ANNA PACZKOWSKA^{1, A–F}, DOROTA KOPCIUCH^{1, D–F}, ELŻBIETA NOWAKOWSKA^{1, A, C, E, F},
KAROLINA HOFFMANN^{2, B, C, E, F}, WIESŁAW BRYL^{2, A, E, F}

Compliance Among Adolescents with Arterial Hypertension

¹ Department of Pharmacoeconomics and Social Pharmacy, Poznań University of Medical Sciences, Poland

² Department of Internal Diseases, Metabolic Disorders and Arterial Hypertension, Poznań University
of Medical Sciences, Poland

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;
D – writing the article; E – critical revision of the article; F – final approval of article

Abstract

Background. The term “compliance” means the degree to which the patient’s behavior, applying medication or certain lifestyle changes, is consistent with arrangements communicated to him by a doctor or other healthcare professional. Literature indicates that the degree of adherence to medical recommendations for hypertensive patients is unsatisfactory, making it the main cause of the low effectiveness of antihypertensive therapy.

Objectives. The aim of the study was to assess the compliance of adolescents in the field of pharmacological and non-pharmacological methods of hypertension treatment.

Material and Methods. The study included 62 patients (20 women, 42 men) diagnosed with hypertension and treated in specialist healthcare facilities. As a research tool, a questionnaire prepared on the basis of recent literature was used.

Results. The vast majority of respondents (72.7%) declared that they were regularly taking antihypertensive drugs. The proportion of patients regularly taking antihypertensive drugs was higher in patients treated with monotherapy than with polytherapy (48.5% vs. 24.2%).

Among the methods of non-pharmacological treatment of hypertension, the most accepted lifestyle change in the study population was smoking cessation (83.8% of respondents) and reduction of salt consumption (64.5% of respondents), and the least acceptable lifestyle change was maintaining proper body weight by eating a low calorie diet (30.6% of respondents).

Conclusions. Adolescents with hypertension adhere in varying degrees to medical recommendations related to the hypertension treatment. The available literature indicates that the currently effective way to improve cooperation with the patients is education (*Adv Clin Exp Med* 2016, 25, 3, 441–448).

Key words: compliance, arterial hypertension, adolescents.

Hypertension (HTN), due to its high prevalence, poor detection, effectiveness of treatment, and high risk of complications from the cardiovascular system, is an important health, social and economic problem [1].

In recent years, with the progress of civilization and lifestyle changes (consumption of high-calorie and high-salt content foods, and sedentary lifestyle) HTN is increasingly often diagnosed among children and adolescents [2]. The prevalence of HTN (blood pressure above the 95th percentile) among the general population of adolescents aged

11–17 is currently estimated at 3.2% and of prehypertension at 15.7% of the population [3].

One of the most critical elements that decide upon the effectiveness of applied hypertension therapy is compliance of patients with therapeutic recommendations. According to a definition by Haynes, Taylor and Sackett, following doctors’ therapeutic recommendations (compliance, therapeutic compliance, compliance with the treatment) means the level to which the demeanor of patients is consistent with doctors’ recommendations about modifications of a lifestyle, the intake

of prescribed medicines and regular check-up visits to healthcare centers [4]. As stated by numerous authors, in order to normalize the arterial tension value the minimum required level of compliance is 80% [5].

Nowadays there is no effective and easily available method of measuring the level of compliance. The most frequently applied methods are pharmacological, clinical and physical methods. According to several doctors, the easiest method of evaluation of patients' compliance is a medical interview of the doctor with the patient about the regularity of prescribed medicine intake and following recommendations pertaining to modifications of lifestyle (increased physical activity, diet low in calories with a limited amount of sodium, decreased intake of alcohol and quitting the habit of smoking) [6, 7].

Various studies related to the evaluation of compliance among adults suffering from arterial hypertension have been conducted so far. The literature, however, lacks a sufficient number of studies devoted to this topic among patients at the developmental age. Failing to follow doctors' recommendations by patients suffering from arterial hypertension is considered to be one of the major causes of the low effectiveness of treatment of this disease [5]. According to a WHO (World Health Organization) report from 2003, 50% of people with arterial hypertension do not follow doctors' recommendations about regularity of applied pharmacotherapy [8]. The most recent studies by Di Pietro et al. indicate that the level of compliance in terms of the intake of hypertension medicines among children and adolescents with primary hypertension was 75% among the studied patients [9].

As indicated by numerous experts, patients less frequently follow non-pharmacological methods of treatment of hypertension. It stems from a fact that patients are convinced about the higher effectiveness of pharmacological methods in contrast to non-pharmacological methods in terms of normalization of arterial tension [10].

There are several different reasons for the inadequate cooperation of patients with doctors. One may blame not only patients and doctors, but also the healthcare system in a particular country. The most common reasons for the failure to take prescribed medicines result from an overly-complicated system of dosage, the occurrence of side effects and insufficient education of the patients concerning the aim and regularity of medicine intake [11].

Wide scale studies have proved that young people, especially men, professionally non-active people with a low income, people with coexisting diseases which, in their opinion, are more serious than hypertension and patients whose hyperten-

sion therapy has been ineffective so far belong to the group of patients with a low level of compliance in hypertension therapy [10].

The aim of the conducted studies was the evaluation of the level of implementation of therapeutic recommendations in terms of pharmacological and non-pharmacological treatment of hypertension among adolescents.

Material and Methods

Study Population

A prospective study of the evaluation of implementation of therapeutic recommendations included 230 patients consecutively visiting the selected healthcare facility for diagnosis and treatment of diseases, over the time of two years (2011, 2012). Of this group, 62 patients at developmental age (16–18 years old) with diagnosed and treated primary hypertension were included in the study, based on the inclusion and exclusion criteria described below. Each of the eligible study participants, before proceeding to the survey, was informed of the study objective and conditions and gave a written informed consent to participate in the study. The research project received the approval of the local ethics committee.

Inclusion criteria in the study:

- age of 16–18;
- primary hypertension diagnosed according to ICD-10 classification;

- diagnosed HTN treated for at least 3 months;
- patient's consent to participate in the study.

Exclusion criteria in the study were:

- lack of patient's consent to participate in the study;
- age under 16 and above 18;
- pending diagnosis of hypertension;
- diagnosed HTN treated for less than 3 months.

Study Technique

A questionnaire specially prepared for the purpose of this study based on the literature related to this topic has been the major tool of the present study. The questionnaire consisted of 9 questions related to the level of compliance in terms of pharmacological and non-pharmacological treatment of hypertension. Moreover, specific information about patients was collected (age, gender, place of living) and about the course of the disease (duration of the disease, indicators of blood pressure and the type of applied pharmacological treatment).

Results

Characteristics of the Study Group

Table 1 presents specific clinical data about the adolescent group with hypertension. The study group included 62 people (42 male and 20 female) aged 17.04 ± 0.81 years old (Table 1). The average BMI was: 25.41 ± 4.71 kg/m². The average duration time of the disease was: 2.19 ± 1.14 years. The average value of systolic blood pressure for the total population of the patients from the study was 145.13 ± 15.05 mm Hg, and diastolic blood pressure was 89.44 ± 9.33 mm Hg (Table 1).

In the total group of both females and males, the desired level of control of hypertension was achieved by 33.87% of participants (Table 1).

Among the patients included in the study, the vast majority of the group was treated pharmacologically – 53.23% of participants, including monotherapy (60.61% of participants) and polytherapy (39.39% of participants) (Table 1). In the pharmacotherapy of hypertension among adolescents, the most frequently used medicines

were: angiotensin converting enzyme inhibitors (54.54% of participants), beta blockers (36.36% of participants), calcium blockers (30.30% of participants), diuretics (15.15% of participants) and angiotensin II receptor antagonist (12.12% of participants).

The presence of coexisting diseases was confirmed in 24.19% of participants. Dominant diseases were: lipid disorders (12.9%), diabetes type II (4.83%) and bronchial asthma (6.46%) (Table 1).

Statistically significant differences were observed in terms of: the number of population, age and the type of applied hypertension therapy. In the study group with identified and treated hypertension, there were more men (67.74%). Among the women, however, non-pharmacological therapy was applied more frequently compared to the men's group (75% vs. 33.33% of participants) (Table 1).

No statistically significant differences were observed in the context of gender in: BMI, duration of the disease, indicated value of systolic and diastolic blood pressure, percentage of people with controlled blood pressure (< 140/90 mm Hg) and the percentage of people with coexisting diseases (Table 1).

Table 1. Characteristics of adolescents with hypertension (n = 62)

Variables	Total	Men	Women
Number	62	42 (67.74%)*	20 (32.26%)*
Age (years) ($\pm$ SD)*	17.04 ± 0.81	$17.21 \pm 0.75^*$	$16.70 \pm 0.86^*$
Body mass index (BMI) (kg/m ²):			
– total ($\pm$ SD)	25.41 ± 4.71	25.92 ± 4.83	24.32 ± 4.17
– a proper body mass – BMI < 25 kg/m ²	32 (51.61%)	20 (47.62%)	12 (60%)
– overweight – BMI 25–29.9 kg/m ²	17 (27.42%)	13 (30.95%)	5 (25%)
– obesity – BMI $\geq$ 30 kg/m ²	13 (20.97%)	9 (21.43%)	3 (15%)
Duration of the disease (years) ($\pm$ SD)	2.19 ± 1.14	2.31 ± 1.15	1.93 ± 1.08
Systolic blood pressure (mm Hg) ($\pm$ SD)	145.13 ± 15.05	145.52 ± 15.34	144.30 ± 16.18
Diastolic blood pressure (mm Hg) ($\pm$ SD)	89.44 ± 9.33	88.69 ± 9.14	91.05 ± 9.75
Type of hypertension therapy:			
non-pharmacological	29 (46.77%)	14 (33.33%)*	15 (75%)*
pharmacological:	33 (53.23%)	28 (66.64%)*	5 (25%)*
– monotherapy	20 (60.61%)	16 (57.14%)	4 (80%)
– polytherapy	13 (39.39%)	12 (42.86%)	1 (20%)
Controlled blood pressure < 95 percentile	21 (33.87%)	15 (35.71%)	6 (30%)
The presence of coexisting diseases:			
– total	15 (24.19%)	12 (28.57%)	3 (15%)
– lipid disorders	8 (12.9%)	6 (14.28%)	2 (10%)
– diabetes type II	3 (4.83%)	2 (4.77%)	1 (5%)
– bronchial asthma	4 (6.46%)	4 (9.52%)	0 (0)

* – statistically significant differences ($p < 0.05$).

Evaluation of Compliance Among Adolescents with Hypertension

The results of the conducted studies devoted to the evaluation of the level of implementation of therapeutic recommendations related to the regularity of hypertension medicines among adolescents with identified and treated hypertension proved that a vast majority of patients from the study group takes the medicines prescribed by doctors regularly (72.72% of participants). The percentage of patients who follow doctors' therapeutic recommendations about pharmacotherapy was higher in the group of patients using monotherapy (48.48%) than in patients using polytherapy (24.24%) (Table 2).

No statistical significance was observed in the dependence of following doctors' recommendations about pharmacotherapy in the category of gender among adolescents with hypertension ($p = 0.8299$) (Table 3).

The results of the studies devoted to the implementation of doctors' recommendations in terms of the non-pharmacological treatment of hypertension and the controlling measures of blood pressure by adolescents in their home environment indicated a divergent level of following the therapeutic recommendations by patients (Table 4).

Performing regular physical activities (jogging, swimming or riding a bike) was declared by a vast majority of participants – 70.97%. A similar situation was observed in the case of smoking. More than 83% of respondents did not smoke at all (Table 4).

Positive results were observed in terms of limiting the intake of salt in everyday diet, limiting the intake of alcohol and checking blood pressure in the home environment (Table 4).

64.52% of participants tried to limit the intake of salt in their everyday diet. 33.87% of respondents declared a total lack of alcohol intake and 25.81% claimed that they drink it occasionally (a few times a year). Daily checking of blood pressure in the home environment was conducted by 53.23% of participants. 33.87% of them declared blood pressure checks once or twice a week (Table 4).

Applying a low calories diet into everyday diet in order to normalize body mass among overweight and obese people was followed by only 30.65% of participants. It was definitely a negative phenomenon (Table 4).

No statistically significant differences about following non-pharmacological recommendations in the treatment of hypertension and checking blood pressure in the home environment in the category of gender were noted ($p > 0.05$) (Table 4).

Discussion

A focal point of the discussion about chronic diseases that determines the effectiveness of applied therapy is following doctors' recommendations by patients (compliance). The results of the conducted studies devoted to the evaluation of the level of compliance among patients with hypertension proved to be unsatisfactory. This phe-

Table 2. Evaluation of the implementation by adolescents of doctors' recommendations regarding the intake of hypertension medicines depending on the type of pharmacotherapy

Type of hypertension therapy	Compliance		
	percentage of patients not taking medicines regularly (%)	percentage of patients taking medicines regularly (%)	level of statistical significance p^{**}
Monotherapy	12.12	48.48	SI*
Polytherapy	15.15	24.24	
Total	27.27	72.72	

SI* – statistically insignificant; p^{**} – the level of statistical significance, statistically significant differences for $p < 0.05$.

Table 3. Following doctors' recommendations about pharmacotherapy depending on gender in adolescents with hypertension

Following doctors' recommendations about pharmacotherapy	Gender		p
	men (%)	women (%)	
No	11 (26.19)	4 (20.00)	$p = 0.8299$
Yes	31 (73.81)	16 (80.00)	

Table 4. Evaluation of compliance among adolescents in terms of non-pharmacological treatment of hypertension and controlling blood pressure in a home environment

Doctors' recommendations		Men [%]	Women [%]	Level of statistical significance p**	Total [%]
Regular physical activity (at least 2 times a week)	following	64.29	85.00	SI*	70.97
	non-following	35.71	15.00		29.03
No smoking	following	90.48	70.00	SI	83.87
	non-following	9.52	30.00		16.13
Limiting the intake of salt (< 6 g per day)	following	66.67	60.00	SI	64.52
	non-following	33.33	40.00		35.48
Limiting the intake of alcohol (high percentage/ > 2 drinks per day)	everyday intake	0	0	SI	0
	2–4 times a week	11.90	10.00		11.29
	2–4 times a month	26.19	35.00		29.03
	a few times a year, on special occasions	30.95	15.00		25.81
	no intake	30.95	40.00		33.87
Following a low calorie diet	following	28.57	35.00	SI	30.65
	non-following	71.43	65.00		69.35
Checking blood pressure	every day	57.14	45.00	SI	53.23
	1–2 times in a week	30.95	40.00		33.87
	1–2 times in a month	11.90	15.00		12.90
	a few times a year	0	0		0

SI* – statistically insignificant; p** – the level of statistical significance, statistically significant differences for $p < 0.05$.

nomenon is related to the area of the regularity of prescribed medicine intake and modifications of the lifestyle of the patients (non-pharmacological treatment).

In the case of the occurrence of hypertension among adolescents, where overweight and obesity are major phenotypes, non-pharmacological treatment is of paramount importance [12]. A non-pharmacological treatment that is based on modifications of the lifestyle by reduction of body mass, more physical activity, limiting sodium intake, higher intake of fruits and vegetables with a concurrent limitation of saturated fats and fats in general is a basic form of treatment applied for 3 to 6 months in patients with a risk of stage 1 primary hypertension without additional cardio-vascular disorders and coexisting diseases. A lack of hypertensive effect after this period makes it possible to apply pharmacological treatment. It ought to be emphasized that applying pharmacotherapy does not mean that non-pharmacological treatment is over. Both these methods can be considered as crucial elements of hypertension treatment [12].

So far, there have been numerous studies and surveys devoted to the evaluation of the lifestyle of adolescents and their dependence on selected environmental factors and the frequency of occurrence of higher both diastolic and systolic blood pressure [13–15].

From the analysis of the study conducted, one concludes that adolescents with diagnosed and treated hypertension are more willing to follow therapeutic recommendations about the regularity of medicine intake rather than about non-pharmacological methods of hypertension treatment. This observation is consistent with a widespread belief that modifications of lifestyle are more challenging and require from patients great determination and time, which may hamper its effective implementation [16].

Approximately 72.7% of participants from the study group, adolescents suffering from hypertension who underwent pharmacotherapy, declared that they take medicines regularly. The results obtained are consistent with DiPietro [9] study, in which the level of compliance with regular intake

of hypertensive medicines among children and adolescents with primary hypertension equaled 75% of participants. Similar results were obtained in studies by Mears et al. [17], in which, in a general population of children above the age of 10 years old, 75.6% took the medicines regularly.

The vast majority of respondents of the study group (approximately 71%, 43.55% men and 27.42% women) among adolescents with diagnosed and treated hypertension declared performing regular physical activities. Nevertheless, this positive phenomenon proving the implementation of therapeutic recommendations, non-pharmacological treatment of hypertension, did not correspond with the considerable frequency of overweight and obesity among the study group. Similar results were obtained in the study by Singh et al. [14], that aimed to evaluate the occurrence of selected hypertension risk factors among adolescents between the ages of 12 and 18 years, in which 60% of respondents performed physical activities regularly. In the study conducted by Krzych et al. [18], which evaluated the lifestyle of young people (average age – 21) with hypertension, it was noted that regular physical activities were performed by 50% of participants.

The results of the presented studies indicate that, with age, the level of physical activity decreases [19]. Thus, this form of treatment of hypertension should be advised and promoted by specialists among adolescents and young people suffering from obesity and overweight problems.

One of the most disturbing phenomena observed in the study is the problem of drinking alcohol and smoking among adolescents. In the study, regular smoking was declared by 16% of participants, and regular drinking of alcohol (from 2 to 4 times a week) by 11.3% of respondents. The results obtained are similar to ones by Kebede et al. [20], in which the percentage of people regularly smoking and drinking alcohol equaled 13.8% and 9.2% of participants, respectively. Moreover, in Poland the percentage of smoking adolescents is similar to the USA [21].

The negative situation related to the widespread habit of smoking and drinking alcohol among adolescents suffering from hypertension in Poland can be explained by the fact that in some environments this behavior is not disapproved of, but is rather a way to impress one's peers.

It is common knowledge that drinking alcohol and smoking is a factor that enhances the risk of occurrence of hypertension, lipid disorders and early atherosclerosis changes, especially in the aorta and blood vessels [22]. Nowadays, the widespread habit of smoking and drinking alcohol among teenagers requires several campaigns relat-

ed to educational programs on how to deal with these habits, and about the health problems and possible dangers that are caused by them. Behavioral methods based on conditional theory are the most popular methods applied in the treatment of habitual smoking and drinking alcohol. Behavioral methods require changing demeanors before the addiction is developed, and also changing beliefs or thinking schemes [12].

A positive observation, however, was the percentage of patients who aimed to limit the intake of salt in their everyday diet – 64.52%. The results obtained are consistent with the results of studies by different authors [18].

The opposite situation was visible, taking into consideration the intake of high calorie food. Only 30.65% of participants followed a low calorie diet. This observation follows a common belief shared by numerous experts that a low calorie diet that aims to reduce the body mass of patients is the least frequently followed recommendation during the process of therapy of people with hypertension. It stems from the fact that, together with physical activity, it requires a lot of discipline, renunciations and changes in behavior [23].

In various studies published so far, the effectiveness of non-pharmacological treatments of hypertension has been confirmed. In a study by McMurray et al. [24] devoted to the effectiveness of aerobic exercise during physical education classes in schools and to organizing educational programs about a healthy lifestyle among US adolescents, the highest relevant decrease of blood pressure (systolic and diastolic) and decrease of body mass was observed in a group that was educated and performed more physical activity in contrast to a control group and to a group either performing physical activities or educated. Similar results were confirmed by other authors [25].

In studies by Couch et al. [26], however, the effectiveness of the DASH (dietary approaches to stop hypertension) diet has been confirmed. The DASH diet involves a decrease of sodium intake and more frequent consumption of fish, fruits and vegetables and low-fat food in order to normalize blood pressure among adolescents. Over 61% of people with hypertension studied obtained the desired level of blood pressure after applying the DASH diet for a period of three months.

In the meta-analysis conducted by Feng et al. [27], it was confirmed that the reduction of sodium intake in the everyday diet improves the effectiveness of the treatment process of hypertension among adolescents with hypertension. It has been indicated that by reducing sodium intake by 42% for two weeks in children and adolescents with

hypertension, systolic blood pressure was reduced by 1.17 mm Hg, and diastolic by 1.29 mm Hg.

The results of the conducted studies undoubtedly indicate that the level of compliance of adolescents in terms of non-pharmacological treatment of hypertension is insufficient. An introduction of changes to lifestyle ought to be supervised by various specialists who offer effective behavioral methods. Moreover, from several scientific reports, one may conclude that applying pharmacotherapy and changing the lifestyle should be supported by well-planned educational programs. In the study by Kebede [20], 58% of adolescents did not possess a proper knowledge about the factors enhancing the development of hypertension and atherosclerosis. The process of educating patients by increasing their awareness about the disease, risk of complications and principles of treatment and monitoring the disease improves the engagement

of patients in the treatment process, and thus leads to improving its effectiveness and better quality of life of patients [10].

To summarize, adolescents with hypertension in varying degrees adhere to medical recommendations related to hypertension treatment. The vast majority of respondents (72.7%) declared regularly taking antihypertensive drugs.

Among the methods of non-pharmacological treatment of hypertension, the most accepted lifestyle change in the study population was smoking cessation (83.8% of respondents) and reduction of salt consumption (64.5% of respondents), and the least acceptable lifestyle change was to maintain proper body weight by eating a low calorie diet (30.6% of respondents).

From the available literature, data indicates that the current effective way to improve cooperation with the patients is education.

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Address for correspondence:

Anna Paczkowska
Department of Pharmacoeconomics and Social Pharmacy
Poznan University of Medical Sciences
ul. Dąbrowskiego 79
60-529 Poznań
Poland
Tel.: +48 507 975 635
E-mail: aniapaczkowska@ump.edu.pl

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