participants is described in Table 1.

Table 1. Individual characteristics of participants (n=112)

Variable	Freequency (f)	Percentage (%)
Country		
Indonesia	76	67.86
Timor Leste	36	32.14
Age		
17-25 (late adolescence)	2	1.8
26-35 (early adult)	5	4.5
36-45 (late adult)	18	16.1
46-55 (early elderly)	35	31.3
56-65 (late elderly)	35	31.3
>65 (senior)	17	15.2
Gender		
Male	54	48.2
Female	58	51.8
Education		
None	15	13.4
Elementary school	16	14.3
Junior high school	14	12.5
Senior high school	31	27.7
University	36	32.1
Marital Status		
Married	34	58.6
Single	5	8.6
Widow/Widower	19	32.8
Occupation		
Civil servant/soldier/police officer	29	25.9
Retired	7	6.3
Private employee/entrepreneur	17	15.2
Farmer	11	9.8
Housewife	32	28.6
Unemployed	14	12.5
University student	2	1.8

3.2 Blood pressure level of the participants

As shown in Table 2, only 1.78% of the participants have controlled sBP and 5.36% have controlled dBP at the target level. The overall mean of sBP is 162.85 mmHg (SD=18.24) and dBP is 99.30 mmHg (SD=11.57), suggesting poorly controlled BP. Moreover, there are 98.22% patients having sBP of more than 130 mmHg, and 94.64% have dBP of more than 90 mmHg or above.

Table 2. Blood pressure level of the hypertensive patients (n=112)

Variable	Mean (SD)	f	%
Overall systolic blood pressure (mmHg)	162.85 (18.24)	112	100
Overall diastolic blood pressure (mmHg)	99.30 (11.57)	112	100
Controlled systolic blood pressure (<130)		2	1.78
90 – 120		1	0.89
121 – 129		1	0.89
Uncontrolled systolic blood pressure (≥130)		110	98.22
130 – 139		5	4.47
140 – 210		105	93.75
Controlled diastolic blood pressure (<85)		6	5.36
60 – 80		6	5.36
81 – 84		0	0
Uncontrolled diastolic blood pressure (≥85)		106	94.64
85 – 89		2	1.78
90 – 120		104	92.86

SD: Standard Deviation

3.3 Correlation between individual characteristics and adherence and barriers to medication adherence of the hypertensive patients

As shown in Table 3, education (p=0.004) and occupation (p=0.003) have a significant correlation with adherence of the hypertensive patients. On the hand, the findings show that education (p=0.000) and occupation (p=0.000) have a significant correlation with barriers to medication adherence of the hypertensive patients.

Table 3. Correlation between individual characteristics and adherence and barriers to medication adherence of the hypertensive patients at the border of Indonesia and Timor Leste (n=112)

Variables (independent and dependent)	Adherence			Barriers to Adherence		
	No Adherence (n=63) n (%)	Adherence (n=49) n(%)	p-value	No Barriers (n=57) n(%)	Barriers (n=55) n(%)	p-value
Age						
17-25 (late adolescence)	0 (0.00)	2 (100)	0.302	2 (100)	0 (0.0)	0.534
26-35 (early adult)	1 (20.0)	4 (80.0)		4 (80.0)	1 (20.0)	
36-45 (late adult)	5 (27.8)	13 (72.2)		9 (50.0)	9 (50.0)	
46-55 (early elderly)	16 (45.7)	19 (54.3)		18 (51.4)	17 (48.6)	
56-65 (late elderly)	18 (51.4)	17 (48.6)		16 (45.7)	19 (54.3)	
>65 (senior)	9 (52.9)	8 (47.1)		8 (47.1)	9 (52.9)	
Gender						
Male	23 (42.6)	31 (57.4)	0.913	28 (51.9)	26 (48.1)	0.995
Female	26 (44.8)	32 (55.2)		29 (50.0)	29 (50.0)	
Education Level						
None	10 (66.7)	5 (33.3)	0.004*	6 (40.0)	9 (60.0)	0.000*
Elementary school	8 (50.0)	8 (50.0)		7 (43.8)	9 (56.3)	
Junior high school	4 (28.6)	10 (71.4)		11 (78.6)	3 (21.4)	
Senior high school	6 (19.4)	25 (80.6)		24 (77.4)	7 (22.6)	
University	21 (58.3)	15 (41.7)		9 (25.0)	27 (75.0)	
Marital Status						
Married	39 (43.8)	50 (56.2)	0.520	42 (47.2)	47 (52.8)	0.141
Single	3 (30.0)	7 (70.0)		8 (80.0)	2 (20.0)	
Widow/Widower	7 (53.8)	6 (46.2)		7 (53.8)	6 (46.2)	
Occupation						
Civil servant/ soldier/ police officer	19 (65.5)	10 (34.5)	0.003*	6 (20.7)	23 (79.3)	0.000*

Table 3. Continued

Variables (independent and dependent)	Adherence			Barriers to Adherence		
	No Adherence (n=63) n (%)	Adherence (n=49) n(%)	p-value	No Barriers (n=57) n(%)	Barriers (n=55) n(%)	p-value
Retired	2 (28.6)	5 (71.4)		6 (85.7)	1 (14.3)	
Private employee/ entrepreneur	3 (17.6)	14 (82.4)		13 (76.5)	4 (23.5)	
Farmer	7 (63.6)	4 (36.4)		3 (27.3)	8 (72.7)	
Housewife	9 (28.1)	23 (71.9)		21 (65.6)	11 (34.4)	
Unemployed	9 (64.3)	5 (35.7)		6 (42.9)	8 (57.1)	
Student	0 (0.0)	2 (200)		2 (100)	0 (0.0)	

4. Discussion

This study was designed to determine individual characteristics, adherence, and barriers to medication adherence of the hypertensive patients at the border of Indonesia and Timor Leste. The results show that the BP control rate is extremely low.

The results showed that almost half of the respondents indicated non-adherence to treatment and experienced adherence barriers in hypertension treatment. Likewise, from these data, it can be seen that almost all of the respondents had uncontrolled blood pressure. The results of this study are in accordance with research conducted in Myanmar where respondents in the study also showed low awareness of hypertension sufferers to carry out blood pressure control (Mon et al., 2022). The low awareness of people who are at risk of hypertension to control blood pressure is caused by several factors, including not feeling symptoms by sufferers, unavailability of affordable health facilities, and low public knowledge about the disease (Naryati & Priyono, 2022; O'Donnell et al., 2021).

Patients' ability regarding adherence and adherence barriers to BP control may vary for each individual depending on education and occupation. Our findings showed that the majority of the respondents did not complete primary school, and most of them did not comply with BP control. Many hypertensive patients at the Indonesia-Timor Leste border are not aware of their condition because there are no symptoms, so they do not routinely control their BP. This is in line with the condition of HTN which is known as the silent killer (Mensah, 2019). Patients seek health care only if there are complaints. It is possible that people with HTN at the Indonesia - Timor Leste border still focus on meeting their daily basic needs, which make them neglect their high blood pressure. There has not been a HTN management program in Timor Leste, while the Indonesian government has launched an effort to manage HTN since 2018 through the Healthy Indonesia program with a family approach (The Directorate General of Controlling and Preventing Diseases, 2018).However, our study reported that the level of adherence was still quite low, and there were many obstacles to adherence experienced by the respondents in controlling BP, including in taking medication, regulating salt in food, and living a healthy lifestyle. Our findings are in line with a study in Waingapu, East Nusa Tenggara, where most of respondents did not adhere to taking the medication regularly (Mbakurawang & Agustine, 2016).

4.1. The relationship between age and adherence and barriers to medication adherence of the hypertensive patients

Our research showed no relationship between age and adherence of hypertension sufferers to practicing a healthy lifestyle and treating hypertension. Xie et al., (2020) from China have studied the socio-demographic correlations of patient adherence to self-management behaviors of type 2 diabetes and hypertension, reporting that older patients were more likely to adhere to medication therapy of hypertensive patients than others. They stated that the adult age group was more obedient in taking medication and managing a healthy lifestyle compared to other age groups. However, these findings do not make age the only factor that causes other age groups to not adhere to treatment. Other factors such as motivation and self-efficacy and work can be the reason for not visiting health care facilities. It is possible for the younger age group to disobey medication and practice a healthy lifestyle because adulthood is a productive age. They are busy

making a living to meet the needs of daily life, thus causing them to skip regular medication (Tambuwun et al., 2021). Our findings are in line with a study by Tambuwun et al. (2021) from North Mianahasa which reported no relationship between age and adherence to hypertension treatment. The age group under 46 years showed half of respondents were adherence and non-adherence, while half of the number of respondents who are age group over 46 years had adherence and non-adherence.

Based on the results of our study, although there is no statistically significant relationship between age and adherence and barriers to medication adherence, the relationship between these variables is interesting. In terms of adherence, it is initially high in the late adolescence age group, but it gradually decreases in the corresponding groups until it reaches the lowest level in the senior age group. This shows likelihood that initially when an individual is first diagnosed with hypertension, he or she makes various efforts to obtain treatment and manage a healthy lifestyle (Hardy & Urbina, 2021). However, as the person grows older, chances are he or she has started to get busy with activities, causing adherence to start to decrease (Hardy & Urbina, 2021). Another possible causative factor is that there is no target organ damage and there are no typical symptoms of hypertension, making people with hypertension ignore their hypertension problems (Kalehoff & Oparil, 2020; Obrycki et al., 2020). Boredom related to hypertension management, which is a long-term therapy, is also one of the causative factors that cannot be denied (Herrera et al., 2021).

4.2. Relationship between gender and adherence and barriers to medication adherence of the hypertensive patients

Nearly half of the respondents did not adhere, however, most of the respondents stated that they did not experience any medication barriers. Our research shows that there is no relationship between gender and adherence and barriers to medication adherence ($p>0.05$).

Gender differences seem to influence the health behavior of men and women. According to Song et al. (2020), gender is a description of behavior patterns of men or women that are recognized in life. Male personality traits are aggressive, arrogant, competitive, violent, cruel, dominant, independent, and unemotional. Meanwhile, women are more intimate, anxious, loving, dependent, emotional, gentle, sensitive, and submissive. It is the personality possessed by women that seems to make women more concerned about health than men, thus resulting in more adherence to hypertension treatment being found in women (Gheisari et al., 2020).

Health behavior between men and women shows that women are more obedient to undergo hypertension treatment compared to men. In general, women pay more attention to their health, while men often care less about their health and underestimate the condition of their bodies (Tambuwun et al., 2021). This opinion differs from our findings. In this study, although the results of the bivariate test show no significant relationship between gender and adherence, adherence among men is higher than in female. Furthermore, men experience lower barriers to medication adherence than women.

Our research is in line with a previous study by Liberty et al. (2018) in that there is no relationship between gender and adherence to treatment of hypertensive patients at several advanced health facilities in Palembang. Their findings indicate that women and men have understood the goals of hypertension treatment. This is different from the people at the Indonesia – Timor Leste border, where the majority of the people are farmers, as in this case, they probably consider that hypertension is not a major problem that must be overcome. Apart from the fact that hypertension shows no symptoms, the efforts to make a living to meet their daily needs are still a priority for them (Jahan et al., 2020; Kalehoff & Oparil, 2020).

4.3. Relationship between education level and adherence and barriers to adherence

Most of the non-educated respondents did not adhere to a healthy lifestyle, on the other hand the majority of respondents with junior high school, senior high school and university education were more adherent. There is a significant relationship between education level and adherence and adherence barriers ($p<0.05$).

Education level is related to knowledge. An individual who is highly educated has a better level of knowledge to receive information than a person with a low level of education (Chen et al., 2022). However, a high level of education alone is not a factor for an individual to comply with hypertension treatment. As our findings in this study reveal, hypertensive patients who did

not attend school have low adherence, but ironically patients with higher education (bachelor) background also have low adherence. In terms of the low compliance of hypertensive people who have a bachelor's degree, the majority of them work as employees who are busy with work, so they do not carry out routine health checks and do not take medication regularly (Tam et al., 2020). An individual with an undergraduate degree generally has adequate knowledge, but because of their busy lives, higher education is not a reason for them to take better self-care, making them focus more on their work and thereby neglect their health. The lowest adherence is seen in respondents who did not attend school, and this gradually increases to elementary school. Most of the junior high school and senior high school participants increase their adherence. The contrast appears as adherence decreases in the undergraduate group. In addition, there is a significant relationship between education level and adherence (p<0.05).

Our findings are in line with previous research by Sukma et al. (2018) which explained that the level of education was related to adherence to treating hypertension at the Pandanaran Health Center, Semarang City (p=0.008). Only a small proportion of respondents who are low education level were in the adherence category, while most of the respondents who are higher education level had adherence to medication.

In contrast to previous research from Purnawan (2019) related to adherence to treatment of hypertensive patients in Gianyar Bali, it was reported that there was no relationship between education and adherence to treatment for hypertension sufferers in Gianyar, Denpasar (p>0.05). Many respondents who were highly educated showed adherence to treatment, and the rest were disobedient to treatment. On the other hand, most of the respondents with low education level adhered to treatment, while small portion did not comply with treatment.

4.4. Relationship between marital status and adherence and barriers to adherence

Most of the respondents who are married and single have a high level of adherence compared to widowers/widows. Further analysis, there is no relationship between marital status with adherence and barriers to adherence (p>0.05).

Marital status plays an important role in hypertension. It is considered a measure of social network and is associated with improved control of hypertension. It is speculated that married hypertensive patients may have better control of hypertension partly through increased adherence to recommendations (Mahmood et al., 2020; Aliyah & Damayanti, 2022). This is contrast to our findings which. The highest adherence is seen in single respondents compared to those with hypertension who are married and widowers/widows. The barriers to adherence related to medication and healthy lifestyle practices are found to be lowest in people with hypertension who are single compared to married individuals and widowers/widows.

It is assumed that married hypertensive patients can control their blood pressure well due to the existence of a support system from both their partners and children as well as other family members. However, the findings are different in our study since single hypertension sufferers have high adherence compared to married patients and widowers/widows.

4.5. Relationship between occupation and compliance and compliance barriers

This study also revealed that there is a statistically significant relationship between occupation and adherence and barriers to adherence to BP control. Farmers are less likely to comply with antihypertensive medication and have high barriers to adherence to controlling BP when compared to patients who have other types of occupation. As another study reported from Ethiopia, farmers tend to be less educated and may have less information about medication adherence compared to patients with other occupations (Tsadik et al., 2020). One contradictory opinion describes that understanding adherence and barriers to adherence to hypertension management to have the BP control on target is less important (Misra et al., 2017). Instead, health care providers should be aware of and understand patients' beliefs about disease and treatment when providing care to them and incorporate these beliefs in designing effective interventions to improve adherence and prevent or avoid adherence barriers to hypertension therapy management, including taking medication, setting a low salt diet, and visiting health care facilities (Tsadik et al., 2020). All of students diagnosed with hypertension have very high adherence, followed by private sector/self-employed patients, retirees, and housewives. Furthermore, there are three types of occupation that make people with hypertension experience obstacles to adherence to medication, which include civil servant/soldier/police,

farmers, and unemployed. Students who are diagnosed with hypertension do not have obstacles to hypertension treatment.

5. Implication and limitation

This study showed that adherence and barriers to adherence to controlling BP were the main challenges for the people with HTN at the border of Indonesia - Timor Leste. Therefore, health care providers, including nurses, should seek the best solution through adequate interventions to strengthen the continuity of care related to BP control. Furthermore, this study reported a significant relationship between education and occupation with adherence and barriers to adherence to controlling BP for people with HTN. Efforts to improve lifestyle, including salt consumption and physical activities, require continuous support to enable people with HTN to increase their motivation and self-efficacy in controlling BP. It is necessary to develop effective interventions to optimize BP control. In addition, efforts to reduce sodium consumption and family support are needed to allow people with HTN to keep receiving support to properly control BP. Therefore, nurses should continue to provide health education, motivation, and self-efficacy support, especially for a healthy lifestyle including low sodium consumption. The involvement of family members is also very important in BP management intervention programs.

There are some limitations of this study. First, the sample size was limited since this research was conducted from December 2021 to February 2022. During the COVID-19 pandemic, there were obstacles in the data collection process, and only patients who happened to receive the questionnaire could complete it. Therefore, further research is needed to strengthen our findings. Second, the short duration of the study led to only one interaction. Third, the data collection was done through a Google form, which made it difficult to monitor the patient's honesty in answering the given questionnaires.

6. Conclusion

This study reveals that the adherence of the hypertensive patients at the Indonesia - Timor Leste border is low, but the barriers to adherence are still high. One extreme finding is that the blood pressure control is far below the target. The findings show the relationship of individual characteristics with adherence and barriers to adherence to blood pressure control. Two individual characteristics have been identified, including education and occupation. Therefore, this study has enriched knowledge of adherence and barriers to adherence to controlling blood pressure in the hypertensive patients at the Indonesia - Timor Leste border. Based on the findings, health care providers need to develop intervention strategies to improve adherence and reduce or eliminate the existing barriers to adherence. Further research needs to identify effective education methods to increase the knowledge, motivation, and self-efficacy of hypertensive patients. This is especially necessary to stimulate healthy lifestyle changes to improve BP control and avoid complications among the hypertensive patients at the Indonesia - Timor Leste border.

Acknowledgment

We would like to thank the Education Fund Management Institute (LPDP) through the Scholarship for Indonesian Lecturers (BUDI) scheme for providing financial support for our study. We would also like to express our sincere gratitude to all the hypertensive patients who participated in the study.

Author contribution

PALB prepares the research proposal, collects data, analyzes data, interprets data, prepares the manuscript, and makes revisions. BBS, DI, and WJ give corrections, supervision, important suggestions, recommendations during the research process, and improvements to the final manuscript.

Conflict of interest

All authors declare no conflicts of interest related to this paper.

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