



# The Effect of Mindfulness Level on Drug Adherence in Hypertension Patients

## Hipertansiyon Hastalarında Bilinçli Farkındalık Düzeyinin İlaç Uyumuna Etkisi

✉ Pınar ŞEN GÖKÇEİMAM<sup>1</sup>, ✉ Esra AYDIN SÜNBLÜ<sup>1</sup>, ✉ Tuba GÜÇTEKİN<sup>2</sup>, ✉ Murat SÜNBLÜ<sup>2</sup>

<sup>1</sup>*Istanbul Erenköy Mental and Nervous Diseases Training and Research Hospital, Clinic of Mental Health and Diseases, Istanbul, Turkey*

<sup>2</sup>*Marmara University, Pendik Training and Research Hospital, Clinic of Cardiology, Istanbul, Turkey*

### ABSTRACT

**Aim:** The effect of mindfulness levels of hypertensive patients on drug adherence was studied.

**Materials and Methods:** Hypertensive patients between the ages of 18 and 65 years, who gave their consent to participate in the study, were literate and had been using antihypertensive drugs for at least one year, were included in the study. Those who had mental retardation and/or mental disease that prevented filling the scale were excluded from the study. It is a cross-sectional and descriptive study. Socio-demographic data form and the Mindful Attention Awareness scale (MAAS) and Modified Morisky Adherence scale were applied to the participants.

**Results:** Drug adherence of the patients with a low mean age was found to be low. There was no significant difference between the groups in terms of drug compliance when it was examined in terms of gender, education level, employment status and marital status. In those with a family history of hypertension, the rate of low drug adherence was significantly higher compared to the rate of medium-high drug adherence, there was no statistically significant difference in drug adherence scores in terms of hypertension duration of disease. The mean MAAS scores were significantly higher in those with medium- high drug adherence.

**Conclusion:** Our study results provide evidence that drug adherence was low in the hypertensive patient group and there was a significant relationship between mindfulness and adherence. As in other chronic diseases, it is vital to increase drug adherence in hypertensive patients and to increase the level of mindfulness affecting drug adherence for this purpose. Our study data will raise awareness for clinical interventions in this area.

**Keywords:** Hypertension, mindfulness, drug adherence

### ÖZ

**Amaç:** Çalışmada hipertansiyon hastalarının bilinçli farkındalık düzeylerinin antihipertansif ilaç uyumuna olan etkisi araştırılmıştır.

**Gereç ve Yöntem:** Çalışmaya katılmaya onam veren kişilerden okur yazar olan, en az bir yıldır antihipertansif kullanıyor olan 18-65 yaş aralığındaki hipertansif hastalar çalışmaya dahil edilmiştir. Ölçek doldurmayı engelleyecek düzeyde mental yetersizliği ve/veya mental hastalığı bulunanlar çalışma dışında bırakılmıştır. Kesitsel ve tanımlayıcı bir araştırmadır. Katılımcılara sosyo-demografik veri formu, Bilinçli Farkındalık ölçeği (BFÖ) ve Modifiye Morisky Tedavi Uyum ölçeği uygulanmıştır.

**Bulgular:** Yaş ortalaması düşük olan hastaların ilaç uyumu düşük olarak saptandı. Cinsiyet, eğitim düzeyi, çalışma durumu ve medeni durum açısından bakıldığında gruplar arasında ilaç uyumu açısından anlamlı fark yoktu. Ailesinde hipertansiyon öyküsü olanlarda ilaç uyumunun düşük olma oranı orta-yüksek olma oranına kıyasla anlamlı şekilde yüksekti. İlaç uyumu skorlarında hipertansiyon hastalığının süresi açısından istatistiksel açıdan anlamlı bir fark yoktu. BFÖ skor ortalamaları ilaç uyumu orta-yüksek olanlarda anlamlı şekilde daha yüksekti.

**Sonuç:** Çalışma sonuçlarımız hipertansif hasta grubunda ilaç uyumunun düşük olduğu, farkındalık ve uyum arasında anlamlı bir ilişki olduğu yönünde kanıt sunmaktadır. Diğer kronik hastalıklarda olduğu gibi hipertansiyon hastalarında da ilaç uyumunun artırılması, bu amaçla ilaç uyumunu etkileyen farkındalık düzeyinin artırılması hayati önem arz etmektedir. Çalışma verilerimiz bu alanda yapılacak klinik müdahaleler için farkındalık oluşturacaktır.

**Anahtar Kelimeler:** Hipertansiyon, bilinçli farkındalık, ilaç uyumu

**Address for Correspondence:** Pınar ŞEN GÖKÇEİMAM MD, Erenköy Mental and Nervous Diseases Training and Research Hospital, Clinic of Mental Health and Diseases, Istanbul, Turkey

**Phone:** +90 505 409 03 40 **E-mail:** dr\_psen@hotmail.com **ORCID ID:** orcid.org/0000-0001-5228-3784

**Received:** 30.06.2021 **Kabul tarihi/Accepted:** 15.03.2022

## INTRODUCTION

Hypertension is the most important preventable cause of morbidity and mortality globally, yet there are relatively few data collected using standardized methods. The aim of hypertension therapy is to reduce the mortality rate and prevent hypertension-related diseases such as cerebral hemorrhage, stroke and ischemic heart disease by managing blood pressure (BP). However, despite advances in the prevention and treatment of hypertension, the percentage of people with high or uncontrolled BP is high<sup>1</sup>.

Assuming clinically valid BP values, the two main factors contributing to the control of hypertension in treated patients are the prescription of adequate numbers and doses of BP medications and treatment adherence. Suboptimal adherence to treatment is also associated with a variety of target organ changes associated with a greater risk of cardiovascular events, including vascular stiffness, left ventricular hypertrophy, and microalbuminuria. Besides, suboptimal adherence is associated with many adverse cardiovascular events such as acute coronary syndromes, stroke, transient ischemic attack, and chronic heart failure, and mortality<sup>2</sup>.

Long-term chronic diseases such as hypertension are often associated with progressive reductions in therapy over months and years<sup>3</sup>. Adherence with pharmacotherapy for hypertension is typically reported, 50% after one year from baseline<sup>4</sup>.

Contemporary pharmacological treatment strategies are insufficient in some individuals, and there may be patients who cannot achieve results in the treatment of hypertension, as in other chronic diseases, due to many factors that may be directly or indirectly related. Up to the present, with the cooperation of cardiology and psychiatry, psychiatric drugs have also played an important role in the treatment of hypertension. With this pharmacological treatment approach, it is aimed to eliminate the direct biological effects of pathological mood in BP regulation. However, the point where psychiatry has reached shows that in many patients, only the pharmacological approach is insufficient, it is necessary to treat the patient with psychotherapeutic interventions, poor lifestyle that causes the continuation of high BP, breakage of treatment resistance and drug incompatibility. Lifestyle changes alone or in combination with pharmacological therapy are usually sufficient to achieve BP control<sup>5</sup>.

Although complementary behavioral therapies for BP control are not a substitute for conventional therapy, they can be evaluated for their potential to reduce BP. Stress reduction through meditation is a potentially important non-pharmacological therapy that can both reduce polypharmacy and improve BP control<sup>6</sup>. As it is known, the main effect of stress and depression is acute or chronic sympathetic

nervous system activation that leads to the development of hypertension in susceptible individuals or worsening of BP levels if they are already hypertensive. An easily accessible, low-cost and reproducible technique such as mindfulness can reduce this pathology and the resulting organ damage<sup>7</sup>. Adding mindfulness-based strategies to the pharmacological treatment management of hypertensive individuals may contribute to BP control both directly and indirectly through lifestyle changes and increased drug adherence.

The aim of this study is to examine the effect of conscious awareness levels on drug compliance in patients with hypertension. To the best of our knowledge, there is no other study in the literature examining the effect of individuals' mindfulness levels on drug adherence. While we re-discuss the importance of multidimensional approach together with pharmacotherapy in hypertensive patient management with mindfulness, we hope that the results will accelerate mindfulness-based approaches in the clinical management of hypertensive patients.

## MATERIALS AND METHODS

The study is a cross-sectional and descriptive study and it was conducted with 68 hypertensive patients who were consecutively included in the study from individuals who were admitted to a university hospital cardiology outpatient clinic, met the research criteria, and gave written consent to participate in the study. Ethics committee approval was obtained from Marmara University Faculty of Medicine Clinical Research Ethic Committee (number: 09.2019.414, date: 05.04.2019) to conduct the study. The Helsinki Declaration Principles were complied with at every stage. Patients with hypertension, who were between the ages of 18 and 65 years, who were literate and gave consent to participate, who had received anti-hypertensive treatment for at least one year were included in the study. Those who had a mental retardation and/or mental disease that would hinder interview and filling the scale were excluded from the study. The evaluation of the clinician who performed the examination and the patient's statement regarding a previous diagnosis were taken into consideration in determining the mental status of the patients. Socio-demographic data form and the Mindful Attention Awareness scale (MAAS) and Modified Morisky Adherence scale (MMAS) were applied to the participants.

**Socio-demographic Data Form:** It is a form containing sociodemographic data prepared by the researchers in a content suitable for the purpose of the study.

**The MAAS:** The scale was developed to measure attention and awareness skills in daily life<sup>8</sup>. It is used to evaluate individual differences in being able to focus attention on the time lived and the body, not the past or the future. It consists of 15 items

in total. It is a 6 point Likert type scale. Turkish adaptation study has been done<sup>9</sup>.

**The MMAS:** The original Morisky scale provides sufficient information on drug use habits. However, it was seen insufficient about the continuity of drug use during the long-term treatment of chronic diseases. Besides, the questionnaire was not designed to classify the knowledge and motivation levels of the patients. It contains questions answered as yes and no. As a result, the MMAS was developed with the addition of two new questions<sup>10</sup>. The Turkish validity and reliability study of the scale was conducted<sup>11</sup>.

### Statistical Analysis

Statistical analyses were performed using Statistical Package for the Social Sciences 20.0 statistical package for Windows. Continuous data were expressed as mean±standard deviation or median (minimum-maximum), while categorical data were presented as number of patients and percentage. The chi-square test was used for the comparison of categorical variables, while the Student's t-test or Mann-Whitney U test was used to compare parametric and nonparametric continuous variables, respectively. Normal distribution was assessed by the Kolmogorov-Smirnov test. Multivariate logistic regression analysis was performed to determinate the predictors of MMAS. A value of  $p < 0.05$  was considered statistically significant.

### RESULTS

Sixty-eight patients diagnosed with hypertension were included in the study. Socio-demographic characteristics are shown in Table 1. The mean age of the participants was  $58.6 \pm 11.7$  years; 70.6% ( $n=48$ ) of them were male. Only 32.3% of them had high school and above education level. The mean MAAS score was  $48.2 \pm 16.3$ . According to MMAS, drug adherence was low in 70.6% ( $n=48$ ) of the group.

Comparison of demographic and clinical data of the study population by MMAS scores is given in Table 2. The mean age of the patients with low drug adherence was statistically significantly lower than that of those with medium-high drug adherence ( $p=0.01$ ). No statistically significant difference was found between the two genders in terms of drug adherence ( $p=0.945$ ). Regarding drug adherence in terms of educational status, employment status, and marital status, there was no significant difference between the groups with low and medium-high drug adherence ( $p=0.241$ ,  $p=0.123$ ,  $p=0.221$ ). Considering drug adherence in patients with comorbid cancer, those with high adherence were significantly higher ( $p=0.006$ ). The rate of low drug adherence was significantly higher in those with a family history of HT compared to the medium-high rate ( $p=0.011$ ). There was no statistically significant

difference in drug adherence scores in terms of HT duration ( $p=0.665$ ). The mean MAAS scores were significantly higher in those with medium-high drug adherence ( $p=0.004$ , Figure 1).

The determinants of drug adherence in HT patients are shown in Table 3. Mindfulness was found to be an independent predictor according to age, family history of HT and MAAS results ( $p=0.002$ ,  $p=0.019$ ,  $p=0.005$ , respectively).

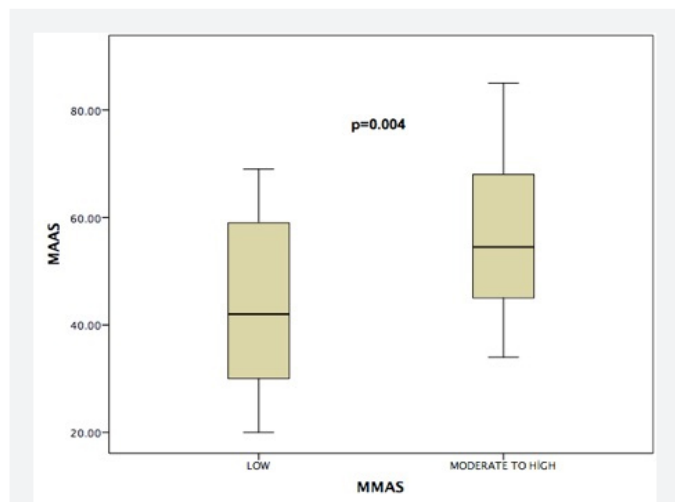
### DISCUSSION

Studies investigating the effect of mindfulness-based approaches on treatment adherence in hypertensive patients have been included in the literature in recent years<sup>6,12</sup>. Treatment adherence is an important problem in chronic diseases. There are many studies in the literature investigating the drug adherence of hypertensive patients<sup>13</sup>. It was reported that adherence to hypertension pharmacotherapy was below 50% one year after initiating the medication<sup>4</sup>. Studies have reported higher levels of drug non-adherence in hypertensive patients with uncontrolled BP<sup>13,14</sup>.

**Table 1. Baseline characteristics and clinical data of study population (n=68)**

Age (years)	58.6±11.7
Sex (male %)	48 (70.6)
Education status (n %)	
Literate	14 (20.6)
Primary school	20 (29.4)
Middle school	12 (17.6)
High school	16 (23.5)
University	6 (8.8)
Working status (n %)	
Working	24 (35.3)
Not working	16 (23.5)
Retired	24 (35.3)
Disabled retired	4 (5.9)
Married (n %)	60 (88.2)
Living with nuclear family (n %)	50 (73.5)
Diabetes mellitus (n %)	26 (38.2)
Coronary artery disease (n %)	28 (41.2)
Pulmonary disease (n %)	8 (11.8)
Psychiatric disease (n %)	4 (5.9)
Malignancy (n %)	4 (5.9)
Family history of hypertension (n %)	54 (79.4)
Family history of other medical condition (n %)	30 (44.1)
Duration of hypertension (years)	12.4±9.5
Mindful Attention Awareness scale	48.2±16.3
Morisky Medication Adherence scale	
Low	48 (70.6)
Moderate-high	20 (29.4)

In a study investigating the predictors of low drug adherence in the treatment of hypertension, it was found that 36.6% of the patients had good drug adherence<sup>15</sup>. In line with the



**Figure 1.** Comparison of MAAS and MMAS  
 MMAS: Morisky Medication Adherence scale, MAAS: Mindful Attention Awareness scale

literature, it was found that 70.6% of our patient group had low drug adherence in our study. It can be thought that the fact that hypertension is a chronic disease and that it is difficult to use drugs for a lifetime reduces adherence with drug therapy. Considering that the mean duration of hypertension in our patient group was 12.4±9.5, the concept of disease and treatment was not new for our patient group, and it was assumed that they were informed about the course of the disease and possible complications during this period; however, the treatment adherence was still poor.

Factors related to drug adherence have been the subject of many studies in the literature<sup>16,17</sup>. In a study, it was stated that the level of adherence was not dependent on gender, that the level of adherence increased with the age of the patient, and that there was no statistically significant relationship between drug adherence and education level<sup>17</sup>. Another study found that low drug adherence in hypertensive patients was associated with advanced age<sup>18</sup>. This may be related to factors such as decreased cognitive flexibility and the need to use medication for a longer period of time. There are also studies which found that young patients have lower medication adherence compared to older patients<sup>15,19</sup>. Similar to these studies, in our

Table 2. Comparison of baseline characteristics and clinical data of the study population according to Morisky Medication Adherence scale			
	Low (n=48)	Moderate to high (n=20)	p value
Age (years)	55.7±11.5	65.5±9.1	0.001
Sex (male %)	34 (70.8)	14 (70.0)	0.945
Education Status (n %)			
Literate	8 (16.7)	6 (30.0)	0.241
Primary school	12 (25.0)	8 (40.0)	
Middle school	10 (20.8)	2 (10.0)	
High school	14 (29.2)	2 (10.0)	
University	4 (8.3)	2 (10.0)	
Working status (n %)			
Working	20 (41.7)	4 (20.0)	0.123
Not working	10 (20.8)	6 (30.0)	
Retired	14 (29.2)	10 (50.0)	
Disabled retired	4 (8.3)	0 (0)	
Married (n %)	44 (91.7)	16 (80.0)	0.221
Living with nuclear family (n %)	34 (70.8)	16 (80.0)	0.553
Diabetes mellitus (n %)	16 (33.3)	10 (50.0)	0.198
Coronary artery disease (n %)	18 (37.5)	10 (50.0)	0.340
Pulmonary disease (n %)	4 (8.3)	4 (20.0)	0.221
Psychiatric disease (n %)	4 (8.3)	0 (0)	0.312
Malignancy (n %)	0 (0)	4 (20.0)	0.006
Family history of hypertension (n %)	42 (87.5)	12 (60.0)	0.011
Family history of other medical condition (n %)	24 (50.0)	6 (30.0)	0.130
Duration of hypertension	12.7±10.5	11.6±6.8	0.665
Mindful Attention Awareness scale	44.6±15.3	56.8±15.5	0.004

**Table 3. Logistic regression analysis to determinate the predictors of MMAS**

	Odds ratio	95% Confidence interval	p value
Age	1.105	1.036-1.178	0.002
Family history of hypertension	6.443	1.352-30.702	0.019
MAAS	1.076	1.023-1.133	0.005

MMAS: Morisky Medication Adherence scale, MAAS: Mindful Attention Awareness scale

study, it is observed that the drug adherence of those with a low average age is lower than those with a high average age. This may be due to the fact that younger patients take the disease or possible complications less seriously than the elderly. The fact that younger patients are likely to be more intense in activities of daily living and have more responsibilities may also be another factor that impairs drug adherence.

There are studies showing that women with resistant hypertension have more drug non-adherence than men<sup>20</sup>. In a study conducted with ischemic heart patients; women's belief in treatment and adherence was found to be better than men<sup>21</sup>. Another study found that young active men and the elderly with cognitive deficits were at high risk for drug non-adherence<sup>22</sup>. In another study investigating adherence to antihypertensives, it was shown that adherence to treatment was better in women than in men<sup>23</sup>. One study found that poor drug adherence in hypertensive patients was associated with male gender<sup>18</sup>. Considering the results of this study, it is seen that there are conflicting findings in the literature regarding the relationship between drug adherence and gender. In our study, no significant relationship was found between gender and drug adherence. This result may be due to the small sample size in our study. However, the obtained results suggest that gender is not an effective demographic factor on the perception of the severity of the disease and drug compliance.

It is mentioned in the literature that low education level, low income level and unemployment may decrease antihypertensive treatment adherence<sup>19,20</sup>. Contrary to these results, no statistically significant difference was found between drug adherence and education level and employment status in our study. It is particularly striking that no correlation in the same direction was found between education level and drug adherence. This result suggests that accessing information, having more information, and being able to access treatment economically are not sufficient for drug adherence. While it can be predicted that the socioeconomic level has a positive effect in terms of reaching and continuity of drugs, it can be predicted that this will increase drug adherence, our study results indicate that these factors are not effective and/or sufficient. As per our results, individuals with a good education level appear to be at risk for complications as well as those with low levels. When the literature findings and the results of our study are evaluated together, the importance

of the mindfulness of individuals from all ages, genders and sociocultural levels for drug adherence can be understood. One study noted that a higher level of adherence was observed in patients taking longer-term hypertension medications<sup>17</sup>. As the duration of the disease increases, more awareness, being able to internalize the disease, and being exposed to complications may explain this result. However, contrary to this finding, in our study, no statistically significant difference was found in drug adherence scores in terms of disease duration. The fact that adaptation behavior has not developed despite the duration of the disease suggests the presence of other factors that make it difficult to adapt. One of these may be insufficient and/or disabled skills such as mindfulness, attention, organizing, managing time and work consciously, despite having information about the disease and possible risks. Many factors affecting these abilities in chronic diseases should be reviewed and studied. One of these factors may be the presence of comorbid mental and physical diseases. In a study examining the relationship between comorbidity and drug adherence in hypertensive patients, it was found that patients with no or only one comorbid state had more medication adherence than patients with two or more comorbid conditions<sup>24</sup>. According to this result, it can be thought that the number of comorbidities negatively affects drug adherence and the patient has difficulty in managing the current situations together. In a meta-analysis study in which 25 studies were included, it was found that 31.2% of hypertensive patients with comorbidity did not have drug adherence<sup>13</sup>. In one study, the presence of chronic heart failure was associated with low drug adherence<sup>20</sup>. In our study, when we looked at comorbid diseases in hypertensive patients, it was seen that they did not make a difference in terms of drug adherence except cancer. When drug adherence was examined in patients with cancer diagnosis, it was found that those with high adherence were significantly higher than those with low adherence. This result suggests that the higher the motivation to survive, the greater the awareness of drug adherence. The coexistence of another serious illness may be a factor that will increase conscious awareness. One study reported that hospitalization positively affected the treatment adherence process<sup>20</sup>. This result supports our aforementioned view. No data were found in the literature regarding the effect of hypertension in the family on adherence to antihypertensive medications. The result of our study is surprising contrary to what was expected. In our study, the rate of low drug adherence

was significantly higher in those with a family history of hypertension compared to the moderate-high rate. This result also supports our view that having knowledge, knowing the disease and its course may not be a sufficient factor for the development of regular drug use behavior. In one systematic review, age was an independent predictor of decreased systolic BP and diastolic BP values, regardless of technique and method of measuring BP. BP is present as older people may be more motivated to adhere to behavioral interventions in their desire to reduce pharmacological dependence<sup>25</sup>. Age, family history of HT and awareness levels were found to be independent determinants in our study. Potential reasons for low drug adherence, such as forgetting the drug, complicated drug regimen and side effects, are cited<sup>26</sup>. In a study, it was stated that the most important reason for low adherence was forgetting the drug with a rate of 51.4%<sup>15</sup>. Higher levels of depressive symptoms have been associated with low drug adherence<sup>20</sup>. Drug resistance and low drug adherence have been strongly associated with psychological profiles. While basic clinical characteristics were not reliable predictors of drug adherence and treatment resistance, psychological factors were found to be predictors<sup>27</sup>. In some studies conducted with individuals with chronic diseases, it was found that the patient's decision and responsibility for own treatment was directly proportional to better clinical outcomes<sup>28,29</sup>. It was suggested that self-monitoring and self-regeneration of drugs by patients in patients with high cardiovascular risk might help improve BP control<sup>30</sup>. This situation seems to be related to the ability to participate in the treatment effectively and consciously and to maintain it. High level of mindfulness is important in terms of high drug adherence and positive clinical outcomes in chronic diseases. For example, diabetic patients with higher levels of mindfulness have been shown to have higher normal glucose levels. In the study, it was mentioned that the level of mindfulness might be associated with better glucose regulation because it provided a better control<sup>31</sup>. There are publications reporting that mindfulness practice reduces symptoms in medical conditions such as cancer disease<sup>32</sup> and rheumatoid arthritis<sup>33</sup>. Clinically positive results have been reported in studies based on mindfulness in cardiovascular diseases<sup>34</sup>.

In a study conducted in prehypertensive patients who did not receive treatment in recent years, it was found that there was a statistically and clinically significant decrease in BP and BMI after an eight-week mindfulness-based course and this decrease continued for another three months after the interview<sup>7</sup>. It was reported that mindfulness-based interventions could be viewed as preventive and complementary interventions in diabetes mellitus, especially for the relief of symptoms related to depression and anxiety in diabetic patients, and also in the management of other factors, including mindful eating,

physical exercise, and adherence to therapy<sup>35</sup>. To the best of our knowledge, no study has been found in the literature that examines the relationship between the level of mindfulness and drug adherence in hypertensive patients. High MAAS scores in patients with medium-high drug adherence in our study supports our study hypothesis. It can be thought that high awareness enables the forgetfulness factor to be eliminated, to be organized, to be better aware of body sensations, to manage time correctly, and to follow the treatment process consciously. In our study, finding the awareness as per the MAAS scores as an independent predictor for drug adherence is significant. For drug adherence, it is necessary to remember the dosing hours, not to have trouble remembering, not to stop the treatment spontaneously on the assumption that the disease is recovered or the drug is not good without managing the process in cooperation with the physician. It can be said that mindfulness ensures that all components of this process are managed correctly by the patient. In chronic diseases, anxiety or depressive symptoms can be added to the process and may impair drug compliance. Although it was not evaluated in our study, it may be thought that drug adherence increased due to the positive effects of mindfulness on mood.

### Study Limitations

The small sample size in our study is one of our limitations. The fact that the scales used are self-report scales may also have affected the results of the study. In our study, the type and number of antihypertensive patients used were not studied, and the mood of the patients was not evaluated. Drug side effects that may lead to drug incompatibility have not been questioned. Studies in which these factors are also evaluated will contribute to other studies based on awareness.

### CONCLUSION

Our study results revealed that drug adherence was low in the hypertensive patient group, and there is a significant relationship between conscious awareness and drug adherence. Increasing drug adherence in patients with hypertension and increasing the level of mindfulness affecting drug adherence for this purpose is vital. Interventions to increase awareness in hypertensive patients should be noticed, and the patient should be supported in a multidisciplinary system.

### Ethics

**Ethics Committee Approval:** Ethics committee approval was obtained from Marmara University Faculty of Medicine Clinical Research Ethic Committee (number: 09.2019.414, date: 05.04.2019) to conduct the study.

**Informed Consent:** Informed consent was obtained.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Concept: P.Ş.G., E.A.S., T.G., M.S., Design: P.Ş.G., E.A.S., T.G., M.S., Data Collection or Processing: T.G., Analysis or Interpretation: P.Ş.G., M.S., Literature Search: P.Ş.G., E.A.S., Writing: P.Ş.G., E.A.S., T.G., M.S.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

## REFERENCES

1. Chow CK, Teo KK, Rangarajan S, Islam S, Gupta R, Avezum A, et al. Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. *JAMA*. 2013;310:959-68.
2. Burnier M, Egan BM. Adherence in Hypertension. *Circ Res*. 2019;124:1124-40.
3. Lauffenburger JC, Landon JE, Fischer MA. Effect of Combination Therapy on Adherence Among US Patients Initiating Therapy for Hypertension: a Cohort Study. *J Gen Intern Med*. 2017;32:619-25.
4. Hill MN, Miller NH, Degeest S; American Society of Hypertension Writing Group, Materson BJ, Black HR, Izzo JL Jr, et al. Adherence and persistence with taking medication to control high blood pressure. *J Am Soc Hypertens*. 2011;5:56-63.
5. Mancia G, Fagard R, Narkiewicz K, Redón J, Zanchetti A, Böhm M, et al. 2013 ESH/ESC Guidelines for the management of arterial hypertension: the Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *J Hypertens*. 2013;31:1281-357.
6. Hughes JW, Fresco DM, Myerscough R, van Dulmen MH, Carlson LE, Josephson R. Randomized controlled trial of mindfulness-based stress reduction for prehypertension. *Psychosom Med*. 2013;75:721-8.
7. Goldstein CM, Josephson R, Xie S, Hughes JW. Current perspectives on the use of meditation to reduce blood pressure. *Int J Hypertens*. 2012;2012:578397.
8. Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. *J Pers Soc Psychol*. 2003;84:822-48.
9. Ozyesil Z, Arslan C, Kesici Ş, Deniz ME. Adaptation of the Mindful Attention Awareness Scale into Turkish. *Education and Science*. 2011;36:224-35.
10. Simpson SH, Johnson JA, Farris KB, Tsuyuki RT. Development and validation of a survey to assess barriers to drug use in patients with chronic heart failure. *Pharmacotherapy*. 2002;22:1163-72.
11. Vural B, Teberu Acar Ö, Topsever P, Filiz TM. Reliability And Validity Of Turkish Version Of Modified Morisky Scale. *The Journal of Turkish Family Physician*. 2012;3:17-20.
12. Nejati S, Zahiruddin A, Afrookhteh G, Rahmani S, Hoveida S. Effect of Group Mindfulness-Based Stress-Reduction Program and Conscious Yoga on Lifestyle, Coping Strategies, and Systolic and Diastolic Blood Pressures in Patients with Hypertension. *J Tehran Heart Cent*. 2015;10:140-8.
13. Abegaz TM, Shehab A, Gebreyohannes EA, Bhagavathula AS, Elnour AA. Nonadherence to antihypertensive drugs: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2017;96:e5641.
14. Yassine M, Al-Hajje A, Awada S, Rachidi S, Zein S, Bawab W, et al. Evaluation of medication adherence in Lebanese hypertensive patients. *J Epidemiol Glob Health*. 2016;6:157-67.
15. Gniwa Omezzine R, Akkara A, Abdelkafi Koubaa A, Belguith Sriha A, Rdissi A, Amamou K. Predictors of Poor Adherence to Hypertension Treatment. *Tunis Med*. 2019;97:564-71.
16. Brown MT, Bussell JK. Medication adherence: WHO cares? *Mayo Clin Proc*. 2011;86:304-14.
17. Gavrilova A, Bandere D, Rutkovska I, Šmits D, Mauriņa B, Poplavska E, et al. Knowledge about Disease, Medication Therapy, and Related Medication Adherence Levels among Patients with Hypertension. *Medicina (Kaunas)*. 2019;55:715.
18. Essomba NE, Hamadou B, Kedy Koum DC, Atemkeng A, Coppieters Y. Facteurs de Non Observance au Traitement Antihypertenseur chez les Adultes à Douala. *Health Sci Dis*. 2017;18:51-7.
19. Strauch B, Petrák O, Zelinka T, Rosa J, Somlóová Z, Indra T, et al. Precise assessment of noncompliance with the antihypertensive therapy in patients with resistant hypertension using toxicological serum analysis. *J Hypertens*. 2013;31:2455-61.
20. Irvin MR, Shimbo D, Mann DM, Reynolds K, Krousel-Wood M, Limdi NA, et al. Prevalence and correlates of low medication adherence in apparent treatment-resistant hypertension. *J Clin Hypertens (Greenwich)*. 2012;14:694-700.
21. Dias A, Pereira C, Monteiro MJ, Santos C. Patients' beliefs about medicines and adherence to medication in ischemic heart disease. *Aten Primaria*. 2014;46(Suppl 5):101-6.
22. Krousel-Wood MA, Muntner P, Islam T, Morisky DE, Webber LS. Barriers to and determinants of medication adherence in hypertension management: perspective of the cohort study of medication adherence among older adults. *Med Clin North Am*. 2009;93:753-69.
23. Qvarnström M, Kahan T, Kieler H, Brandt L, Hasselström J, Bengtsson Boström K, et al. Persistence to antihypertensive drug treatment in Swedish primary healthcare. *Eur J Clin Pharmacol*. 2013;69:1955-64.
24. Ambaw AD, Alemie GA, W/Yohannes SM, Mengesha ZB. Adherence to antihypertensive treatment and associated factors among patients on follow up at University of Gondar Hospital, Northwest Ethiopia. *BMC Public Health*. 2012;12:282.
25. Shi L, Zhang D, Wang L, Zhuang J, Cook R, Chen L. Meditation and blood pressure: a meta-analysis of randomized clinical trials. *J Hypertens*. 2017;35:696-706.
26. Al-Ramahi R. Adherence to medications and associated factors: A cross-sectional study among Palestinian hypertensive patients. *J Epidemiol Glob Health*. 2015;5:125-32.
27. Petit G, Berra E, Georges CMG, Capron A, Huang QF, Lopez-Sublet M, et al. Impact of psychological profile on drug adherence and drug resistance in patients with apparently treatment-resistant hypertension. *Blood Press*. 2018;27:358-67.
28. Foster G, Taylor SJ, Eldridge SE, Ramsay J, Griffiths CJ. Self-management education programmes by lay leaders for people with chronic conditions. *Cochrane Database Syst Rev*. 2007;(4):CD005108.
29. Schrieber L, Colley M. Patient education. *Best Pract Res Clin Rheumatol*. 2004;18:465-76.
30. McManus RJ, Mant J, Haque MS, Bray EP, Bryan S, Greenfield SM, et al. Effect of self-monitoring and medication self-titration on systolic blood pressure in hypertensive patients at high risk of cardiovascular disease: the TASMIN-SR randomized clinical trial. *JAMA*. 2014;312:799-808.
31. Loucks EB, Gilman SE, Britton WB, Gutman R, Eaton CB, Buka SL. Associations of Mindfulness with Glucose Regulation and Diabetes. *Am J Health Behav*. 2016;40:258-67.
32. Zernicke KA, Campbell TS, Specia M, McCabe-Ruff K, Flowers S, Carlson LE. A randomized wait-list controlled trial of feasibility and efficacy of an online mindfulness-based cancer recovery program: the eTherapy for cancer applying mindfulness trial. *Psychosom Med*. 2014;76:257-67.
33. Pradhan EK, Baumgarten M, Langenberg P, Handwerker B, Gilpin AK, Magyari T, et al. Effect of Mindfulness-Based Stress Reduction in rheumatoid arthritis patients. *Arthritis Rheum*. 2007;57:1134-42.
34. Griffiths K, Camic PM, Hutton JM. Participant experiences of a mindfulness-based cognitive therapy group for cardiac rehabilitation. *J Health Psychol*. 2009;14:675-81.
35. Medina WL, Wilson D, de Salvo V, Vannucchi B, de Souza ÉL, Lucena L, et al. Effects of Mindfulness on Diabetes Mellitus: Rationale and Overview. *Curr Diabetes Rev*. 2017;13:141-7.