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Original article

YOUNGER HYPERTENSIVE PATIENTS HAVE LOWER HEALTH-RELATED QUALITY OF LIFE AND DIFFERENT HYPERTENSION CORRELATES. EVIDENCE FROM BULGARIA

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ABSTRACT

The purpose of this study was to determine hypertension correlates among the patients' survey characteristics after splitting the sample into two groups based on their age and perform this assessment separately for each of the groups.

Materials and methods. A cross-sectional retrospective study among 647 patients was conducted using self-administered EQ-5D 3L, as well as demographic, economic and health questions.

Results. The overall self-reported arterial hypertension (AH) prevalence was 36.9%. The sample was split into two groups: 18-54 and 55+ years, with AH prevalence of 23.5% and 51%, respectively. The differences between AH and non-AH patients in each age group were explored. Younger AH patients significantly more often reported fatigue, headache, chest pain and having at least 1 acute condition for the last year than non-hypertensive ones at the same age. Diabetes, asthma/chronic bronchitis and joint pain/arthritis were also more common among younger AH patients. The overall HRQol and self-perceived health were significantly lower among young hypertensive patients, and their median severity index was higher compared to non-hypertensive adults of the same age. They more often experienced moderate pain/discomfort and moderate anxiety/depression. Despite of this, older AH patients reported similar HRQoL compared to non-AH patients.

Conclusions. Different comorbidities were found amongst younger and older hypertensive patients. Most of the already known AH correlates were confirmed only among younger adults (18-54 years old). Arterial hypertension leads to significantly lower health-related quality of life, self-perceived health and higher severity index only among the younger group, mainly due to the depression and pain they experience.

Keywords: blood pressure, hypertension, self-reported hypertension, EQ-5D; HRQoL, self-perceived health, epidemiology, preventive cardiology,

INTRODUCTION

Diseases of the circulatory system (International Classification of Diseases [ICD]-10 I00-I99) are the leading cause of death in Bulgaria: 80,000 cases in 2021, which means 1163.2 per 100,000 inhabitants [1]. Arterial hypertension (AH) is pointed as the risk that caused the most death cases in Bulgaria from 2009-2019 [2]. The number of deaths attributable to hypertension per 100,000 inhabitants in the country from all ages and causes is 680, the highest within Europe [3]. Hypertension (ICD-10 I10-I15) is the direct cause of death for 121 per 100,000 inhabitants in 2020 [4].

Arterial hypertension prevalence in Bulgaria is estimated between 29.7% for the population aged 15+, 31.8% for 18+ and 32.7% for 20+ [5-7]. A study in 2014 measured hypertension prevalence by age group, increasing with age: 18.8% for 18-44 years old, 47.8% for 45-64 and 58.9% for aged 65 and above [8]. Recalculating the prevalence resulted in 1.5-1.8 million people suffering from AH in the country. A total of 15% of study participants in 2007 were unaware of their high blood pressure [9]. More than half (52%) of the patients on treatment in 2019 had uncontrolled hypertension [10].

Direct measuring of a patient's blood pressure by the physician may cause phenomena known as white coat hypertension and masked hypertension [11]. This makes identifying AH patients harder.

Obtaining information directly from the patients can be useful in identifying hypertensive patients. Generic health-related quality of life (HRQoL) instruments are widely used not only among the general population but also among patients with specific diseases, including

AH. Additional questionnaires, either validated or not, about patients' health problems could also gather useful information and point the physician to possible hypertension. This is a relatively cheap, painless and easy method for reliable data collection [12].

Arterial hypertension does not have any specific symptoms, and therefore, most patients with high blood pressure are unaware of it [13]. This results in premature deaths and disabilities that could be prevented to some extent.

It is already known that AH is related to diabetes, ischaemic heart disease, haemorrhagic stroke, ischaemic stroke, renal diseases, lung function etc. [13, 14]. In addition, hypertension tends to be related to the economic development of the countries compared to a macro level. Also, the socioeconomic status of the patients is known as a predictor of hypertension development [15, 16]. There might be other correlates of high blood pressure that should be considered in everyday hypertension management and recognition.

Knowing hypertension correlates will draw attention to the cases more likely to develop or already have high blood pressure. Thus, this will help to identify hidden hypertensive patients. Therefore, their treatment initiation will prevent premature deaths and disabilities. In this way, high blood pressure-related disease prevention will start with revealing who might have AH.

The proportion of people with arterial hypertension (AH) is rising worldwide, including among young adults [17, 18]. Arterial hypertension is an age-related disease; its frequency rises with ageing. As the age increases, the proportion of non-hypertensive people decreases, and more hypertensive patients are found while aging [19, 20]. Therefore, the growth in the world's population due to the extended life expectancy caused an additional increase in the number of hypertensive patients. Our hypothesis is that hypertension correlates might differ in different age groups. Thus, checking whether AH correlates separately for younger and older adults is worth checking. In line with this, is it usually expected that AH could be diagnosed among older adults. Therefore it is important to assess AH correlates among those whose age is below the suspected for AH development.

The aim of this study was to determine hypertension correlates among the patients' survey characteristics after splitting the sample into two groups based on their age and perform this assessment separately for each of the groups. We examined patients' health-related quality of life, acute and chronic diseases, the number of visits to different healthcare facilities and some demographic and economic factors.

MATERIALS AND METHODS

Design of the study

The complicated COVID-19 situation and the risk of the virus spreading during data collection motivated us to re-analyse the already collected data. A cross-sectional study among 647 patients was conducted a few years ago during outpatient visits at their family doctor's office. A self-administered pen-and-paper questionnaire was used for data collection. The patients were recruited at 3 different outpatient healthcare facilities in the Yambol region (South-East Bulgaria): one urban in the center of the district, another urban but smaller town (a municipality center) and one rural. All patients visiting their doctor's office were offered to fill out the questionnaire. The sample size was based on the adult population (18 years and above) of the Yambol district. It was calculated for 50% proportion and 4% margin error, a population size of nearly 100,000 and a 95% confidence level. The sample size resulted in 583 persons. Sixty-four persons were added to compensate for possible drop-outs and missing data.

Questionnaire

A three-level version of the EuroQol 5-dimensional questionnaire (EQ-5D 3L) was used as a self-assessment tool for patients' health-related quality of life [21]. A licence for academic purposes was obtained. Since there was no available scoring for the Bulgarian population, the results were scored using the United Kingdom value set [22]. We also calculated the severity index (known as the misery index) ranged from 5 (the best health) to 15 (the worst health) [23]. The Visual-analogue scale (VAS) was transformed into a 5-level question representing respectively 100% (excellent health), 75% (very good health), 50% (good health), 25% (satisfactory health) and 0% (bad health) self-rated health. The scale was changed for better understanding, especially for elderly respondents.

Additional questions related to the type of chronic diseases patients had, the type of acute conditions they experienced, and the number of visits to different healthcare facilities (inpatient, outpatient and emergency department) during the last 12 months were asked. Demographics (sex, age, education) and economic status (occupation, net monthly income, owning a family car, mobile phone, their own income source and money problems) were also collected.

Subjects of the study

The patients' characteristics were reported elsewhere [24-25]. The median age of the subjects was 52.5 years, ranging from 18 to 88 years old. Two-thirds were females (66%). Nearly half (49.3%) had graduated from high school. Less than half (45.3%) of the participants were full-time occupied; 73.6% have had mobile phone, 53.5% had their own income source, and 31.1% have had

a family car. Money problems were reported by 21.1%, which corresponded to their net monthly income: 70.5% claimed it as less than 500 BGN, which equals 255.6 EUR (BGN is fixed to EUR as 1 BGN=1.95583).

Statistical methods

The results were reported as numbers and percentages for categorical variables, medians and interquartile range (IQR: both 25th and 75th percentile) for continuous variables due to their non-Gaussian distribution. ROC curve analysis was performed to assess the diagnostic significance of a numerical variable. The optimal cut-off point was selected at the minimum absolute difference between sensitivity and specificity. The Mann-Whitney U test was used to compare the average values of the two groups. Pearson chi-squared test (Fisher's Exact test when applicable) was performed to check the relationship between qualitative variables. P-values <0.05 were considered significant. IBM SPSS vs. 22 was used for the analysis.

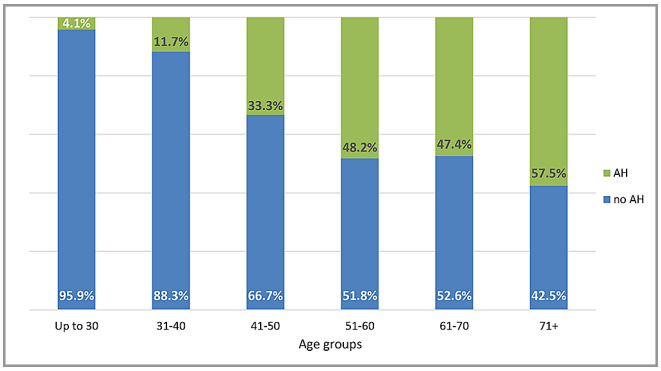
Ethical considerations

The study was designed and conducted in line with the Declaration of Helsinki. All subjects were informed about the design and aims of the study and agreed to participate in the study at the beginning of taking the survey. No identifiable information was collected (e.g., names, date of birth or civil unique identifier). Locally, the medical practices signed a declaration approving the conducting of anonymous surveys among their patients.

RESULTS

The overall self-reported arterial hypertension prevalence was 36.9%. The median age of those who reported AH was 62 years (IQR 51-73) compared to 47 years (IQR 35-62) of those who claimed their blood pressure as normal, p<0.001. The sample was split into 10-year age groups. We observed a rising proportion of arterial hypertension patients with the increase in their age (fig. 1).

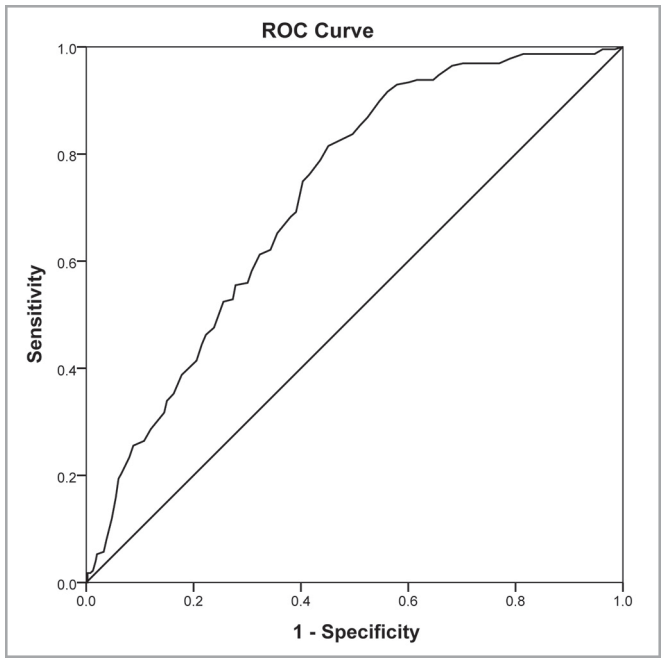
Fig 1. Distribution of AH prevalence by age groups. As age increases, the proportion of non-hypertensive people decreases, and more hypertensive patients are found with their aging.



Age as a predictor of arterial hypertension

We used an ROC curve analysis to determine the predictive ability of age for arterial hypertension development. The age showed to be a good predictor of AH with area under the curve (AUC)=0.721 (95% CI 0.681-0.760), p<0.001. The optimal cut-off point was selected at 55 years old and above, with a sensitivity of 65.2% and specificity of 64.4% (fig. 2).

Fig 2. ROC-curve determines the predictive ability of the age to develop arterial hypertension. The area under the curve is 0.721 (95% CI 0.681-0.760), p<0.001. The optimal cut-off point was selected at 55 years old and above with a sensitivity of 65.2% and specificity of 64.4%.



The sample was eventually split into two groups by their age: 18-54 and 55 and above. AH prevalence among younger patients (18-55 years old) was 23.5% compared to 51.0% among older ones (aged 55 and above). The sample size decreased to 626 persons due to 21 missing cases on their age.

Correlates of arterial hypertension were assessed separately for each of these age groups (tables 1-5).

Comorbidities of the study subjects

Younger AH patients (18-54) significantly more often reported fatigue (35.4% vs 21.8%, p=0.018), headache (53.2% vs 28.4%, p<0.001) and chest pain (27.8% vs 6.6%, p<0.001) for the last year than non-hypertensive ones at the same age (table 1). The prevalence of these conditions among the older group's AH patients was comparatively higher, but significance was not reached (p>0.05). In addition, in both age groups, AH patients significantly more frequently complained of insomnia than non-AH ones (34.2% vs. 10.5%, p<0.001 among younger and 37.8% vs. 22.5%, p=0.005 among older adults). Specific for the younger group is that hypertensive patients significantly more often reported having at least 1 acute

condition for the last 12 months (88.6% vs. 68.5%, p<0.001).

Diabetes (15.2% vs 4.7%, p=0.001), asthma/chronic bronchitis (17.7% vs 4.7%, p<0.001) and joint pain/arthritis (16.5% vs 7.4%, p=0.016) are significantly more common among younger AH patients. The same chronic diseases are equally spread among older adults with and without AH (p>0.05).

Both age groups' hypertensive patients significantly more often have had heart problems/angina (31.6% vs. 2.3%, p<0.001 among younger and 50.7% vs. 29.6%, p<0.001 among older adults). In spite of this, younger AH patients groups significantly more frequently have had at least one chronic disease (64.6% vs. 42.8%, p=0.001), whilst older AH patients less frequently reported this (82.4% vs. 91.5%, p=0.021).

Table 1. Presence of some acute conditions for the last 12 months and chronic diseases among patients with and without AH (separately by age groups), the number and percentage of those who reported the presence of the diseases is shown, % by column

Condition	Age group	No AH		AH		p
		n	%	n	%	
Cold/flu	18-54	54	21.0	16	20.3	0.885
	55+	27	19.0	40	27.0	0.106
Fatigue	18-54	56	21.8	28	35.4	0.018
	55+	60	42.3	68	45.9	0.527
Headache	18-54	73	28.4	42	53.2	<0.001
	55+	49	34.5	62	41.9	0.196
Insomnia	18-54	27	10.5	27	34.2	<0.001
	55+	32	22.5	56	37.8	0.005
Sore throat	18-54	51	19.8	15	19.0	0.867
	55+	16	11.3	28	18.9	0.069
Trauma	18-54	12	4.7	2	2.5	0.406
	55+	14	9.9	6	4.1	0.051
Chest pain	18-54	17	6.6	22	27.8	<0.001
	55+	27	19.0	39	26.4	0.136
Other acute diseases	18-54	6	2.3	4	5.1	0.212
	55+	11	7.7	6	4.1	0.181
Have had at least 1 acute condition for the last 12 months	18-54	176	68.5	70	88.6	<0.001
	55+	132	93.0	133	89.9	0.348
Diabetes	18-54	12	4.7	12	15.2	0.001
	55+	23	16.2	35	23.6	0.113
Asthma/chronic bronchitis	18-54	12	4.7	14	17.7	<0.001
	55+	23	16.2	34	23.0	0.147
Other lung diseases	18-54	2	0.8	1	1.3	0.687
	55+	5	3.5	2	1.4	0.229
Heart problems/angina	18-54	6	2.3	25	31.6	<0.001
	55+	42	29.6	75	50.7	<0.001
Joint pain/arthritis	18-54	19	7.4	13	16.5	0.016
	55+	60	42.3	59	39.9	0.679
Cancer during the last 5 years	18-54	2	0.8	0	0.0	0.432
	55+	2	1.4	3	2.0	0.686
Stomach problems	18-54	29	11.3	11	13.9	0.526
	55+	24	16.9	28	18.9	0.654
Fear, depression, "bad nerves"	18-54	24	9.3	13	16.5	0.077
	55+	14	9.9	24	16.2	0.109
Back pain, lower back pain, sciatica	18-54	40	15.6	17	21.5	0.217
	55+	54	38.0	52	35.1	0.609
Other chronic diseases	18-54	13	5.1	1	1.3	0.140
	55+	16	11.3	9	6.1	0.116
Have had at least 1 chronic disease (excluding AH)	18-54	110	42.8	51	64.6	0.001
	55+	130	91.5	122	82.4	0.021

Furthermore, younger hypertensive patients visited their doctor's office significantly more frequently for the last 12 months than non-hypertensive patients (median 6 vs. 3, p=0.001), table 2. The median number of acute conditions of AH patients was significantly higher in both age groups (2 vs. 1, p<0.001 for 18-55 and 2 vs. 1, p=0.037 for 55+ years old). The median number of their chronic diseases was also significantly greater in the group of AH patients from both ages (2 vs. 0, p<0.001 for younger and 3 vs. 2, p<0.001 for older adults). No significant difference was observed in the average number of visits to the Emergency department and hospital (p>0.05) in both age groups.

Table 2. Average number of visits to different healthcare facilities, acute and chronic diseases among patients with and without AH (separately by age groups)

Number of visits	Age group	no AH		AH		p
		Median	IQR	Median	IQR	
Number of outpatient visits at the doctor's office for the last 12 months	18-54	3	2-7	6	3-12	0.001
	55+	5	3-10	6	3-12	0.227
Number of emergency department visits for the last 12 months	18-54	1	1-3	2	1-2	0.449
	55+	2	1-3	2	1-3	0.224
Number of inpatient visits at a hospital for the last 12 months	18-54	1	1-3	1	1-2	0.827
	55+	1	1-2	2	1-3	0.882
Number of acute diseases for the last 12 months	18-54	1	0-2	2	1-3	<0.001
	55+	1	1-2	2	1-3	0.037
Number of chronic diseases (excluding AH)	18-54	0	0-1	2	1-3	<0.001
	55+	2	1-2	3	2-4	<0.001

Health-related quality of life

The median EQ-5D index was significantly lower among young hypertensive patients compared to non-hypertensive at the same age (0.8 vs. 1, p<0.001), table 3. This indicates worse health-related quality of life. In line with this, we also observed different average levels of their severity index. The median misery index of young hypertensive patients was significantly higher compared to non-hypertensive adults of the same age (7 vs. 5, p<0.001). In addition, we also found a relationship between AH and the overall self-perceived health in the group 18-54 years old (p<0.001). Patients who have had hypertension more often reported worse health (median VAS 50 vs. 75, p<0.001). Despite this, older AH patients' HRQol, severity index and self-perceived health are similar to non-hypertensive adults of the same age (p>0.05).

Hypertensive and non-hypertensive patients in both age groups have similar answers in the areas of mobility, self-care and usual activities (p>0.05). Additionally, younger patients with AH significantly more often experienced moderate pain/discomfort and moderate anxiety/depression than those with normal blood pressure (p<0.05) at the same age, which causes a difference in their overall health-related quality of life. Older adults reported similar levels of pain/discomfort and anxiety/depression in both groups, with and without AH (p>0.05).

Table 3. Average EQ-5D scores; average severity index; distribution of self-perceived health and EQ-5D dimensions among patients with and without AH (separately by age groups), % by column.

HRQoL		Age group	no AH		AH		p
			Median	IQR	Median	IQR	
EQ-5D		18-54	1.0	0.8-1.0	0.8	0.8-1.0	<0.001
		55+	0.8	0.6-0.8	0.8	0.6-0.8	0.302
Severity index		18-54	5	5-6	7	5-7	<0.001
		55+	7	6-9	8	6-10	0.329
Visual-analogue scale (%)		18-54	75	50-100	50	50-50	<0.001
		55+	25	25-50	25	25-50	0.042
			n	%	n	%	p
How can you describe your overall health	Excellent	18-54	72	28.2	1	1.3	<0.001
	Very good		77	30.2	14	17.7	
	Good		71	27.8	49	62.0	
	Satisfactory		29	11.4	13	16.5	
	Bad		6	2.4	2	2.5	

	Excellent	55+	3	2.2	1	0.7	0.266
	Very good		11	8.1	6	4.1	
	Good		52	38.5	50	34.5	
	Satisfactory		60	44.4	72	49.7	
	Bad		9	6.7	16	11.0	
Mobility	No problems	18-54	216	85.0	63	79.7	0.235
	Some problems		36	14.2	16	20.3	
	Confined to bed		2	0.8	0	0.0	
	No problems	55+	57	41.6	51	35.9	0.061
	Some problems		76	55.5	91	64.1	
	Confined to bed		4	2.9	0	0.0	
Self-Care	No problems	18-54	249	98.0	77	97.5	0.924
	Some problems		3	1.2	1	1.3	
	Unable to wash or dress		2	0.8	1	1.3	
	No problems	55+	109	81.3	110	78.0	0.771
	Some problems		23	17.2	29	20.6	
	Unable to wash or dress		2	1.5	2	1.4	
Usual activities	No problems	18-54	234	92.1	70	88.6	0.160
	Some problems		20	7.9	8	10.1	
	Unable to perform usual activities		0	0.0	1	1.3	
	No problems	55+	86	63.7	83	60.1	0.832
	Some problems		42	31.1	47	34.1	
	Unable to perform usual activities		7	5.2	8	5.8	
Pain/ Discomfort	No pain or discomfort	18-54	173	67.8	29	36.7	<0.001
	Moderate pain or discomfort		70	27.5	44	55.7	
	Extreme pain or discomfort		12	4.7	6	7.6	
	No pain or discomfort	55+	33	24.3	23	16.1	0.196
	Moderate pain or discomfort		84	61.8	94	65.7	
	Extreme pain or discomfort		19	14.0	26	18.2	
Anxiety/ Depression	Not anxious or depressed	18-54	188	74.6	42	53.8	0.001
	Moderately anxious or depressed		59	23.4	35	44.9	
	Extremely anxious or depressed		5	2.0	1	1.3	
	Not anxious or depressed	55+	73	54.9	71	52.6	0.920
	Moderately anxious or depressed		50	37.6	54	40.0	
	Extremely anxious or depressed		10	7.5	10	7.4	

Demographic and economic factors associated with AH

We supposed that demographics are possible factors in hypertension development; thus, the percentage by the question is shown (% by rows) in Table 4. AH was significantly more frequent among older females compared to older males (55.9% vs. 42%, p=0.027), but no significant difference between both genders was observed among younger patients. AH had a similar distribution among patients with different educational levels among both age groups (p>0.05).

Table 4. Distribution of gender and education among patients with and without AH (separately by age groups), % by row

Demographics		**Age group**	**no AH**		**AH**		**p**
			n	%	n	%	
Gender	Male	15-54	75	72.8	28	27.2	0.330
	Female		181	78.0	51	22.0	
	Male	55+	58	58.0	42	42.0	0.027
	Female		83	44.1	105	55.9	

Education	Primary	15-54	10	62.5	6	37.5	0.139
	High school		141	73.8	50	26.2	
	University or collage		96	81.4	22	18.6	
	Primary	55+	48	42.1	66	57.9	0.218
	High school		65	52.4	59	47.6	
	University or collage		25	53.2	22	46.8	

Our hypothesis was that economic status could be a result of arterial hypertension; therefore, % by column was calculated. Older hypertensive patients were less frequently at full-time occupancy compared to non-hypertensive ones (8.1% vs. 20.4%, p=0.003), table 5. In comparison, younger patients with high blood pressure were significantly more frequently part-time occupied (11.5% vs 4.7%, p=0.029) but less frequently unemployed (2.6% vs 10.2%, p=0.034) and less frequently homemaker/housewife (1.3% vs 8.6%, p=0.026). Additionally, younger people with AH significantly more often experienced disability that prevented them from working (7.7% vs. 2.3%, p=0.026). In line with this, hypertensive subjects from both age groups were significantly more frequently retired without working (3.8% vs. 0.4%, p=0.014 for the younger group and 75.7% vs. 64.1%, p=0.031 for the older adults).

Moreover, younger patients with AH significantly more often have their own or family car. On the contrary, the income distribution among older hypertensive patients showed they had significantly lower net monthly income (p=0.031).

Table 5. Distribution of economic characteristics among patients with and without AH (separately by age groups), % by column

Economic status		**Age groups**	**no AH**		**AH**		**p**
			n	%	n	%	
Occupation	Full time	18-54	188	73.4	60	76.9	0.538
		55+	29	20.4	12	8.1	0.003
	Part-time	18-54	12	4.7	9	11.5	0.029
		55+	3	2.1	4	2.7	0.743
	Unemployed	18-54	26	10.2	2	2.6	0.034
		55+	4	2.8	7	4.7	0.394
	Not working due to disability	18-54	6	2.3	6	7.7	0.026
		55+	9	6.3	7	4.7	0.549
	Retired and not working	18-54	1	0.4	3	3.8	0.014
		55+	91	64.1	112	75.7	0.031
	Retired and working	18-54	2	0.8	0	0.0	0.434
		55+	14	9.9	12	8.1	0.602
	Homemaker/Housewife	18-54	22	8.6	1	1.3	0.026
		55+	10	7.0	10	6.8	0.924
Have had a mobile phone		18-54	216	85.4	71	89.9	0.308
		55+	94	74.0	87	64.9	0.111
Have had own income source		18-54	173	68.4	56	70.9	0.674
		55+	57	44.9	55	41.0	0.531
Have had money problems		18-54	45	17.8	20	25.3	0.141
		55+	29	22.8	40	29.9	0.199
Have had own/family car		18-54	102	40.3	42	53.2	0.044
		55+	32	25.2	24	17.9	0.152
Net monthly income	Less than 240 BGN*	18-54	34	14.8	13	17.1	0.912
	240 - 500 BGN		99	43.0	33	43.4	
	501 - 1000 BGN		70	30.4	23	30.3	
	1001+ BGN		27	11.7	7	9.2	
	Less than 240 BGN	55+	72	52.6	96	67.1	0.031
	240 - 500 BGN		51	37.2	36	25.2	
	501 - 1000 BGN		11	8.0	11	7.7	
	1001+ BGN		3	2.2	0	0.0	

* 1 BGN=1.95583 EUR (fixed rate)

DISCUSSION

The paper aimed to add to the knowledge and understanding of AH in order to help identify hidden hypertensive patients. We assessed hypertension correlates and hypothesised that they might be different among younger and older patients.

Our study's overall self-reported AH prevalence was higher than that measured by the European Health Interview Survey (EHIS). This is probably due to age differences in the samples. Our study covers a population aged 18+, and EHIS includes 15+, resulting in a lower total prevalence [5].

We found higher hypertension prevalence among older (55+) women than older men. EHIS reported similar trends: after a certain age, AH is more common among females [5]. We can speculate that this could be due to menopause and poorer treatment adherence [26, 27, 28]. Ji et al. found higher AH prevalence among younger men, which we were not able to prove [29].

The age distribution in our study is not normal; persons aged 65+ are overrepresented. This discrepancy could be explained by its design: the respondents are recruited in front of their family doctors' offices, where the number of patients of higher ages increases because they seek and need more healthcare services. However, it is expected that AH is more prevalent with ageing, and this observation is in accordance with the published data so far. In addition, the overall AH prevalence measured by our study complies with this.

Hypertension is often called a "silent killer" because its symptoms are not common, not clearly visible and also could be mixed with other diseases [13]. In line with this, we found that younger hypertensive patients (aged 18-54) more often reported fatigue, headache, chest pain, and asthma/chronic bronchitis, which are already known as hypertension symptoms. We also proved that young adults from the sample more often had acute conditions per year and also reported diabetes. Joint pain/arthritis was also more frequently reported by younger hypertensive patients, which is also a known fact [30]. We proved these relationships only among younger AH patients (18-54 years old). Older adults experience the same symptoms regardless of whether they have or do not have arterial hypertension.

We noticed a higher frequency of insomnia among AH patients from both age groups, which is already confirmed as a bidirectional association [31].

AH is a known risk factor for cardiovascular, cerebrovascular and kidney diseases and dementia [31, 32, 33]. The risk is greater in younger patients [34, 35, 36]. We confirmed heart problems/angina and a higher number of acute/chronic diseases among both age groups of AH patients compared to non-hypertensive ones.

Moreover, corresponding with the literature findings, we found anxiety and depressive symptoms more often amongst younger hypertensive persons, who are suspected to have poorer hypertension control [37, 38]. Younger adults with AH more frequently reported pain/discomfort [13]. Thus, this significantly lowered their overall health-related quality of life. In contrast, Zhang et al. proved that hypertensive patients have lower HRQol regardless of their age [39]. Our results confirmed this only among the younger age group.

It is well-accepted that hypertension among all ages leads to disabilities and retirement that retain people from working. Furthermore, we found that hypertension was associated with lower income among 55+ years old. Mills et al. had proven the same at a macro level: developed countries' hypertension prevalence decreased in recent years [15]. Zhou et al. confirmed this at an individual level [33]. Other studies also reported that low socioeconomic status is associated with an increased risk of stroke, other cardiovascular diseases, and hypertension [16, 40]. Our study confirms that: older adults had significantly lower net monthly income and less frequently were full-time occupied. We found that in both age groups, AH patients were more often retired and not working. This puts them at greater risk of more serious AH complications development.

Particular attention should be drawn to younger hypertensive patients. Evidence shows that their hypertension could cause more serious health problems, including worsening their cognitive function at older age [34]. Hypertension influences them much longer and, therefore, would inflict more serious organ damage compared to older adults. On the other hand, younger AH patients are of working age, and their productivity loss would considerably impact the economy. They also show different correlates of hypertension compared to older ones. The correlates revealed by this study are already known, but the presence of more than 1 of them or more often than usual per year acute conditions should stress the attention of the general practitioner and patients themselves to seek hidden hypertension, especially among younger adults. It is even worth considering self-assessment questionnaire development that could help identify unknown hypertension. In line with this, early hypertension detection and treatment initiation could save lives prevent disabilities and higher healthcare costs.

Strengths and limitations of the study

The detected hypertension rate and the prevalence of other diseases and conditions are self-reported. We did not verify the statement; it is the patient's own perception of whether they have or don't have these health problems. EHIS is also based on self-reported prevalence. We could only speculate the proportion of hidden hypertensive persons and how many of those reported normal blood pressure actually have optimal blood pressure [41]. However, this approach to patients reported outcomes is validated and brings valuable information for the spread of AH.

The study design is cross-sectional and retrospective; therefore, causal relationships cannot be proved. However, the results confirmed known relationships and compared their frequency between younger and older patients.

The study did not analyse essential risk factors for arterial hypertension, such as obesity, smoking, drinking, dietary habits, physical activity, etc. However, their relationship with AH is well-known and proven [11]. In addition, we retrospectively re-analysed the data that had already been collected and could not change the survey design.

CONCLUSION

Different comorbidities were found amongst younger and older hypertensive patients. Most of the already known AH correlates were confirmed only among younger adults (18-54 years old). Arterial hypertension leads to significantly lower health-related quality of life, self-perceived health and higher severity index only among the younger group. Both age groups' socioeconomic status is worsened due to AH.

Abbreviations

AH - arterial hypertension
AUC - area under the curve
EHIS - European Health Interview Survey
EQ-5D 3L - the three-level version of the EuroQol 5-dimensional questionnaire
HRQol - health-related quality of life
ICD - International Classification of Diseases
IQR - interquartile range
VAS - Visual-analogue scale

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