RESEARCH ARTICLE

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A Cross-Sectional Study of Hypertension Prevalence, Awareness, Treatment, Ratios under Control and Related Factors in Turkish Cypriot Individuals Living in North Cyprus

Ersan Berksel[1], Gülşen Özduran[2,3], Hüseyin Kaya Süer[4], Aslı Aykaç[5]

[1]Department of Nursing, Cyprus Science University Faculty of Health Sciences, Kyrenia, North Cyprus
[2]Department of Nutrition and Dietetics, Near East University Faculty of Health Sciences, Nicosia, North Cyprus
[3]DESAM Research Institute, Near East University, Nicosia, North Cyprus
[4]Department of Infectious Diseases and Clinical Microbiology, Near East University Faculty of Medicine, Nicosia, North Cyprus
[5]Department of Biophysics, Near East University Faculty of Medicine, Nicosia, North Cyprus

Abstract

BACKGROUND/AIMS: With an incidence of more than one billion worldwide, hypertension (HT) is a major cause of premature death. The aim of this study was to evaluate the prevalence, awareness, treatment, and ratios under control of HT and its associated factors among individuals living in North Cyprus.

MATERIALS AND METHODS: Blood pressure, height, and weight measurements were taken when a doctor visited individuals' homes in this cross-sectional study. The socio-demographic characteristics of the individuals, as well as their dietary patterns, daily salt, alcohol and smoking consumption frequencies, whether they had been diagnosed with HT before, and whether they regularly used antihypertensive drugs were investigated in this research.

RESULTS: The prevalence of HT was 34.5%. The prevalence among males (n=200) was 44.4% and the prevalence among females (n=203) was 24.6%. 71.3% of the hypertensive patients were aware and 28.7% of them were unaware of their disease status. 27.3% of the hypertensive patients' blood pressure was under control, and 66.9% of the hypertensive patients were using antihypertensive drugs. 84.8% of the hypertensive patients had a body mass index considered as being overweight or obese. It was determined that 64.7% of the hypertensive patients were fed animal-based foods and 93% of the hypertensive patients whose blood pressure was not under control consumed salt in amounts greater than 6 g/day.

CONCLUSION: It was determined that approximately one-third of adults had HT, approximately one-fourth of HT patients were unaware that they had HT, and only one-fourth of HT patients had their blood pressure under control.

Keywords: Hypertension, prevalence, North Cyprus, body mass index, salt consumption

Address for Correspondence: Gülşen Özduran
E-mail: glsn_ozdrn@hotmail.com
ORCID ID: orcid.org/0000-0001-9406-3165

Berksel et al. Prevalence of Hypertension in the Turkish Cypriot Population

Cyprus J Med Sci 2024;9(3):173-179

INTRODUCTION

The prevalence of uncontrolled hypertension (HT) is a major risk factor for cardiovascular disease and stroke.[1] It is projected that the cardiovascular mortality rate associated with HT will be 23 million by 2030. The fact that individuals are not aware of the existence of their HT or do not receive treatment paves the way for the emergence of preventable or fatal diseases.[2] Therefore, with an early diagnoses of HT, regulating systolic blood pressure (SBP) below 140 mmHg and diastolic blood pressure (DBP) below 90 mmHg and making the necessary life changes are important in terms of preventing cardiovascular complications and deaths.[3] There are differences between countries in study reports on the ratios of awareness, diagnosis, prevalence, treatment, and control of HT. According to the literature, the prevalence of HT is 22.6% in Canada, 29% in the USA, 30% in England, 30.7% in India, and 39.6% in Greece.[4-7]

In parallel with the increase in average life expectancy, the incidence of chronic diseases is increasing, and so the concept of "quality of life" comes to the fore. In addition to the anxiety caused by the thought of living with a lifelong disease, an individual with a chronic disease also experiences physical, psychological, social, and economic problems.[8] Due to all of these changes, the quality of life of this individual and their family are negatively affected. In the control of HT-related diseases, drug use and lifestyle change positively affect the course of the disease.[9] With a consumption of more than 6 grams per day on average, salt is one of the main factors which increases BP. Other factors which increase BP include alcohol and cigarette consumption. A healthy lifestyle for HT patients can be defined as having an ideal body weight, leading an active lifestyle, eating a diet low in salt and saturated fat, and not drinking excessively.[7]

The aim of the study was to evaluate the prevalence, awareness, treatment, and control ratios of HT and its associated factors for the first time among individuals living in North Cyprus.

MATERIALS AND METHODS

Individuals and Study Design

This cross-sectional study was conducted between April and August, 2022 with physicians visiting the individuals' homes. This study was approved by the Ethics Committee of Cyprus Science University (approval number: 2022/12.001, date: 07.12.2022). The individuals who participated in our study are those who are Turkish Cypriots living in North Cyprus and over 18 years of age. 210,121 citizens live in 6 towns and 187 villages. Individuals were randomly selected from 6 towns (n=258) and 16 villages (n=145), taking into account the towns' populations. Those individuals who voluntarily agreed to participate in this study were informed about its purpose and method by the physician, and oral and written consents were obtained from these individuals.

The questionnaire consisted of two parts, the first part consisted of 2 questions (age and gender) about the socio-demographic characteristics of the individuals, and the second part consisted of 6 questions about the patients' attitudes and behaviors regarding HT. In the second part of the questionnaire, in which health behaviors were questioned, the individuals' nutrition model, daily salt consumption amounts, smoking and alcohol consumption frequency, and whether they had ever been diagnosed as HT patients by a doctor before were investigated.

Finally, those individuals who had been previously reported to have HT by their doctor were questioned as to whether they regularly used antihypertensive drugs. The amount of salt consumed daily was determined by using the food consumption frequency questionnaire by looking at the amount and frequency of consumption of foods containing salt. The consumption of foods rich in salt such as bread, olives, cheese, halloumi, pickles, ready-to-eat foods, and dried nuts were investigated.

Anthropometric Measurements

The height of the individuals was measured with a meter placed horizontally on the wall, in the barefoot position, with the heels together and perpendicular to the body in the line of sight of the head. The weight of the individuals without shoes while wearing light clothes was measured using a sensitive weighing scale. The height and weight values of the individuals were measured by the researchers and their body mass index [BMI (kg/m^2)] was calculated from the determined values.

BP Measurement

The individual's BP was measured in a sitting position using a conventional or electronic sphygmomanometer with the arm and heart on a table at the same level. The BP values of the individuals were recorded as the average value which was obtained by using two different BP devices with classical cuffs (Erka Perfect 201 001 02 Aneroid) and electronic (Omron M7 HEM-7361T-EBK). A 5-minute rest period was given between the two BP measurements which were taken by the same person. The initial hearing of Korotkoff sounds were recorded as SBP and their disappearance as DBP. BP measurements of individuals with high BP were measured again after 5-10 min. The blood pressures of the 6 individuals who had high blood pressure were within normal values in the measurements made 5-10 minutes later so the blood pressures of these individuals were accepted as normal. Individuals who expressed nervousness during their BP measurement were excluded from this study.

Definitions

Individuals were diagnosed according to criteria from the Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of Hypertension (JNC-7).[10] HT was defined as SBP ≥140 mmHg and/or DBP ≥90 mmHg.[11]

Based on the guidelines of the Turkish Society of Endocrinology and Metabolism, BMI (kg/m^2) was evaluated as underweight <18.5 kg/m^2, normal=18.5-24.99 kg/m^2, overweight=25.0-29.99 kg/m^2 and obese ≥30.0 kg/m^2.[12]

Statistical Analysis

The processing and evaluation of the data were carried out with the help of a computer using IBM SPSS (version 22.0). For descriptive analyses, data were expressed as frequencies and percentages. Pearson's chi-square (χ^2) test was used to find the relationship between categorical variables and the t-test was used to compare continuous variables. BMI was further divided into quartiles and the means of BP indexes (SBP and DBP) were compared by ANOVA. Pearson's correlation was used to find the relationship between BP (SBP and DBP) and BMI. A p-value <0.05 was considered statistically significant.

Cyprus J Med Sci 2024;9(3):173-179

Berksel et al. Prevalence of Hypertension in the Turkish Cypriot Population

RESULTS

Of the 403 individuals in this study, 203 (50.4%) were female, 200 (49.6%) were male, and the gender ratio (male:female) was 1:1.02. The individuals' mean age was 48.3±16.7 years, the males' mean age was 48.7±17.0, and the females' mean age was 47.8±16.5. 37.5% (n=151) of the individuals were in the age range of 18-39, 35.7% (n=144) were in the age range of 40-59, and 26.8% (n=108) were in the age range of 60 years or over. 61.1% (n=246) of the individuals had a BMI considered as being overweight or obese. This ratio was 78.5% (n=157) for males and 43.9% (n=89) for females. 53.6% (n=216) of individuals were smokers and 30.3% (n=122) had never smoked. It was determined that smoking was more common in females than in males (p<0.001). The ratio of smokers for males was 38% (n=76) and 69% (n=140) for females. 30.5% (n=123) had never used alcohol before and 19.1% (n=77) consumed alcohol at least two times per week. When the frequency of alcohol consumption was evaluated by gender, it was found that males consumed alcohol more often than females (p<0.001). The ratio of those who drank alcohol at least 2 days a week in males was 30.5% (n=61) and 7.9% (n=16) in females. When the dietary models of the individuals were questioned, it was determined that 59.6% (n=240) of them consumed animal-based foods. The males were found to consume more animal-based foods than the females (p<0.001). This ratio was 75% (n=150) in males and 44.3% (n=90) in females. The salt daily consumption of 89.3% (n=360) of the individuals was more than 6 grams. This ratio was found to be 88.5% (n=177) for the males and 90.1% (n=183) for the females (Table 1).

The prevalence of HT was 44.4% (n=89) for the males (n=200) and 24.6% (n=50) for the females (n=203) (Table 2). It was found that the prevalence of HT among those aged 18-39 (n=151) was 6.6% (n=10), among those aged 40-59 (n=144), it was 37.5% (n=54), and for those aged 60 or over (n=108), it was 69.4% (n=75) (Table 2). 71.3% (n=99) of hypertensive patients (n=139) were aware, and 28.7% (n=40) were unaware that they had HT, and only 27.3% (n=38) of HT patients had their BP under control. It was determined that 66.9% (n=93) of the HT patients (n=139) used antihypertensive drugs on a regular basis, while 33.1% (n=46) did not use any antihypertensive drugs at all (Table 3).

The individuals' mean SBP measurements were found to be 125.3±19.1. Average SBP was found to be significantly higher in males (129.7±18.2) than in females (120.9±19.1) (p<0.05). It was determined that the mean DBP value of the individuals was 78.7±10.3. DBP averages for males (81.5±10.4) were found to be significantly higher than those for females (75.9±9.3) (p<0.05) (Table 4).

SBP levels were found to rise with age in females and to decrease in males at 70-79, and 80 and over after reaching a peak in the age range of 60-69 years. Males were found to have significantly higher SBP levels than females in the 18-29, 30-39, 40-49, 50-59, and 60-69 age groups (p<0.05 in all groups, Table 4, Figure 1). Males (81.5±10.4) were found to have a significantly higher DBP than females (75.9±9.3) (p<0.05). When DBP levels were compared between gender and age groups, it was found that females had significantly lower BP levels than males in the 18-29, 30-39, 40-49, 50-59, and 60-69 age groups (p<0.05 in all groups, Table 4, Figure 1). The scatter plot showing the relationship between age and SBP and DBP is shown in Figure 2a, b. A significant correlation

Table 1. Distribution of health-related characteristics of individuals according to gender							
Characteristics	Male, (n=200)		Female, (n=203)		Total, (n=403)		p
	n	%	n	%	n	%	
Smoking frequency							
Non-smoker	76	38.0	46	22.7	122	30.3	**<0.001¹***
Smoker	76	38.0	140	69.0	216	53.6	
Ex-smoker	48	24.0	17	8.4	65	16.1	
Alcohol consumption							
Every day	17	8.5	0	0.0	17	4.3	**<0.001¹***
At least two days/week	44	22.0	16	7.9	60	14.9	
Occasionally	99	49.5	104	51.2	203	50.4	
Never	40	20.0	83	40.9	123	30.5	
Salt consumption (g/day)							
6≤	177	88.5	183	90.1	360	89.3	0.354²
6>	23	11.5	20	9.9	43	10.7	
Diet models							
Plant-based foods	50	25.0	113	55.7	163	40.4	**<0.001²***
Animal-based foods	150	75.0	90	44.3	240	59.6	
BMI classification (kg/m²)							
18.5>	0	0.0	10	4.9	10	2.5	**<0.001¹***
18.5-24.99	43	21.5	104	51.2	147	36.5	
25.0-29.99	111	55.5	57	28.1	168	41.7	
30.0≤	46	23.0	32	15.8	78	19.4	

¹Pearson's chi-square test (χ²), ²Fisher's exact test; *p<0.05. BMI: Body mass index.

Berksel et al. Prevalence of Hypertension in the Turkish Cypriot Population

Cyprus J Med Sci 2024;9(3):173-179

was found between SBP (r=0.430, p<0.05) and DBP (r=0.164, p<0.05) with age.

When the relationship between BMI and SBP or DBP was evaluated, it was found that the SBP and DBP of underweight [(109.0±16.9) and (70.3±7.7), respectively] and normal weight [(115.9±14.1) and (74.2±7.8), respectively] individuals were lower than those of overweight [(130.1±17.7) and (81.0±9.5), respectively] and obese individuals [(134.7±21.8) and (83.5±12.2), respectively] (p<0.05 in all groups). The scatter plot showing the relationship between BMI and SBP or DBP is given in Figure 2c, d. A significant correlation was found between SBP (r=0.384, p<0.05) and DBP (r=0.377, p<0.05) with BMI.

DISCUSSION

The prevalence of HT in Greece was 39.6%, it was 35.1% in Pakistan, 31.2% in Türkiye and 30% in England.[13-16] When these ratios were examined, the prevalence of HT was determined to be 34.5% according to our results and this was found to be compatible with the findings of previous studies. When the prevalence of HT was evaluated by gender, different results were reported in the literature. Some study results showed that the prevalence of HT was higher in males, and some study results showed that it was higher in females, while other studies showed that the prevalence was equal in both sexes. In one study in Canada, the prevalence of HT among females was 24.3% and among males, it was 21.7%.[17] In another study conducted in Türkiye, the prevalences of HT in females and males were 36% and 30%, respectively.[18] In a study in Greece, the prevalence of HT in females was 36.5% and in males, it was 42.7%.[16] In another study conducted in Nigeria, unlike other research results, it was determined that the prevalence of HT was equal in both genders.[19] In our study, the prevalence was seen to be 44.5% among males and 24.6% among females. It was determined that the majority of HT patients were males and the prevalence was 1.8 times higher in males than in females. The different prevalences for HT among these

reports may be due to parameters such as age groups, BMI, and the lifestyles (daily salt consumption, alcohol and cigarette consumption) of the individuals included in these studies.

The ratio of those who were aware of their disease was 45% in China,[20] 51.4% in India,[5] 54.7% in Türkiye,[8] 65% in England, 81% in the USA, 83% in Canada[4] and 71.3% in the current study. The ratio of patients receiving medical treatment was 36.2% in China,[20] 47.4% in Türkiye,[8] 51% in England, 74% in the USA, 80% in Canada[4] and 66.9% in our study. The ratios of HT patients who reached the target BP were given as 66% in Canada, 53% in the USA,[4] 11.1% in China,[20] 28.7% in Türkiye,[8] 27% in England[4] and 27.3% in our study - with our result being compatible with the results of the studies conducted in Türkiye and England. One of the most important factors in the low ratio of HT control is the low percentage of awareness of HT. Approximately one-third of HT patients were unaware of their status and did not use any antihypertensive medicine. In addition, there was a lack of adequate antihypertensive treatment.

Age is an important risk factor for HT as its prevalence correlates with increasing age. According to the United States Centers for Disease Control (CDC), the prevalence of HT differs for males and females across all age groups and ethnicities.[21] A significant ratio (45-50%) of hypertensive patients in Türkiye are in the middle age group.[15] According to the results of a study on chronic diseases and their risk factors conducted in Türkiye, it was reported that one out of every three people between the ages of 45-54 had HT.[4] Consistent with previous study reports, our results showed that the prevalence of HT increased with age. In our study, when the prevalence of HT was evaluated according to age groups, almost one out of every three people (37.5%) in the 40-59 age group had HT. In another study conducted upon individuals over the age of 65 in Türkiye, the prevalence of HT was reported to be 67% in males and 82% in females.[20] In our study which was conducted in North Cyprus, similar to the ratios in Türkiye, the prevalence of HT was determined to be 69.4% over 60 years age.

While the unchangeable risk factors for HT include the presence of diabetes and kidney disease, advanced age, and a family history of HT, excessive salt consumption, alcohol consumption, tobacco use, insufficient physical activity and unbalanced/inadequate eating habits are among the risk factors which can be changed.[1] One of the other factors associated with HT evaluated within the scope of this study was

Table 2. Prevalence of hypertension by gender and age groups

		Prevalence of hypertension n (%)
Gender	Male	89 (44.4)
	Female	50 (24.6)
	Total	139 (34.5)
Age groups	18-39 age	10 (6.6)
	40-59 age	54 (37.5)
	60≤ age	75 (69.4)
	Total	139 (34.5)

Table 3. Awareness, drug use, and blood pressure control ratios of hypertensive individuals

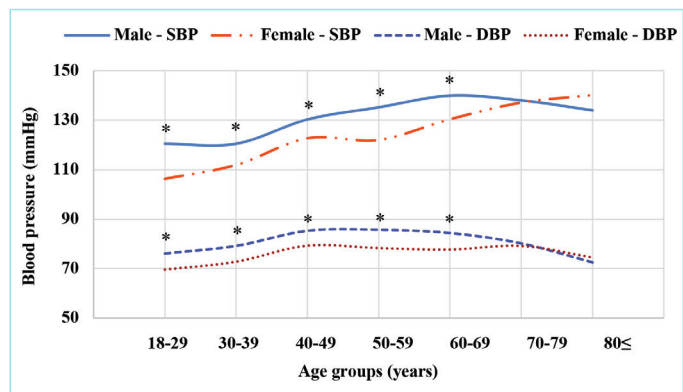| Parameters (n=139)		n	%
Awareness	Aware	99	71.3
	Unaware	40	28.7
Antihypertensive drug use	Yes	93	66.9
	No	46	33.1
BP under control	Yes	38	27.3
	No	101	72.7
BP: Blood pressure.			

Figure 1. Distribution of mean values SBP and DBP measures according to gender and age groups.

Independent samples t-test; *p<0.05; SBP: Systolic blood pressure, DBP: Diastolic blood pressure.

Cyprus J Med Sci 2024;9(3):173-179

Berksel et al. Prevalence of Hypertension in the Turkish Cypriot Population

Table 4. Mean values of SBP and DBP measures according to age groups and gender					
Variables	**Age groups (years)**	**Male, (n=200)**	**Female, (n=203)**	**Total, (n=403)**	**p**
		$\overline{X} \pm SD$ (min.-max.)	$\overline{X} \pm SD$ (min.-max.)	$\overline{X} \pm SD$ (min.-max.)	
SBP	18-29	120.5±12.0 (100.0-147.0)	106.3±9.5 (90.0-128.0)	113.8±12.9 (90.0-147.0)	**<0.001[1]***
	30-39	120.5±12.8 (100.0-160.0)	111.9±15.1 (90.0-170.0)	115.94±14.7 (90.0-170.0)	**0.003[1]***
	40-49	130.3±16.4 (105.0-160.0)	122.7±15.8 (90.0-160.0)	126.0±16.4 (90.0-160.0)	**0.034[1]***
	50-59	135.2±19.5 (100.0-180.0)	122.0±18.9 (100.0-170.0)	130.1±20.2 (100.0-180.0)	**0.013[1]***
	60-69	139.9±18.3 (110.0-180.0)	130.4±13.9 (100.0-160.0)	135.2±16.8 (100.0-180.0)	**0.035[1]***
	70-79	138.0±21.4 (110.0-180.0)	137.1±24.6 (110.0-220.0)	137.5±22.8 (110.0-220.0)	0.912
	80≤	134.0±21.8 (105.0-180.0)	140.1±25.1 (110.0-190.0)	136.8±22.9 (105.0-190.0)	0.578
DBP	18-29	76.1±7.2 (55.0-85.0)	69.6±6.8 (60.0-80.0)	73.0±7.7 (55.0-85.0)	**0.002[1]***
	30-39	79.2±7.3 (70.0-100.0)	72.8±8.1 (60.0-95.0)	75.8±8.4 (60.0-100.0)	**<0.001[1]***
	40-49	85.3±9.5 (60.0-110.0)	79.3±8.0 (60.0-100.0)	81.9±9.1 (60.0-110.0)	**0.003[1]***
	50-59	85.7±12.3 (60.0-120.0)	78.3±9.6 (60.0-100.0)	82.8±11.8 (60.0-120.0)	**0.018[1]***
	60-69	84.4±11.8 (60.0-110.0)	77.7±4.8 (60.0-80.0)	81.1±9.6 (60.0-110.0)	**0.009[1]***
	70-79	80.2±8.6 (65.0-100.0)	79.2±16.3 (60.0-140.0)	79.7±13.0 (60.0-140.0)	0.833
	80≤	72.5±11.8 (60.0-100.0)	74.5±6.7 (60.0-80.0)	73.4±9.5 (60.0-100.0)	0.578

[1]Independent samples t-test, *p<0.05. SD: Standard deviation, min.: Minimum, max.: Maximum, SBP: Systolic blood pressure, DPB: Diastolic blood pressure.

BMI. BMI was found to be higher in HT individuals and there was a linear relationship between HT and BMI.[18] The fact that obesity is a mechanism responsible for HT brings with it the recommendation to reduce the body weight of hypertensive individuals.[22] In our study, a higher ratio of BMI and a higher prevalence of HT were detected in males than in females. CDC data from 2015 to 2018 indicate that there are gender and age-related differences in obesity ratios.[23] The strong correlation between HT and obesity, and the fact that males have a higher BMI than females may be among the factors explaining the higher prevalence of HT in males in comparison to females in our study results.[24]

Since smoking and alcohol consumption also increase BP, they are among the main risk factors for HT.[25-28] In our study, the presence of HT was found to be lower in non-smokers and individuals who had quit smoking when compared to current smokers. Our study results were consistent with the results of other studies in the literature. In the current study, the ratio of hypertensive patients whose BP was not under control and consumed salt over 6 g/daily was 93%.

Since salt consumption is known to be one of the main factors increasing BP, salt restriction, which is recommended in the guidelines as one of the non-pharmacological treatments of HT, is reported to have a BP lowering effect in both normotensive and hypertensive patients. Salt restriction also increases the efficiency of antihypertensive drugs.[29,30] The daily consumption amount is suggested as being less than 6 grams. However, as in many countries, the amount of salt consumed in our country is almost more than twice this rate. The main reason why salt consumption is so high is the high salt content of processed and packaged food products, rather than the salt used on the table.[27,28] In our study, although the dietary models were not fully examined, the dietary models of the individuals were evaluated on the basis of plant and animal food. The foods consumed in the traditional Cypriot diet contain high levels of salt (halloumi, olives, cheese, tsamarella, pickles, kebabs) and/or sugar. They consume these salty foods at breakfast, lunch and dinner. In the traditional diet of Cyprus, people consume grilled meat, pickled meat such as tsamarella (salted goat meat without bones), pickled celery, watermelon and walnut pastes, halloumi and crushed olives.
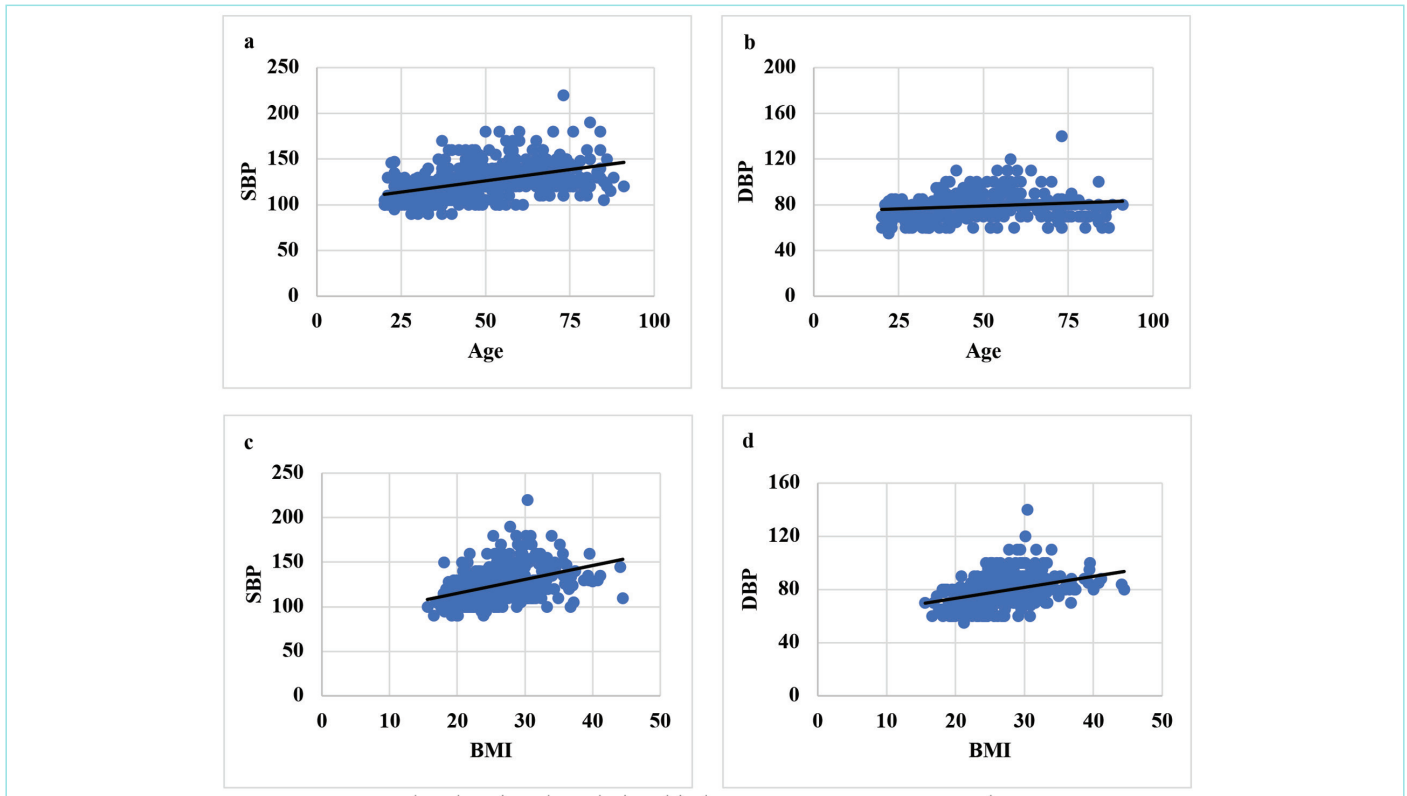
Berksel et al. Prevalence of Hypertension in the Turkish Cypriot Population

Cyprus J Med Sci 2024;9(3):173-179

Figure 2. Scatterplot showing the relationship between age, BMI, SBP and DBP measurements of the individuals.

[a]: (r=0.430, p=0.000[1*]), [b]: (r=0.164, p=0.001[1*]), [c]: (r=0.384, p=0.000[1*]), [d]: (r=0.377, p=0.000[1*]), [1]Pearson's correlation test; *p<0.05; BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure.

Since HT is a life-threatening disease, it is very important to decrease the prevalence of HT. Approximately one-fourth of hypertensive patients are unaware that they have HT and three-fourths of hypertensive patients' BP is not under control. It has been determined that 84.8% of hypertensive individuals are overweight or obese, and 93% whose BP is not under control consume more than 6 grams of salt per day.

Study Limitations

There were some limitations in our study. First, the number of individuals included in this study was limited, the other limitation was that the evaluation of daily salt consumption was carried out without measuring 24-hour urinary sodium excretion leading to an approximation of the consumption as being above or below 6 grams.

CONCLUSION

HT awareness is low in our country, which is similar to the rest of the world. In order to reduce the prevalence of HT, being overweight/obese should be avoided and daily salt consumption should be reduced. HT awareness should be increased for BP control in patients with HT, and lifestyle changes should be implemented effectively in addition to the use of antihypertensive drugs.

MAIN POINTS

- Hypertension awareness is low all over the world and also in North Cyprus.

- The prevalence of hypertension was 34.5% in Turkish Cypriot individuals living in North Cyprus.

- The daily salt consumption of 89.3% of the individuals was more than 6 grams.

ETHICS

Ethics Committee Approval: This study was approved by the Ethics Committee of Cyprus Science University (approval number: 2022/12.001, date: 07.12.2022).

Informed Consent: It was obtained.

Authorship Contributions

Surgical and Medical Practices: E.B., Concept: E.B., H.K.S., A.A., Design: E.B., Data Collection and/or Processing: E.B., Analysis and/or Interpretation: G.Ö., Literature Search: E.B., G.Ö., A.A., Writing: E.B., G.Ö., H.K.S., A.A.

DISCLOSURES

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

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Cyprus J Med Sci 2024;9(3):173-179

Berksel et al. Prevalence of Hypertension in the Turkish Cypriot Population

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