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## Knowledge influence on the adaptation to pharmacological recommendations of patients with arterial hypertension

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### Abstract

Arterial hypertension is a chronic condition that currently affects about 32% of Poles and increases annually. The main factors conditioning the success of treatment is patient-doctor cooperation and adaptation to therapeutic recommendations.

Aim of the study was to assess the impact of knowledge on the adaptation to pharmacological recommendations of patients with hypertension.

The study involved 102 patients with hypertension. Survey consisted of 38 self-prepared questions and Morisky Medication Adherence Scale (MMAS) and Hypertension Knowledge - Level Scale (HKLS).

The group of patient was dominated by people with low levels of adherence. The average level of adherence was reached by 34% of respondents, and the high level was 30%. Women showed a higher level of adherence than men. Patients with low levels of adherence were significantly less likely to have a self-control diary than patients with medium and high

levels ( $p=0.040$ ). The higher level of adherence is, the more participants agree to the dates of medical appointments. Patients with a high level of adherence never gave up on any of the hypertension drugs. Weakness, as a symptom of too low pressure, was more often mentioned by patients with a high level of adherence than patients with a low level. Patients with medium-level adherence mentioned stroke as a complication of hypertension significantly less frequently than others.

The influence of adherence level on hypertensive patients has: gender, keeping a self-control diary, compliance appointments, weakness as a symptom of too low pressure, stroke as a complication of hypertension. There was no significant difference in the level of knowledge of arterial hypertension in groups of patients with different levels of adherence.

**Key words:** arterial hypertension, adherence, compliance

## **Introduction**

Hypertension is one of the chronic diseases and increases the risk of cardiovascular complications, which rarely lead to death. The incidence of this disease is still growing. Currently in Poland about 32% of the population suffers from this disease. According to forecasts, in 20 years, hypertensive people will constitute 50% of the population [1]. Difficulty with adherence (doctor-patient cooperation) and compliance (compliance with therapeutic recommendations) in hypertension result from patient and also medical personnel. [2]. To adherence and compliance in the relationship between patient and health care in hypertension were correct, several recommendations should be followed. First of all, the patient should be involved in the therapeutic process. This means the ability to make decisions, conduct self-examination and systematic visits to the doctor and control tests. The patient should be informed about the necessity of treatment for the rest of their lives, non-pharmacological treatment parallel to the medication being taken, as well as possible malaise after the inclusion of antihypertensive drugs. The treatment needs to be clear and possibly memorized by the patient [3, 4].

## **Aim of the study**

The main aim of this study was to assess the knowledge impact to adapt to pharmacological recommendations of patients with arterial hypertension. The specific objectives are as follows:

1. Determine which of the socio-demographic and clinical features have an impact on adaptation to pharmacological recommendations.
2. Determine if patients' knowledge affects adaptation to therapeutic recommendations.
3. Determination of the level of adherence and compliance in hypertension.

## **Materials and methods**

The research was carried out from September 2015 to March 2016. The study group consisted of 102 patients hospitalized due to arterial hypertension at the University Clinical Hospital in Wroclaw in the Clinic of Angiology, Hypertension and Diabetology. The consent for the study was issued by the Bioethical Commission of the Wroclaw Medical University (permission number: KB 136/2015).

Tool used to conduct the research was a questionnaire consisting of three parts. The first part of the authorship questionnaire (38 questions, including 13 open questions) contained the following questions: socio-demographic, patient's adaptation to treatment, as well as the scope of patient knowledge about the disease entity, which is arterial hypertension. Subsequent parts are the questionnaire was Morisky Medication Adherence Scale (MMAS-8-ITEM), which gives the opportunity to evaluate the cooperation and compliance with therapeutic recommendations and Hypertension Knowledge - Level Scale (HK-LS).

Additionally, the analysis of medical records determining the patient's clinical condition and date about disease basis on the medical history was taken into account.

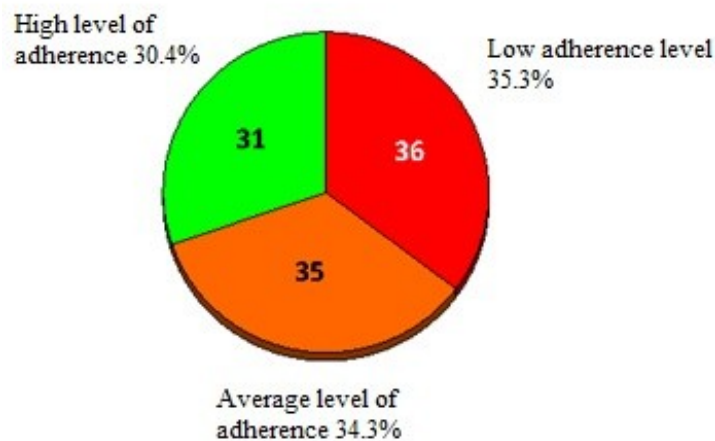
The questionnaire was anonymous, and the participation of patients was voluntary. Before receiving the questionnaire, patients were informed about the objectives of the research, anonymity as well as that resulting data will be used only for scientific purposes. All surveyed patients were instructed how to complete the questionnaire. Some patients, who are unable to independently complete a questionnaire, require assistance. At this time, questions were read and respondents' comments were recorded. The inclusion criterion for the study was the age above 18 and consent, voluntary participation in the research. The calculations were made using the computer program STATISTICA v. 10 PL and the EXCEL spreadsheet.

## Results

The questionnaire survey included 102 patients, including 57 women (55.9%) with hypertension aged 24 to 86 years (mean 61 years, SD  $\pm$ 10 years).

The level of adherence (compliance with pharmacological recommendations) was determined using the MMAS-8-Item questionnaire (Morisky Medication Adherence Scale). Patients who obtained less than 6 points in the MMAS questionnaire were included in group 1 (low level of adherence). Group 2 (average level of adherence) included patients who scored from 6 to 7.75 points. In group 3 (high level of adherence) there were patients who obtained 8 points [Fig. 1].

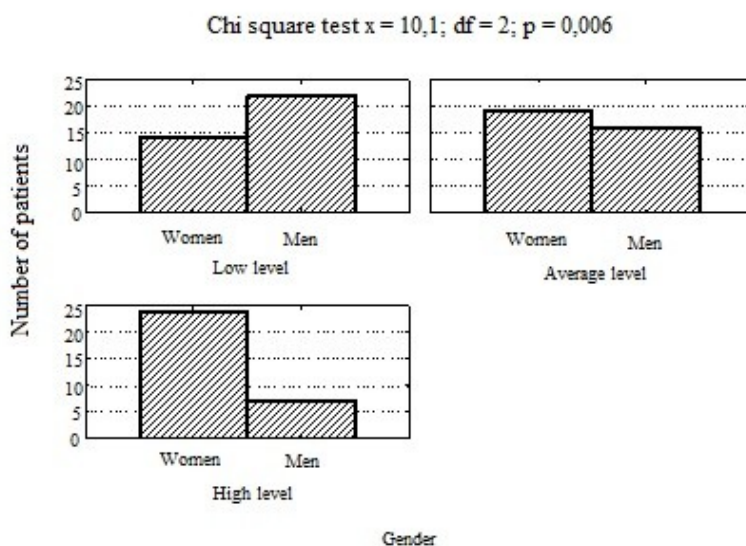
*Figure 1. Adherence structure of the examined patients.*



**Table 1.** Gender of patients in subgroups with different levels of adherence and results of comparisons.

Gender	Adherence level (MMAS-8)								Chi square test <i>p</i>
	All <i>N</i> = 102		Group I Low <i>n</i> = 36		Group II Average <i>n</i> = 35		Group III High <i>n</i> = 31		
	n	%	n	%	n	%	n	%	
Women	57	55.9	14	38.9	19	54.3	24	77.4	<b>0.006</b>
Men	45	44.1	22	61.1	16	45.7	7	22.6	

**Figure 2.** The number of patients in subgroups with different levels of adherence and gender and the chi-square test result



There was a statistically significant ( $p < 0.01$ ) relationship between the level of adherence and the gender of patients. Women showed a higher level of adherence than men [Tab. 1, Fig. 2].

**Table 2.** Age of patients in subgroups with different levels of adherence and result of variance

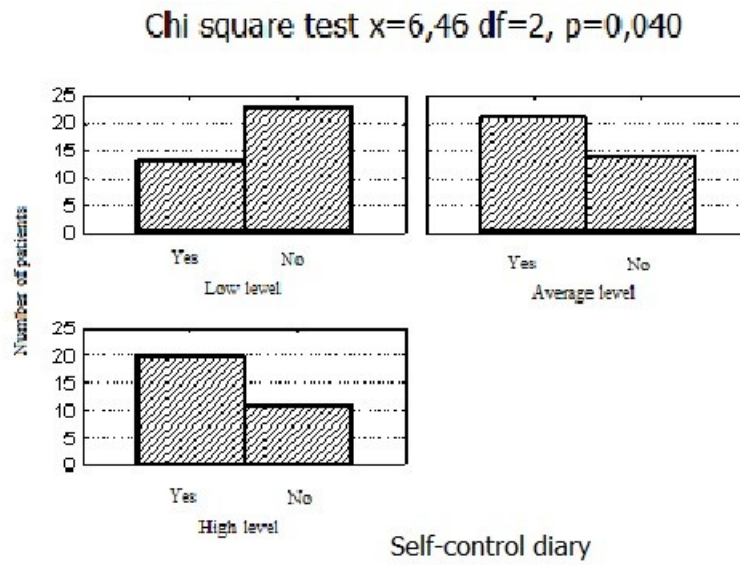
Age	Adherence level (MMAS-8)				ANOVA
	All	Group I	Group II	Group III	<i>p</i>
		Low	Average	High	
	<i>N</i> = 102	<i>n</i> = 36	<i>n</i> = 35	<i>n</i> = 31	
<i>M</i> ± <i>SD</i>	61.6 ± 14.7	62.9 ± 15.9	59.4 ± 15.8	62.5 ± 12.1	0.561
<i>Me</i> ( <i>Q</i> <sub>1</sub> ; <i>Q</i> <sub>3</sub> )	64 (54;71)	63 (55;71)	63 (48;72)	66 (55;70)	
<i>Min</i> – <i>Max</i>	27 - 91	28 - 91	27 - 87	27 - 80	

The level of adherence is relatively higher in people with low and high acceptance levels depending on their age, but the differences were not statistically significant ( $p > 0.05$ ). In the group of patients with high adherence, the average age was  $62.5 \pm 12.1$ , and in the group with low adherence level  $62.9 \pm 15.9$ . The age of the group with average disease adherence was the lowest and was  $59.4 \pm 15.8$  [Tab. 2].

**Table 3.** Having a self-control diary in subgroups of patients differing in the level of adherence and the result of chi-square independence

Do you have a self-examination diary?	Adherence level (MMAS-8)								Chi square test
	All		Group I		Group II		Group III		<i>p</i>
	<i>N</i> = 102		Low		Average		High		
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%	<i>N</i>	%	
Yes	54	52.9	13	36.1	21	60.0	20	64.5	<b>0.040</b>
No	48	47.1	23	63.9	14	40.0	11	35.5	

**Figure 3.** Number (proportion) of patients in subgroups with different levels of adherence and having a self-control diary and chi-square test result.



Patients with low levels of adherence were significantly less likely to have a self-monitoring diary than patients with medium and high levels ( $p < 0.05$ ) [Tab. 3, Fig. 3].

**Table 4.** Symptoms of under-pressure mentioned by patients in subgroups with different levels of adherence and chi-square independence test

If you know the symptoms of too low pressure, please replace them:	Adherence level (MMAS-8)								Test $\chi^2$ <i>P</i>
	All <i>N</i> = 102		Group I Low <i>n</i> = 36		Group II Average <i>n</i> = 35		Group III High <i>n</i> = 31		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Edema	8	7.8	3	8.3	1	2.9	4	12.9	0.314
Headache	35	34.3	15	41.7	11	31.4	9	29.0	0.502
Weakness	15	14.7	2	5.6	4	11.4	9	29.0	<b>0.020</b>
Dizziness	9	8.8	4	11.1	3	8.6	2	6.5	0.797
Bad mood	4	3.9	1	2.8	1	2.9	2	6.5	0.785
Apathy	9	8.8	4	11.1	4	11.4	1	3.2	0.420
Somnolece	5	4.9	2	5.6	1	2.9	2	6.5	0.776
Fainting	8	7.8	3	8.3	2	5.7	3	9.7	0.829
Dark in front of my eyes	5	4.9	2	5.6	2	5.7	1	3.2	0.874
Poor visual acuity	39	38.2	14	38.9	14	40.0	11	35.5	0.927

The percentages in table 4 do not add up to 100, because it was possible to mark more than one answer. The most frequently mentioned symptom of low blood pressure was poor visual acuity of 38.2%, headache 34.3% and weakness of 14.7%. With the exception of weakness no statistically significant relationship was found between adherence level and the mentioned symptoms of hypotension ( $p > 0.05$ ). Weakness, as a symptom of too low pressure, was more often mentioned by patients with high levels of adherence than patients with low levels of adherence ( $p < 0.05$ ) [Tab. 4].

**Table 5.** Complications of hypertension exchanged by patients in subgroups with different levels of adherence and chi-square independence test

If you know the complications of hypertension, please replace them:	Adherence level (MMAS-8)								Test $\chi^2$ <i>P</i>
	All <i>N</i> = 102		Group I Low <i>n</i> = 36		Group II Average <i>n</i> = 35		Group III High <i>n</i> = 31		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Stroke	25	24.5	11	30.6	3	8.6	11	35,5	<b>0.023</b>
Myocardial infarction	4	3.9	3	8.3	1	2.9	0	0	0.199
Edema	5	4.9	3	8.3	0	0	2	6.5	0.238
Blurred vision	6	5.9	2	5.6	2	5.7	2	6.5	0.987
Eye diseases	3	2.9	2	5.6	1	2.9	0	0	0.406
Varicose veins	8	7.8	2	5.6	3	8.6	3	9.7	0.806
Kidney disease (insufficiency)	15	14.7	7	19.4	3	8.6	5	16.1	0.418
Ischemic heart disease	40	39.2	11	30.6	14	40.0	15	48.4	0.327
Heart damage	38	37.3	10	27.8	15	42.9	13	41.9	0.342

The percentages in table 5 do not add up to 100, because it was possible to mark more than one answer. The most frequently mentioned complications related to ischemic heart disease (39.2%), heart damage in general (37.3%) and stroke (24.5%). Patients with medium-level adherence mentioned stroke as a complication of hypertension significantly less frequently than others ( $p < 0.05$ ) [Tab. 5].



**Table 6.** Knowledge of side effects of taking drugs by patients in subgroups with different levels of adherent and chi-square test result.

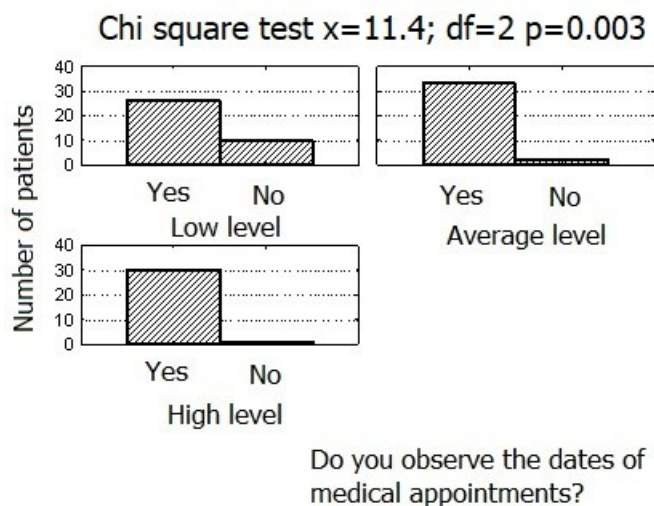
Do you know the side effects of the medicines you are taking?	Adherence level (MMAS-8)								Test $\chi^2$ <i>P</i>
	All		Group I		Group II		Group III		
	<i>N</i> = 102		<i>n</i> = 36		<i>n</i> = 35		<i>n</i> = 31		
	n	%	n	%	n	%	n	%	
Yes	7	6.9	4	11.1	2	5.7	1	3.2	0,421
No	95	93.1	32	88.9	33	94.3	30	96.8	

More than 90% of the patients do not know the side effects of medication. There was no statistically significant association between the level of adherence and the declared knowledge of the side effects of taking drugs ( $p > 0.05$ ) [Tab.6].

**Table 7.** Observance of established dates of medical visits by patients in subgroups with different levels of adherence and result of chi-square independence test

Do you observe the dates of medical appointments?	Adherence level (MMAS-8)								Test $\chi^2$ <i>P</i>
	All		Group I		Group II		Group III		
	<i>N</i> = 102		<i>n</i> = 36		<i>n</i> = 35		<i>n</i> = 31		
	n	%	n	%	n	%	n	%	
Yes	89	87.3	26	72.2	33	94.3	30	96.8	<b>0.003</b>
No	13	12.7	10	27.8	2	5.7	1	3.2	

**Figure 4.** Number (proportion) of patients in subgroups with different levels of adherence and compliance with established dates of medical visits and the result of the chi-square test



It was observed statistically significant relationship between the level of adherence defined by MMAS-8 questionnaire and survey responses to the question about their observance of appointments. The higher is level of adherence the more affirmative answers to the question: “Do you observe the dates of medical appointments?” This relationship is statistically significant ( $p < 0.01$ ). [Tab. 7, Fig. 4]

**Table 8.** Current drugs for hypertension exchanged by patients in subgroups with different levels of adherence and chi-square independence test.

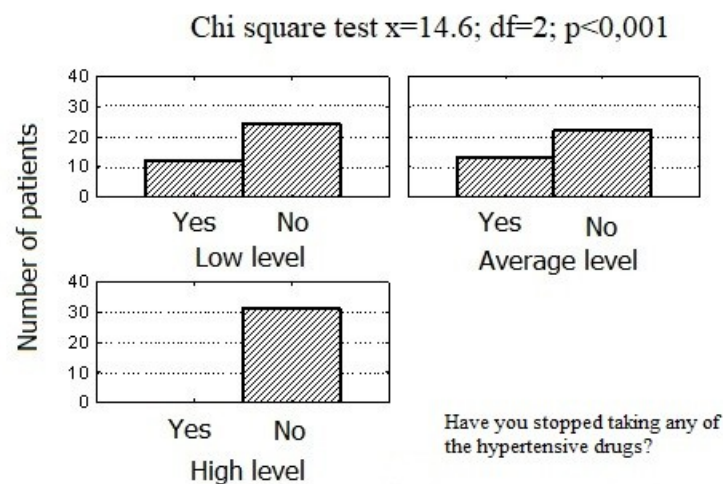
What medicines are you currently taking for hypertension?	Adherence level (MMAS-8)								Test $\chi^2$ <i>P</i>
	All		Group I		Group II		Group III		
	N	%	n	%	n	%	n	%	
Angiotensin converting enzyme inhibitors	58	56,9	22	61,1	18	51,4	18	58,1	0,703
Sartans	19	18,6	8	22,2	6	17,1	5	16,1	0,784
$\beta$ -blockers	33	32,4	9	25,0	12	34,3	12	38,7	0,467
Calcium channel blockers	56	54,9	19	52,8	18	51,4	19	61,3	0,688
Diuretics	61	59,8	17	47,2	26	74,3	18	58,1	0,065
Other antihypertensive drugs	8	7,8	2	5,6	3	8,6	3	9,7	0,806
Aldosterone antagonists	3	2,9	0	0	0	0	3	9,7	<b>0,029</b>

The percentages in table 8 do not add up to 100, because it was possible to mark more than one answer. The most frequent groups of antihypertensive drugs among the hospitalized patients were diuretics (59.8%), angiotensin converting enzyme inhibitors (56.9%) and calcium channel blockers (54.9%). Patients with high levels of adherence received aldosterone antagonists ( $p = 0.029$ ) compared to the other groups. [Tab. 8]

**Table 9.** Interruptions in taking NT drugs by patients in subgroups with different levels of adherence and chi-square independence test

Have you stopped taking any of the hypertensive drugs in the last 6 months?	Adherence level (MMAS-8)								Test $\chi^2$ $p$
	All		Group I Low		Group II Average		Group III High		
	$N = 102$		$n = 36$		$n = 35$		$n = 31$		
	n	%	n	%	n	%	n	%	
Yes	25	24,5	12	33,3	13	37,1	0	0	<b>&lt;0,001</b>
No	77	75,5	24	66,7	22	62,9	31	100	

**Figure 5.** Number (proportion) of patients in subgroups with different levels of adherence and resignation from one of the hypertension drugs and the result of the chi-square



Patients with high levels of adherence never gave up any of the hypertension drugs, in contrast to patients with low and medium levels of adherence ( $p < 0.001$ ) [Tab. 9, Fig. 5].

**Table 10.** Reasons for not taking drugs for hypertension exchanged by patients in subgroups with different levels of adherence and chi-square independence test

What was the reason for not taking drugs?	Adherence level (MMAS-8)								Test $\chi^2$ <i>p</i>
	All		Group I		Group II		Group III		
	<i>N</i> = 102		<i>n</i> = 36		<i>n</i> = 35		<i>n</i> = 31		
	n	%	n	%	n	%	N	%	
They are too expensive	1	1,0	0	0	1	2,9	0	0	0,380
I did not have any symptoms of the disease	5	4,9	3	8,3	2	5,7	0	0	0,278
Drugs cause me to feel bad	6	5,9	1	2,8	5	14,3	0	0	<b>0,030</b>
I take only sometimes	2	2,0	1	2,8	1	2,9	0	0	0,640
I forget to take	7	6,9	3	8,3	2	5,7	2	6,5	0,904
I missed the medicine	6	5,9	4	11,1	2	5,7	0	0	0,156
I cannot get to the doctor for the prescription	5	4,9	2	5,6	2	5,7	1	3,2	0,874
Not applicable	75	73,5	25	69,4	22	62,9	28	90,3	<b>0,033</b>

There was no statistically significant association between the level of adherence and frequent reasons for discontinuation hypertension drugs ( $p > 0.05$ ) except that the drugs cause malaise ( $p < 0.05$ ). Patients with low and medium levels of adherence significantly more often served this reason. [Tab. 10]

Questions from the HK-LS questionnaire can be divided into six subgroups:

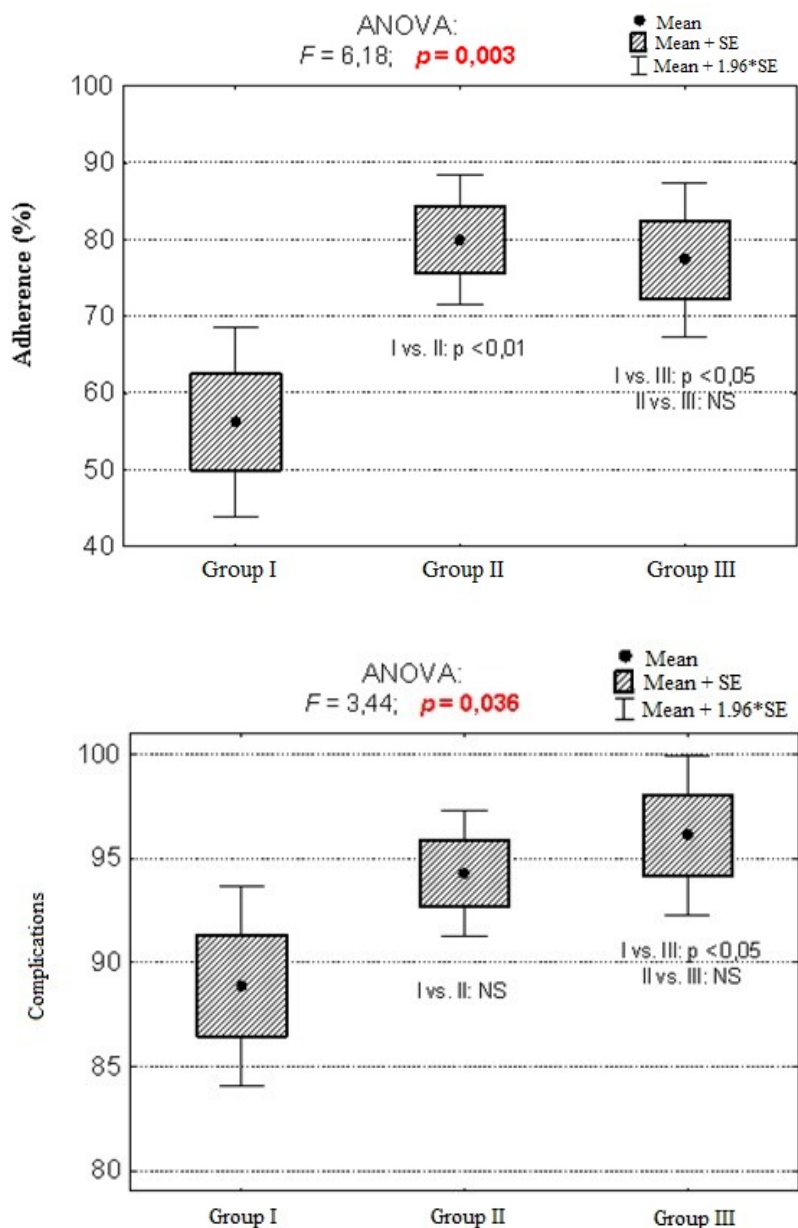
- Definitions - questions 1 and 2;
- Treatment - questions 6, 7, 8 and 9;
- Compliance with medical recommendations regarding medication - questions 3, 4, 5 and 12;
- Lifestyle - questions 10, 11, 13, 16 and 17;
- Diet - questions 14 and 15;
- Complications - questions 18, 19, 20, 21 and 22.

**Table 11.** Statistics ( $M \pm SD$ ) proportion of correct answers regarding the HK-LS question in subgroups of patients differing in adherence levels and the result of variance analysis

Areas of the Knowledge Questionnaire about hypertension (HK-LS)	All N = 102	Group I N = 36	Group II N = 35	Group III N = 31	Test $\chi^2$ p
1. Definitions	90.2 $\pm$ 21.2	93.1 $\pm$ 21.2	87.1 $\pm$ 30.5	90.3 $\pm$ 27.1	0,644
2. Treatment	69.4 $\pm$ 16.5	68.8 $\pm$ 21.9	67.1 $\pm$ 11.8	72.6 $\pm$ 13.5	0,397
3. Compliance with medical recommendations regarding medication (adherence)	70.8 $\pm$ 32.6	56.2 $\pm$ 37.5	80.0 $\pm$ 25.6	77.4 $\pm$ 28.4	<b>0,003</b>
4. Lifestyle	89.2 $\pm$ 14.5	92.8 $\pm$ 10.9	89,1 $\pm$ 14,8	85.2 $\pm$ 17.1	0,101
5. Diet	82.8 $\pm$ 32.6	86.1 $\pm$ 33.0	80.0 $\pm$ 34.7	82.3 $\pm$ 30.4	0,731
6. Complications	92.9 $\pm$ 12.2	88.9 $\pm$ 14.7	94.3 $\pm$ 9.2	96.1 $\pm$ 10.9	<b>0,036</b>

A statistically significant difference in the subgroups with different levels of adherence (MMAS-8) in the level of knowledge assessed using the HK-LS questionnaire was observed in the following areas: "Observing medical prescriptions for drug use" (adherence) and "Complications". [Tab. 11, Fig. 6]

**Figure 6.** Comparison of knowledge about arterial hypertension in the areas of "Adherence" and "Complications" in subgroups of patients differing in the level of adherence (MMAS-8) and the result of variance analysis



**Analysis of Spearman's rank correlations**

Patients from group I (low level of adherence), questions on the questionnaire on arterial hypertension (KH-LS) answered correctly only in 70.8%, significantly statistically less than patients of group II (average level of adherence) ( $p < 0.01$ ) and group III (high level of adherence) ( $p < 0.05$ ). The difference between the groups I and III was found in the KH-LS questionnaire regarding complication ( $p < 0.05$ ). Tables 12 and 13 contain the values of Spearman's rank correlation coefficients ( $\rho$ ) and their significance levels ( $p$ ) between the knowledge level about arterial hypertension assessed using the KH-LS questionnaire and variables from the own questionnaire. For factors (predictors) that significantly correlated

with knowledge, a logistic regression analysis was performed. Table 14 presents the values of logistic regression coefficients (b) and their significance levels.

**Table 12.** The values of Spearman's rank correlation coefficients (*rho*) of analyzed social and demographic features with a high level of knowledge

Variable	Correlation	
	Rho	<i>p</i>
Male	-0.187	0.060
Age	-0.174	0.080
Systolic Blood Pressure	-0.115	0.250
Diastolic Blood Pressure	-0.052	0.604
Professionally active	+0.075	0.540
Lives in a relationship	<b>+0.217</b>	<b>0.029</b>
Body height	-0.113	0.255
Body weight	-0.026	0.791
Body Mass Index	+0.019	0.847
Duration of illness	+0.030	0.766
Classification of hypertension by JNC	-0.093	0.349
Diabetes	+0.065	0.528
Hypercholesterolemia	+0.000	1.000
Ischemic heart disease	+0.072	0.468
Kidney failure	-0.068	0.495
Rheumatic diseases	+0.068	0.495
Current smoking	-0.084	0.397
The number of cigarettes smoked	-0.076	0.762
Years of smoking cigarettes	-0.209	0.402
Pack-years	-0.208	0.406
Frequent alcohol consumption	+0.120	0.226
Controls of cholesterol level	<b>+0.197</b>	<b>0.047</b>
Cholesterol level	<b>-0.196</b>	<b>0.049</b>
Frequency of pressure measurement	-0.057	0.569

The pressure is measured by itself	<b>+0.309</b>	<b>0.002</b>
Has a self-monitoring diary	-0.022	0.823
He takes his medicines directly from the packet himself	-0.078	0.432
He takes medication more than once a day	-0.037	0.709
He uses other forms of treatment than pharmacological	+0.118	0.235
Low-sodium diet	+0.157	0.114
Weight reduction	<b>+0.287</b>	<b>0.004</b>
Moderate physical activity	+0.138	0.165
Limitation of fatty foods	-0.007	0.941
Limitation of alcohol consumption	-0.028	0.778
Limiting smoking	-0.073	0.465
Relaxation techniques	-0.007	0.948
Declared knowledge of the causes of hypertension	<b>+0.372</b>	<b>&lt;0.001</b>
Recognizes symptoms of high / low pressure	+0.097	0.331
He knows the complications of arterial hypertension	+0.118	0.234
He knows the side effects of the medicines he takes	+0.188	0.059
Drugs affect the sexual activity of the patient	+0.157	0.114
Reads information leaflets of taken medicines	+0.178	0.074
It happens that he buys only some of the medicines	-0.060	0.550
He takes only the original medicines	-0.032	0.746
He respects the dates of medical appointments	+0.050	0.616
The number of hospitalizations due to hypertension	+0.136	0.175
Participation in health education regarding hypertension	-0.012	0.907



**Table 13.** Values of Spearman's rank correlation coefficients ( $\rho$ ) of analyzed social and demographic features with a high level of knowledge.

Variable	Correlation	
	Rho	p
He has hypertension drugs with him	<b>+0.272</b>	<b>0.006</b>
The number of hypertensive medications currently being taken	+0.049	0.620
It takes ACE inhibitors	+0.159	0.109
Taking sartans	-0.046	0.644
Taking $\beta$ -blockers	+0.075	0.450
Taking calcium channel blockers	+0.005	0.960
Taking diuretics	-0.097	0.331
Taking other antihypertensive drugs	-0.110	0.269
Taking aldosterone antagonists	+0.120	0.226
Put one of the hypertension drugs in the last 6 months	-0.142	0.154
Adherencja - sum of MMAS-8 points	+0.190	0.057

**Table 14.** Values of logistic regression coefficients ( $b$ ) of socio-demographic features with a high level of knowledge in the one- and multi-factor analysis

Predictors	One-factor analysis		Multivariate analysis	
	$b$	$p$	$B$	$p$
It lives in compound	<b>+0.941</b>	<b>0.030</b>	0	> 0.05
Controls cholesterol	<b>+0.892</b>	<b>0.049</b>	0	> 0.05
Cholesterol level	<b>-0.365</b>	<b>0.034</b>	0	> 0.05
The pressure is measured by itself	<b>+1.658</b>	<b>0.003</b>	<b>+1.776</b>	<b>0.005</b>
Reduces body weight	<b>+1.600</b>	<b>0.006</b>	0	> 0.05
Declares knowledge of the causes of hypertension	<b>+2.010</b>	<b>&lt;0.001</b>	<b>+2.088</b>	<b>&lt;0.001</b>
Has medicines for hypertension with him	<b>+1.220</b>	<b>0.007</b>	0	> 0.05

As a result of multivariate logistic regression analysis, it was found that the independent predictors of a high level of knowledge about arterial hypertension are: declaration of knowledge of the causes of arterial hypertension, and self-measurement of pressure. Other important factors in univariate analysis proved to be insignificant in multivariate analysis. Based on the values of the coefficients b logistic regression equation was derived:

$$\text{High level of knowledge} = -1.302 + 2.088 \times \text{Know the cause of arterial hypertension} + 1.78 \times \text{Isolated measures of BP.}$$

## Discussion

In Poland and in the world, arterial hypertension is one of the major and widespread civilization diseases [1]. Occurrence of a sudden cardiovascular incident, despite a decrease the patient quality of life, results in increased compliance. It mobilizes the patient to take actions that have an impact on reducing the risk of another incident [1]. Systematic therapy reduces the risk of complications up to 40%. The World Health Organization, European and Polish Society for Arterial Hypertension emphasize the essence of patient education and nonpharmacological treatment as the basic methods of management in hypertensive therapy [3].

In the conducted study, the level of adherence of hypertensive patients was defined as low - 35.3%. The average level of adherence was found in 34,3% and high in 30.4%. One of the factors taken into account in the assessment of the level of adherence was the gender of the patients. There was a statistically significant ( $p < 0.01$ ) relationship between the level of adherence and the gender of patient. Women showed a higher level of adherence than men. Gašiorowski in his work reports that women statistically significantly better than men complied with medical recommendations [5]. Pudło in his work also gives the importance of gender. Among the population studied by Pudło women more rarely declared skipping doses of medicines [6]. Basińska and Andruszkiewicz stay in a opposite view because they state that women do not show adherence compared to men [7]. Another opinion have Kurowska and Kuźba, according to which no statistical significance was found in the conducted studies regarding the sex of the respondents [8, 9].

Next factor taken into consideration was age. In the group of patient with high adherence, average age was  $62.5 \pm 12.1$ , and in the group with low adherence to  $62.9 \pm 15.9$ . Age groups with an average adherence of the disease was the lowest and amounted to  $59.4 \pm 15.8$ . The level of adherence is relatively higher in people with low and high acceptance levels depending on their age, but the differences are not statistically significant. Other data is provided by Pudło, because age was important in skipping doses of the drug. The age group of 20-40 years more often admitted to skipping the dose, which may be reflected in professional activity, lack of time and performance of many functions of life ( $p < 0.001$ ) [6]. In the results of Kuźba and Kurowska, the age of the studied population was irrelevant [8,9]. The same is position of factors such as: education, marital status or place of residence. They did not affect the level of adherence of the respondents.

An important factor in the adherence of patients was the knowledge of low-pressure symptoms. The most frequently mentioned symptom was poor visual acuity of 38.2%, headache 34.3% and weakness 14.7%. Weakness associated with the level of adherence and the mentioned symptoms of too low blood pressure ( $p > 0.05$ ). Weakness, as a symptom of too low pressure, was more often mentioned by patients with a high level of adherence than patients with a low level of adherence ( $p < 0.05$ ). Patients should know and be able to recognize the symptoms of under-pressure, because pharmacotherapy may be poorly selected or requires dose reduction despite the failure to achieve optimal blood pressure. All episodes of malaise should be reported to the doctor [8].

The respondents mentioned as the most common complications of hypertension: ischemic heart disease (39.2%), general heart damage (37.3%) and stroke (24.5%). Patients with an average adherence levels mentioned stroke as a complication of hypertension significantly less frequently than others ( $p < 0.05$ ). Suligowska et. al. in her work reports that 2/3 of Poles mention heart disease and stroke as complications of arterial hypertension [10].

An equally important factor affecting the level of adherence were the groups of used antihypertensive drugs. Diuretics (59.8%), angiotensin-converting enzyme inhibitors (56.9%) and calcium channel blockers (54.9%) were the most commonly used medications among hospitalized patients. Aldosterone antagonists were used by only 2.9% of all respondents. Patients with high levels of adherence received aldosterone antagonists ( $p = 0.029$ ) compared to the other groups. According to Prejbisz and Januszewicz in their research about use of an aldosterone antagonist (spironolactone mainly as well as eplerenone) confirmed the efficacy of antihypertensive therapy. Safety of use was also demonstrated in the case of triple therapy for resistant hypertension [11].

In the study group of patients up to 75% of them permanently assumes antihypertensives drugs (without any interruption). Patients with a high level of adherence never gave up of any drug for hypertension as opposed to patients with low and medium levels of adherence ( $p < 0.001$ ). A similar group (70.2%) from the studied population is indicated by Kurowska [8], Lawson (69.4%) [12] and Ślusarska (67%) [13] as persons taking medicines according to indications.

As a reason for discontinuation of drugs, 6.9% of respondents indicate forgetfulness, 5.9% malaise after taking the dose, and the same number of people indicates that they ran out of medicine. There was a statistically significant relationship between the level of adherence and the reason for discontinuation due to malaise ( $p < 0.05$ ). Patients with low and medium adherence levels reported this reason significantly more often. Kocowska's respondents also indicated discontinuation of drugs due to malaise (15.8%) [14]. Pudło, however, states that among his study group, up to 47% of patients in the period of better well-being give up taking drugs or reduce their doses - of course, without consulting a doctor [6]. Too high frequency of drug dosing negatively affects the regularity of intake - 42% of respondents in Pudło research [6]. Unfortunately, it is true that antihypertensive drugs, despite the effect of hypotension, worsen the mood [15, 16]. It is up to the doctor (including the patient's problem) to choose such measures to minimize this problem.

Keeping a self-control diary declared only 53% of responders. Patients with low levels of adherence were significantly less likely to have a self-monitoring diary than patients with medium and high levels ( $p < 0.05$ ). The percentage of people in particular groups looked as follows: with a low adherence only 36% kept self-examination diary, with an average 60%, and with high adherence 65%. There is no data on the essence of keeping a self-study diary in the research of other authors.

The conducted research also confirmed the importance of observing the dates of visits to the doctor, up to 87% of patients are systematically succeeding (according to the set deadlines). In the group with low adherence, only 72% are concerned with the designated appointments, with an average of 94% and with high adherence of 97% of patients in a particular group. In the entire group surveyed in Kocowska regular medical control participated 94% of patients, which is a satisfactory fact [14]. In his work, Matschay mentions a phenomenon called white coat adherence, in which a few days before an appointment with a doctor, patients increase compliance [17].

## Conclusions

1. The influence of adherence level on hypertensive patients has: gender, keeping a self-control diary, compliance with appointments, weakness as a symptom of too low pressure, stroke as a complication of hypertension, use of aldosterone antagonists and reasons for not taking drugs.
2. There was no significant difference in the level of knowledge about arterial hypertension in groups of patients with different levels of adherence.

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