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Uncontrolled Blood Pressure in Patients with Hypertension and Associated Factors: The Role of Low Health Literacy

ORIGINAL ARTICLE

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ABSTRACT

Objective: The aim of this study was to determine the prevalence of uncontrolled blood pressure, associated factors and evaluate whether or not low health literacy (HL) is a risk factor.

Materials and Methods: This cross-sectional study was conducted in 556 patients who met the inclusion criteria, and were aged 18 years or above. The data were collected using the Personal Information Form prepared by the researchers, Morisky Medication Adherence Scale, and European Health Literacy Survey Questionnaire (HLS-EU-Q). In the analysis, descriptive statistics, Chi-square test, and multivariate logistic regression analysis were used. $p<0.05$ was considered as statistically significant.

Results: In the study uncontrolled blood pressure prevalence was 69.8%. According to the multivariate logistic regression analysis uncontrolled blood pressure was higher in those who were aged 65 years and over (OR: 1.60, 95% CI: 1.12-2.78), had primary and lower education (OR: 1.72, 95% CI: 1.41-2.71), had any comorbidity (OR: 2.09, 95% CI: 1.42-3.11), were current smokers (OR: 2.40, 95% CI: 1.35-3.11), overweight/obese (OR: 2.13, 95% CI: 1.64-3.17), had no medication adherence (OR: 2.98, 95% CI: 1.94-3.32), and had low health literacy (OR: 2.06, 95% CI: 1.34-2.94).

Conclusion: In the study, it was determined that nearly three out of four patients receiving treatment had the uncontrolled blood pressure. Smoking, overweight/obesity, nonadherence to medical treatment, and low health literacy were alterable risk factors for uncontrolled blood pressure.

Keywords: Uncontrolled blood pressure, hypertension, health literacy

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INTRODUCTION

High blood pressure (BP) is also known as hypertension. It is one of the leading preventable risk factors for premature death and disability worldwide (1). By lowering BP in patients with hypertension, a decrease of approximately 13% can be achieved in all-cause mortalities (2). Today, however, it is reported that BP can be controlled in about 14% all of the patients. This rate is lower in developing countries (1). In Turkey, the rate of controlled BP is 27.8% (3). In the literature, nonadherence to medication and lifestyle changes has been stated as the main reason for uncontrolled BP (4). Previous studies have indicated that patients need knowledge to understand how they would receive medication and change their lifestyle. However, they usually are unable to reach and understand the information due to low health literacy (HL) (5).

Health literacy is defined as "individual's skill of accessing, understanding, and using medical knowledge to protect and sustain health" (6). Many studies have revealed that low HL is associated with multiple negative results like poor utilization of the health-care system, noncompliance to medication and lifestyle changes, uncontrolled BP, increased hospitalizations, and all-cause mortality; and they have emphasized that it is necessary to develop HL in activating self-management of patients (5, 7).

In the past decades, HL has been an important issue in public health researches. However, data about HL of patients with hypertension in Turkey are still scarce. Revealing the relationship between HL and control of BP in patients with hypertension is important in terms of contributing to literature, and in lighting the way for interventions to be planned in the chronic illness management in primary health-care institutions.

This study aims to determine the prevalence of uncontrolled BP and the associated factors, and evaluate whether low HL is a risk factor.

MATERIALS and METHODS

Type of the Study
The study is cross-sectional.

The Population and Sample Size of the Study
Bandırma is a district of Balıkesir, a province located in the southern part of Marmara region in Turkey. This study was carried out in a family health center where primary health services were provided by four family medicine units located in Bandırma district center. The population of the study included 1121 patients with hypertension who were aged 18 years or above, and registered at the family health center. The minimum sample size required for the study was calculated as 545 by taking p=0.54, α=0.05, and d=0.03 in the Epi Info 7.2 program (8).

Inclusion and Exclusion Criteria
No sampling method was implemented in this study. Among 623 patients who presented to the family health center between April 2017 and June 2017, those who were diagnosed with hypertension at least six months ago and took medication for it, had cognitive competence to answer the questionnaire, and agreed to participate were included in the study (n=556).

Variables of the Study
The dependent variable of the study is uncontrolled BP. In the study, systolic BP below 140 mmHg and diastolic BP below 90 mmHg showed that BP of the patients was under control (9). The participants were classified as current smokers if they smoked at least one cigarette per day. They were classified as physically active if they did physical activity for at least 5 days a week, and had moderate-intensity activity and/or walking for at least 30 min (10). Body mass index (BMI) was calculated based on verbal statement, and World Health Organization's (WHO) classification. Those with BMI of 30.0 kg/m^2 or more were considered obese (11).

Data Collection Tools
The study data were collected with the Personal Information Form prepared by the researchers, Morisky Medication Adherence Scale, and European HL Survey Questionnaire (HLS-EU-Q).

Morisky Medication Adherence Scale
The scale was developed by Morisky in 1986, and the validity study of the Turkish version of the scale was conducted by Demirezen in 2006 (12, 13). The minimum and maximum scores of the scale were 1.00 and 13.00, respectively. Those getting a score between 1.00 and 7.00 have adherence to treatment, and those getting a score of 8.00 or above have no adherence to treatment. In this study, the Cronbach's alpha value of the scale was calculated as 0.88.

European Health Literacy Survey Questionnaire (HLS-EU-Q)
The questionnaire was developed by Sorenson et al. (14, 15) in 2013. The questionnaire consists of three subscales (Health-Care, Disease Prevention, Health Promotion) and 47 items. The index was modified as recommended by the European HL Project using the following formula (I=(X-1)*50/3). While scores of 0.00-25.00 points are defined as 'inadequate' perceived HL, scores of 26.00-33.00 points are defined as 'problematic'. Further, scores of 34.00-42.00 points are defined as 'sufficient', and scores of 43.00-50.00 points are defined as 'excellent' perceived HL. The questionnaire was adapted into the Turkish population by Republic of Turkey Ministry of Health in 2016 (16). In the study, the general HL was evaluated, and the Cronbach's alpha value was calculated as 0.89. In this study, the general HL level was evaluated in two categories: low (inadequate/problematic) and high (sufficient/excellent).

Application
Before the data were collected, official permission was obtained from Balıkesir Public Health Directorate from the study was approved by Balıkesir University Faculty of Medicine Clinical Research Ethics Committee (Decision date: 22.03.2017, Decision no: 2017/25). Written informed consent was obtained from the patients who participated in this study. Data were collected with the face-to-face interview technique by nurses who were trained about the study. BP of the patients was measured in accordance with the Turkish Cardiology Association National Hypertension Treatment and Follow-up Guide (17).

Statistical Analysis
For data analysis, Statistical Package for Social Sciences (SPSS) version 23.0 software (IBM Corp.; Armonk, NY, USA) was used. In the analysis, descriptive statistics, the Pearson Chi-square test, and multivariate logistic regression analysis were used. Logistic regression models were constructed using the backward elimination likelihood ratio (LR) method to define independent factors associated with uncontrolled BP. The model included variables determined to be related to dependent variables through the univariate analysis and in studies in the literature. Hosmer-Lemeshow goodness-of-fit test was used to determine how well the model fit the data. Explanation of the model was evaluated with Nagelkerke R square. $p<0.05$ was considered as statistically significant.

RESULTS

The mean age of the participants was 55.74±13.69 years (min=18, max=88). Of them, 27.7% were in the age group of 55-64, 62.6% were female, 40.6% were primary school graduates, 65.3% perceived their income level as moderate, 56.8% perceived their health level as moderate, 48.9% had comorbidities, 23.7% were current smoker, 12.2% consumed alcohol, and 4.3% were physically active. The rate of obese participants was 16.9%. The mean score of the participants for the Morisky Medication Adherence Scale was 5.47±2.44 (min=1.00, max=11.00). The rate of the patients who had compliance to the pharmacological treatment was 76.3%. The rate of the patients whose general HL was problematic and inadequate was 54.3% and 22.3%, respectively (Table 1).

In this study, uncontrolled BP prevalence was 69.8%. This prevalence was significantly higher for those who were aged 65 years or above, had primary school or lower education, had no medication adherence, had low level HL, had any comorbidity, perceived their health level as poor, were smokers, overweight/obese ($p<0.05$, Table 2).

According to the multivariate logistic regression analysis uncontrolled BP was higher in those who were aged 65 years and over (OR: 1.60, 95% CI: 1.12-2.78), had primary and lower education

Table 1. Distribution of some characteristics of the patients (n=556)

Characteristics	n	%
Age (Mean±SD=55.74±13.69, min=18, max=88)		
≤44	110	19.8
45-54	140	25.2
55-64	154	27.7
≥65	152	27.3
Gender		
Female	348	62.6
Male	208	37.4
Education level		
İlliterate	22	4.0
Literate but no education	68	12.2
Primary school	226	40.6
Secondary school	74	13.3
High school	140	25.2
University degree or higher	26	4.7
Perceived economic level		
Good	141	25.4
Moderate	363	65.3
Poor	52	9.4
Perceived health level		
Good	198	35.6
Moderate	316	56.8
Poor	42	7.6
Comorbidities		
Yes	272	48.9
No	284	51.1
Smoking		
Current smoker	132	23.7
Non-smoker	424	76.3
Alcohol consumption		
Yes	68	12.2
No	488	87.8
Physical activity		
Yes	24	4.3
No	532	95.7
BMI		
Underweight/ normal weight	136	25.7
Overweight	304	57.4
Obese	90	16.9
Medication adherence (Mean±SD=5.47±2.44, min=1.0, max=11.0)		
Yes	424	76.3
No	132	23.7
General HL		
Excellent	34	6.1
Sufficient	96	17.3
Problematic	302	54.3
Inadequate	124	22.3

*Column percentages

Table 2. Univariate analysis for uncontrolled blood pressure

		Uncontrolled blood pressure		
	n	n	%	p*
Age				
≤44	110	70	63.6	0.020
45-64	294	199	67.7	
≥65	152	119	78.3	
Sex				
Female	348	240	69.0	0.251
Male	208	148	71.2	
Education level				
Primary school or less	316	230	72.8	0.037
Secondary and high school	214	145	67.8	
University degree or higher	26	13	50.0	
Perceived economic level				
Good	141	95	67.4	0.662
Moderate	363	258	71.1	
Poor	52	35	67.3	
Perceived health level				
Good	198	126	63.6	0.020
Moderate	316	227	71.8	
Poor	42	35	83.3	
Comorbidities				
Yes	272	205	75.4	0.005
No	284	183	64.4	
Smoking				
Current smoker	132	103	78.0	0.018
Non-smoker	424	285	67.2	
Alcohol consumption				
Yes	68	52	76.5	0.200
No	488	336	68.9	
Physical activity				
Yes	24	15	62.5	0.427
No	532	373	70.1	
BMI				
Underweight/ normal weight	136	85	62.5	0.027
Overweight/obese	394	286	72.6	
Medication adherence				
Yes	424	284	67.0	0.010
No	132	104	78.8	
General health literacy				
High	130	80	61.5	0.019
Low	426	308	72.3	

*Pearson Chi-square test

(OR: 1.72, 95% CI: 1.41-2.71), had any comorbidity (OR: 2.09, 95% CI: 1.42-3.11), were current smokers (OR: 2.40, 95% CI: 1.35-3.11), overweight/obese (OR: 2.13, 95% CI: 1.64-3.17), had no medication adherence (OR: 2.98, 95% CI: 1.94-3.32), and had low HL (OR: 2.06, 95% CI: 1.34-2.94). The Hosmer-Lemeshow test resulted as p=0.684. This result revealed the appropriateness of the built multivariate binary logistic regression model in order to predict uncontrolled BP in hypertensive patients. The multivariate binary logistic regression model explain 31.4% of the variance in the dependent variable (Nagelkerke R square: 0.314, Table 3).

Table 3. Multivariate analysis of the factors associated with uncontrolled blood pressure

Variables*	β	SE	OR (95% CI)	p
Age				
≤44			1.00	
45–64	0.452	0.417	1.46 (0.91-3.67)	0.102
≥65	0.758	0.413	1.60 (1.12-2.78)	0.045
Sex				
Female			1.00	
Male	0.724	0.431	2.12 (0.84-3.35)	0.154
Education level				
Secondary school or higher			1.00	
Primary school or less	0.835	0.316	1.72 (1.41-2.71)	0.038
Perceived health level				
Good			1.00	
Moderate	0.627	0.328	1.77 (0.85-3.82)	0.149
Poor	0.706	0.640	2.04 (0.94-3.27)	0.120
Comorbidities				
No			1.00	
Yes	0.954	0.412	2.09 (1.42-3.11)	0.041
Smoking				
Non-smoker			1.00	
Current smoker	0.898	0.314	2.40 (1.35-3.11)	0.038
Physical activity				
Yes			1.00	
No	0.564	0.396	1.76 (0.91-2.78)	0.320
BMI				
Underweight/ normal weight			1.00	
Overweight/obese	0.785	0.381	2.13 (1.64-3.17)	0.044
Medication adherence				
Yes			1.00	
No	1.218	0.313	2.98 (1.94-3.32)	0.025
General HL				
High			1.00	
Low	0.752	0.395	2.06 (1.34–2.94)	0.033

*Variables included in the logistic regression model: Age, sex, education level, perceived health level, comorbidities, smoking, physical activity, BMI, medication adherence, and general HL. Hosmer-Lemeshow test: p=0.684, Nagelkerke R square: 0.314

DISCUSSION

Uncontrolled BP can lead to serious consequences, including higher rates of morbidity and mortality. In this study, the prevalence of uncontrolled BP was calculated as approximately 70%. In the Prospective Urban and Rural Epidemiological study conducted in 2013, the prevalence of uncontrolled BP was reported as approximately 67% in developing countries (18). Similarly, it is reported that the prevalence of uncontrolled BP is higher in developing countries like Pakistan (78%) and Iran (69%) (19, 20). Recent studies conducted in Turkey have reported that the prevalence of uncontrolled BP varies approximately 30% (3). The WHO's Global Action Plan for the Prevention and Control of Non-Contagious Diseases 2013-2020 aims to reduce premature mortality caused by chronic illnesses at the rate of 25% until 2025 (21). When considering that hypertension is one of the most important risk factors for premature mortalities, these results indicate that control of BP is one of the primary problems to be examined in developing countries.

Similar to the results in our study, other studies have consistently revealed that older age and higher BMI are associated with poorer hypertension control (8, 22). The reason for failure to control BP in elderly patients may be associated with the fact that hypertension is not aggressively treated in this age group. In the literature, it is reported that the prevalence of uncontrolled BP is higher in those suffering from comorbidities, which is compatible with this study (23). Uncontrolled BP in patients suffering from comorbidities may be associated with multiple drug use, side effects of drugs, or nonadherence to treatment.

Some studies indicate that low education level is a risk factor for uncontrolled BP (8, 22), which is consistent with this study. Some others suggest no association between education level and control of BP (24). Smoking is responsible for approximately 25% of mortalities associated with cardiovascular diseases in adults. Smoking cessation is an essential component of the comprehensive management of patients with hypertension (25). In this study, smoking was determined as a risk factor for control of BP.

In patients with hypertension, nonadherence is an important and often unrecognized risk factor that contributes to the reduced control of BP (12). In this study, the rate of nonadherence to medication was calculated as approximately 24%, and the lack of medication adherence was determined as one of the most important risk factors for uncontrolled BP. Coinciding with studies in the literature, this result makes us realize the necessity to urgently plan interventions for increasing medication adherence in primary healthcare institutions (26).

In the study, it was determined that almost more than three out of four patients had low HL. In the HLS-EU study conducted in Europe, it is reported that low HL levels vary between 29% and 62% (15). In two national studies conducted in Turkey, it was stated that the rate of the participants with low HL level was 65% and 53%,

respectively (27, 28). The studies have showed that HL is associated with cognitive skills like finding, understanding, and interpreting knowledge, and HL increases in parallel with education level and decreases with increasing age (27, 28). Higher level of low HL in this study compared to studies in Turkey may be associated with the fact that a great majority of patients are involved in the advanced age group or have low education level.

Strategic Plan prepared by the Ministry of Health in Turkey involves the goal of "improving health literacy to increase responsibility of individuals for their own health" (29). Studies for determination of HL level by the Ministry of Health in Turkey to reach this goal are conducted, and programs such as HL Trainer Training Program and HL Distance Education Certificate Program are implemented.

Education seminars on HL are provided for patients and their relatives at the hospitals and students at primary education schools (29, 30). In this study, it was determined that almost 77% of adults with hypertension had low level of HL. This result suggests the necessity of accelerating activities carried out to improve HL in such a way that it covers those with chronic disease in Turkey.

Health literacy increases individuals' abilities of understanding their own health condition, using health-care services, participating in treatment processes, and managing chronic illnesses. It makes them strong enough to take responsibility regarding their own health (31). In the literature, it is reported that individuals with low HL level use health-care services less, and encounter more frequently problems related to inadequate disease management (5). In this study, it was also determined that patients with lower general HL level had the reduced control of BP, and lower HL level was an alterable risk factor for uncontrolled BP. This result supports the results of studies in the literature (32).

Limitation of the Study

This is a cross-sectional study, and therefore the causality cannot be determined. Thus, the results of this study should be interpreted with caution. Other limitations of the study were that it was conducted in a relatively small group, and its results can be generalized to its own population.

Health literacy, medication adherence, and some lifestyle characteristics were measured based on self-reported questionnaires. These participants may report better own HL, medication adherence, and healthy lifestyles than these are. This may have resulted in over-estimation of HL and health characteristics. Other limitations of the study are that other lifestyle changes such as weight loss, moderation in alcohol intake, application of a diet program which play a role in the control of BP, and factors regarding health-care services were not questioned.

CONCLUSION

In this study, it was determined that BP could not be controlled in about three out of four of the patients receiving treatment. This was a high and remarkable rate, and it suggested that there were qualitative or quantitative insufficiencies in the follow-up of patients. Smoking, overweight/obesity, medication nonadherence, and low HL were found to be alterable risk factors for uncontrolled BP.

Accordingly, sufficient number and quality of patients with hypertension should be followed up by the primary health-care institutions. At each follow-up, these patients should be evaluated for risk factors of uncontrolled BP. Interventions should be planned by the primary health-care provider to reduce or eliminate changeable risk factors such as smoking, overweight or obesity, and medication nonadherence in patients in terms of uncontrolled BP. In addition, primary health-care organization should evaluate the level of HL of patients during follow-ups. Intersectoral cooperation should be provided, and training programs should be conducted to increase the level of HL.

Ethics Committee Approval: Ethics committee approval was received for this study from Balıkesir University Faculty of Medicine Clinical Research Ethics Committee (22.03.2017-2017/25).

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Conceived and designed the experiments or case: KTS, YM. Performed the experiments or case: KTS, YM, TA. Analyzed the data: KTS, YM. Wrote the paper: KTS, YM, TA. All authors have read and approved the final manuscript.

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