

# Correct and incorrect knowledge of the risk factors concerning the development of arterial hypertension. Part 1. Population of people without hypertension

Andrzej Kleinrok<sup>1,2</sup>, Michał Kamiński<sup>1</sup>, Tomasz Domański<sup>1</sup>, Grażyna Prokop-Lewicka<sup>1</sup>

<sup>1</sup>The Pope John Paul II Province Hospital, Zamość, Poland

<sup>2</sup>University of Management and Administration in Zamość

Head of department: Andrzej Kleinrok

## Abstract

**Introduction.** Hypertension (HT) is one of the most common causes of death in the adult population in the world. The lifestyle factors play a significant role in its pathogenesis. To be effective in preventing its development or slowing its progress the society needs to have proper knowledge.

**Material and methods.** The study was conducted in a population of 929 adults who had no known HT. Sociodemographic data were collected from each subject, anthropometric measurements were taken, blood pressure and heart rate were measured twice. The knowledge was assessed using the authorial questionnaire, and questions were related to knowledge about the effects of smoking, alcohol, coffee, salt, fat, irregular diet, low fibre and vegetables, and skimmed dairy products in diet, overweight and obesity, cholesterol, physical activity, stressful lifestyle on the development of HT.

**Results.** Incorrect knowledge of the influence on the development of HT in the case of alcohol drinking was found in 16.9% of the respondents, coffee — 58.8%, large amounts of salt — 10.3%, large amounts of fat — 82.7%, small amounts of fibre and vegetables and skimmed dairy products — 26.2%, irregular diet — 46.4%, cigarette smoking — 70.9%, overweight and obesity — 5.1%, high cholesterol — 87.6%, low physical activity — 10.9%, stressful lifestyle — 6.5%.

**Conclusions.** Incorrect knowledge of HT-related risk factors was associated particularly with higher level of cholesterol, excessive fat intake, smoking and coffee consumption. Most frequently incorrect answers were given by men, low-educated and non-smokers. In the above-mentioned groups emphasis on health promotion should be placed the most.

**Key words:** hypertension, risk factors, knowledge

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**Address for correspondence:** lek. Michał Kamiński  
The Pope John Paul II Province Hospital  
22–400 Zamość, Poprzeczna 17/18  
tel.: 663 358 271  
e-mail: m.kaminski@onet.pl

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## Introduction

Hypertension (HT) is one of the most widespread diseases and one of the most common causes of death in the adult population in the world [1]. In Poland, based on data from NATPOL 2011, it is estimated that HT occurs in 30–32% of adults, i.e. about in 10.5 million people, of which only 26% are treated effectively [2].

According to the concept of Lalond's health fields, people's health is influenced by the way they live, by the environment, genetic determinants and the organization of health care [3]. The first factor is of particular note and its modification is the best in terms of cost-effectiveness. So, in the pathogenesis of primary HT, the role of lifestyle factors is emphasized. Alcohol; large amounts of sodium; low amount of fibre, vegetables and skimmed dairy products, overweight and obesity; low physical activity; and stressful lifestyle are the causes of this disease.

It is now recommended that men limit alcohol consumption to a maximum of 20–30 g/day of ethanol, and women to a maximum of 10–20 g/day. This is due, among others, to the reports indicating that regular consumption of alcohol raises blood pressure (RR) and to the reversibility of this fact, regardless of other lifestyle changes [4, 5]. In pathogenesis, the role of activating the sympathetic nervous system is emphasized [6].

Increased salt intake leads to an increase in sodium levels in the body, which in turn increases the volume of extracellular space and increases the peripheral vascular resistance, resulting in raised RR [7]. A cause-and-effect relationship between excessive sodium intake and the development of HT has been confirmed. In the meta-analysis published in 2006, the reduction of dietary salt content was associated with a decrease in systolic RR of 3.6 mmHg [5].

Obesity, by activating the sympathetic nervous system and the renin-angiotensin-aldosterone system (RAA), affects the development of HT [8]. It has been shown that weight reduction contributes to both systolic and diastolic RR decrease. This effect is even greater when the weight loss is bigger [9].

Regular physical exercise, especially aerobic training, reduces the risk of HT and improves its control. This is achieved by decreasing plasma renin levels and by reducing vascular resistance, which is controlled by the sympathetic nervous system. In addition, physical activity has a positive effect on co-existing cardiovascular risk factors [5, 10].

Stress stimulators activate the sympathetic nervous system, stimulate the hypothalamic-pituitary-adrenal system, RAA, increase catecholamines, glucocorticosteroids, resulting in RR increase [11]. A connection

of stressful lifestyle with HT development, as well as ischaemic heart disease has been confirmed [12].

Smoking cigarettes and drinking coffee contribute to a short-term increase in RR, so it is commonly believed that they can cause the development of HT [13, 14]. Other factors that were thought to have an effect on this disease (but later evidence did not confirm these assumptions) include high consumption of fat, irregular consumption of food, and high cholesterol level. Smoking is a strong risk factor for cardiovascular death [15]. Nicotine contained in tobacco increases heart rate and peripheral resistance [13]. A 2001 study of over 30,000 people showed no direct link between cigarette smoking and RR in the long run [16].

The caffeine contained in coffee is an antagonist of adenosine receptors and has a vasodilatory effect; thus, is commonly believed to affect HT [14]. A meta-analysis of 10 randomized and 5 cohort studies published in 2012 revealed no association between coffee consumption and HT development [17]. For this reason, there are currently no recommendations to use or avoid this foodstuff.

Despite frequent co-occurrence of HT and lipid disorders, no causal evidence of connection between them was found. The role of irregular diets in the pathogenesis of obesity, which could lead to an increase in RR, is generally emphasized, but there is no convincing evidence to assess the direct impact of diet regularity on the development of HT.

In studies published in 1997 and in 2000, the effect of diet containing large amounts of vegetables and fruits on RR decrease in the HT group was confirmed. This reaction was even greater in people having a diet rich in vegetables, fruits, skimmed dairy products and with reduced total fat [18, 19]. So it might seem that eating fat affects HT. However, in the 2015 study comparing a control diet with a diet that differed only with regard to fat reduction, no significant effect on RR was observed [20].

Prevention of the development of HT in population is largely based on the elimination of risk factors. However, possessing the appropriate knowledge is a prerequisite for effective action and for this reason it seems interesting to assess knowledge. The aim of this study was to determine the range of correct and incorrect knowledge of factors influencing development of HT in non-HT people.

## Material and methods

The study was conducted using a diagnostic survey from June to October 2012. The material was collected

by the students\* of the Nursing Department of the Faculty of Physiotherapy and Pedagogy of the University of Management and Administration in Zamość for the bachelor's degree thesis. The study enrolled a group of 929 people, including 334 men and 595 women from the Lublin Region, who reported to the GP practice for reasons other than cardiovascular disease. The study included only those who reported that they had not had HT. The condition for inclusion in the study was the written consent of the investigated person. Sociodemographic data was collected, i.e. gender, age, place of residence, marital status, education, occupational activity, number of people living in the household, smoking, average weekly alcohol consumption. Monthly income was calculated by dividing the income of people in the household by their number. Alcohol consumption was assessed by specific questions about the consumption of weak and strong alcohol and then converted to pure ethanol. All investigated people were subjected to anthropometric measurements such as body mass (kg), height (cm), waist measurement (cm). Waist measurement was taken between the lower ribs and the upper hip by means of a flexible centimetre tape to the nearest 1 cm. RR in all patients was measured twice using Korotkov method. All patients had pulse measurement at rest.

The authorial questionnaire was used to evaluate the knowledge, which was accepted by the Authorities and Bioethics Committee of the University of Management and Administration in Zamość. It was collected personally by interviewers, and the questions concerned knowledge about the effects of alcohol, coffee, high amount of salt, fat, low amount of fibre and vegetables and skimmed dairy products in diet, irregular meals, smoking cigarettes, overweight and obesity, high cholesterol, physical activity, stressful lifestyle on the development of HT and sources of acquiring knowledge.

In assessing the impact of individual factors on HT, a four-step scale was used: high/moderate/low/no impact. The respondent could also answer "I have /no opinion". The responses were divided into two groups i.e. no impact — the combination of no and low impact responses and positive impact i.e. — the combination of moderate and high impact responses.

### Statistical analysis

The survey data was fed into Statistica 7.1 (StatSoft) program, which was used for presenting the data in the correlation tables (multivariate) and statistical analyses. Then, the percentage of structure was calculated from the results and a nonparametric test was used, i.e. Pearson's chi-squared test. Statistical significance was included with a confidence level  $p < 0.05$ .

**Table I.** General population characteristics (n = 929)

Sociodemographic data	Respondents
Male gender	334 (35.9)
Age (years)	42.0 ( $\pm$ 13.4)
Residence — city	538 (57.9)
Married	662 (71.3)
Education secondary or higher	704 (75.8)
Professionally active including:	707 (76.1)
— physical work	363 (51.3)
— intellectual work	344 (48.7)
Number of people living in the household	3.3 ( $\pm$ 1.5)
Monthly income/person (zł) n = 363*	1109.8 ( $\pm$ 854.4)
<b>Medical data</b>	
Current body weight [kg]	71.5 ( $\pm$ 14.7)
Current height [cm]	168.7 ( $\pm$ 9.0)
Waist measurement [cm]	85.9 ( $\pm$ 14.1)
— women [cm]	82.0 ( $\pm$ 13.0)
— men [cm]	92.9 ( $\pm$ 13.4)
Mean systolic RR [mmHg]	121.8 ( $\pm$ 14.5)
Mean diastolic RR [mmHg]	75.7 ( $\pm$ 9.7)
Average pulse rate [bpm]	73.8 ( $\pm$ 10.4)
BMI	25.0 ( $\pm$ 4.2)
— women	24.3 ( $\pm$ 4.1)
— men	26.3 ( $\pm$ 4.3)
Currently smoking nicotine	275 (29.6)
Smoking nicotine currently or in the past	379 (40.8)
Average weekly consumption of pure alcohol [g]	51.7 ( $\pm$ 131.3)
— women	29.0 ( $\pm$ 81.8)
— men	92.1 ( $\pm$ 183.2)

Data presented as n (%) or mean ( $\pm$  SD)  
RR — blood pressure; BMI — Body Mass Index; \*number of respondents

## Results

The average age of the study population was 42 years, with women accounting for almost 65%. Almost 58% were urban residents, more than 3/4 had secondary or higher education and more than 71% were married. Mean systolic blood pressure in the study group was 121.8 mmHg and diastolic 75.7 mmHg. Other data are shown in Table I.

Incorrect knowledge of the effects of alcohol on the development of HT was reported by 16.9% of respondents. Men (26.8 vs. 16.2;  $p < 0.001$ ), people with education lower than secondary (27.8% vs. 17.5%;  $p = 0.002$ ), people not receiving informa-

\*Data collected by: Iwona Kobel, Jolanta Maślana, Alina Jakóbczak, Urszula Tokarz, Urszula Pacek.

**Table II.** Patients' knowledge of factors affecting HT development (n = 929)

Patients' knowledge of factors affecting HT development	Impact				No opinion
	High	Moderate	Low	No	
Alcohol consumption	402 (43.3)	236 (25.4)	130 (14.0)	27 (2.9)	134 (14.4)
Coffee consumption	256 (27.6)	290 (31.2)	210 (22.6)	57 (6.1)	116 (12.5)
Nicotine smoking	443 (47.7)	216 (23.2)	118 (12.7)	30 (3.2)	122 (13.1)
Consuming large amount of salt	550 (59.2)	182 (19.6)	76 (8.2)	20 (2.1)	101 (10.9)
Consuming large amount of fat	572 (61.6)	196 (21.1)	59 (6.4)	19 (2.0)	83 (8.9)
Irregular diet	169 (18.2)	262 (28.2)	189 (20.4)	94 (10.1)	215 (23.1)
Consuming a small amount of fibre, vegetables and skimmed protein products	205 (22.1)	265 (28.5)	154 (16.6)	89 (9.6)	216 (23.2)
Overweight and obesity	745 (80.2)	99 (10.6)	38 (4.1)	9 (1.0)	38 (4.1)
High level of cholesterol	674 (72.5)	140 (15.1)	45 (4.8)	8 (0.9)	62 (6.7)
Low physical activity	523 (56.3)	240 (25.8)	69 (7.4)	32 (3.5)	65 (7.0)
Stressful lifestyle	666 (71.7)	158 (17.0)	50 (5.4)	10 (1.1)	45 (4.8)

Data presented as n (%)

**Table III.** Factors affecting knowledge of the influence of alcohol on the development of HT

n = 795*	Significant impact**	No impact***	p
Female/male	444 (83.8)/194 (73.2)	86 (16.2)/71 (26.8)	p < 0.001
Age < 49 years/> 49 years	473 (81.1)/165 (77.8)	110 (18.9)/47 (22.2)	p = 0.301
Married/single	455 (79.5)/183 (82.1)	117 (20.5)/40 (17.9)	p = 0.423
Rural/urban residence	263 (80.2)/375 (80.3)	65 (19.8)/92 (19.7)	p = 0.967
Primary education or vocational/secondary or higher	127 (72.2)/511 (82.5)	49 (27.8)/108 (17.5)	p = 0.002
Professionally active yes/no	494 (80.2)/144 (80.4)	122 (19.8)/35 (19.6)	p = 0.941
Knowledge from health professionals yes/no	321 (84.5)/317 (76.4)	59 (15.5)/98 (23.6)	p = 0.004
Knowledge from the press, TV and newspapers, books yes/no	409 (81.1)/229 (78.7)	95 (18.9)/62 (21.3)	p = 0.402
Knowledge from family and friends yes/no	193 (81.8)/445 (79.6)	43 (18.2)/114 (20.4)	p = 0.482
Knowledge from the Internet yes/no	248 (86.4)/390 (76.8)	39 (13.6)/118 (23.2)	p = 0.001
Obesity no/yes	576 (80.4)/62 (78.5)	140 (19.6)/17 (21.5)	p = 0.677
Currently smoking nicotine yes/no	172 (76.4)/466 (81.7)	53 (23.6)/104 (18.3)	p = 0.090

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

tion from health professionals (23.6% vs. 15.5%; p = 0.004), not receiving information from the Internet (23.2% vs. 13.6%; p = 0.001) had incorrect information (Tables II and III).

In the case of coffee consumption, 58.8% of the respondents believed that it had an influence on the development of HT, which is contrary to the current state of knowledge. The opinion was more often presented by single people (74.3% vs. 64.3%; p = 0.006) (Tables II and IV).

In 70.9% of the respondents the information about the impact of smoking on HT development was incompatible with the current state of knowledge. More often women (85.9% vs. 74.0%; p < 0.001), people with upper secondary

education (84.0 vs. 73.3; p = 0.001) those receiving information from health professionals (87.4% vs. 76.6%; p < 0.001) and non-smokers (85.3 vs. 72.8; p < 0.001) had incorrect information (Tables II and V).

Incorrect knowledge about the effect of salt intake on HT development was reported by 10.3% of respondents. Especially men (18.6% vs. 8.0%; p < 0.001) with education lower than secondary (18.6% vs. 9.6%; p < 0.001), those not receiving information from health professionals (15.6% vs. 7.0; p < 0.001), not possessing information from the press, television and newspapers (16.7% vs. 8.7%; p < 0.001) and smokers (16.6% vs. 9.6%; < 0.001) had incorrect information (Tables II and VI).

**Table IV.** Factors affecting knowledge of the influence of coffee on the development of HT

n = 813*	Significant impact**	No impact***	p
Female/male	365 (68.7)/181 (64.2)	166 (31.3)/101 (35.8)	p = 0.188
Age < 49 years/> 49 years	421 (68.8)/125 (62.2)	191 (31.2)/76 (37.8)	p = 0.084
Married/single	375 (64.3)/171 (74.3)	208 (35.7)/59 (25.7)	p = 0.006
Rural/urban residence	236 (70.9)/310 (64.6)	97 (29.1)/170 (35.4)	p = 0.060
Primary education or vocational/secondary or higher	109 (61.9)/437 (68.6)	67 (38.1)/200 (31.4)	p = 0.095
Professionally active yes/no	435 (67.9)/111 (64.5)	206 (32.1)/61 (35.5)	p = 0.409
Knowledge from health professionals yes/no	258 (69.2)/288 (65.4)	115 (30.8)/152 (34.6)	p = 0.261
Knowledge from the press. TV and newspapers. books yes/no	338 (65.5)/208 (70.0)	178 (34.5)/89 (30.0)	p = 0.185
Knowledge from family and friends yes/no	169 (69.8)/377 (66.0)	73 (30.2)/194 (34.0)	p = 0.290
Knowledge from the Internet yes/no	210 (70.9)/336 (65.0)	86 (29.1)/181 (35.0)	p = 0.082
Obesity no/yes	498 (68.0)/48 (59.3)	234 (32.0)/33 (40.7)	p = 0.111
Currently smoking nicotine yes/no	159 (66.5)/387 (67.4)	80 (33.5)/187 (32.6)	p = 0.805

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

**Table V.** Factors affecting knowledge of the influence of cigarette smoking on the development of HT

n = 807*	Significant impact**	No impact***	p
Female/male	446 (85.9)/213 (74.0)	73 (14.1)/75 (26.0)	p < 0.001
Age < 49 years/> 49 years	485 (81.8)/174 (81.3)	108 (18.2)/40 (18.7)	p = 0.877
Married/single	479 (82.6)/180 (79.3)	101 (17.4)/47 (20.7)	p = 0.277
Rural/urban residence	276 (83.1)/383 (80.6)	56 (16.9)/92 (19.4)	p = 0.366
Primary education or vocational/secondary or higher	129 (73.3)/530 (84.0)	47 (26.7)/101 (16.0)	p = 0.001
Professionally active yes/no	520 (82.8)/139 (77.6)	108 (17.2)/40 (22.4)	p = 0.116
Knowledge from health professionals yes/no	332 (87.4)/327 (76.6)	48 (12.6)/100 (23.4)	p < 0.001
Knowledge from the press. TV and newspapers. books yes/no	419 (83.5)/240 (78.7)	83 (16.5)/65 (21.3)	p = 0.089
Knowledge from family and friends yes/no	189 (80.8)/470 (82.0)	45 (19.2)/103 (18.0)	p = 0.676
Knowledge from the Internet yes/no	241 (82.5)/418 (81.2)	51 (17.5)/97 (18.8)	p = 0.629
Obesity no/yes	594 (82.2)/65 (77.4)	129 (17.8)/19 (22.6)	p = 0.284
Currently smoking nicotine yes/no	171 (72.8)/488 (85.3)	64 (27.2)/84 (14.7)	p < 0.001

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

As many as 82.7% of the respondents had an inadequate knowledge of the effect of high intake of fat on HT development. In this group women (92.9% vs. 86.8%; p = 0.003), those with education higher than secondary (93.2% vs. 82.4%; p < 0.001), those possessing information from the press, television and newspapers (92.8% vs. 87.2%; p = 0.008), people possessing information from the Internet (94.5% vs. 88.7%; p = 0.005) and non-smokers (92.8% vs. 85.6%; p < 0.001) were predominant (Tables II and VII).

Incorrect knowledge about the effect of irregularly consumed meals on HT development was reported by 46.4% of respondents. Women (65.4% vs. 51.2%; p < 0.001), those receiving information from health professionals (67.2% vs. 54.5%; p < 0.001),

non-smokers (64.1% vs. 50.7%; p < 0.001) had incorrect information more frequently (Tables II and VIII).

Misconceptions about the effect of low consumption of fibre and vegetables and skimmed dairy products on the development of HT were present in 26.2% of the respondents. The misleading information was especially possessed by people not receiving information from the Internet (38.5% vs. 26.4%; p = 0.001) and non-smokers (40.0% vs. 31.9%; p = 0.041) (Tables II and IX).

In the case of overweight and obesity, 5.1% of respondents believe that it does not affect the development of HT. More often men (8.1% vs. 3.8%; p = 0.006), people over 49 years old (7.9% vs. 4.3%; p = 0.036), single people (7.8% vs. 4.3%; p = 0.039), people with education lower than secondary (11.2%

**Table VI.** Factors affecting knowledge of the influence of large amounts of salt on the development of HT

n = 828*	Significant impact**	No impact***	p
Female/male	504 (92.0)/228 (81.4)	44 (8.0)/52 (18.6)	p < 0.001
Age < 49 years/> 49 years	531 (87.9)/201 (89.7)	73 (12.1)/23 (10.3)	p = 0.468
Married/single	543 (89.6)/189 (85.1)	63 (10.4)/33 (14.9)	p = 0.075
Rural/urban residence	301 (86.7)/431 (89.6)	46 (13.3)/50 (10.4)	p = 0.204
Primary education or vocational/secondary or higher	149 (81.4)/583 (90.4)	34 (18.6)/62 (9.6)	p < 0.001
Professionally active yes/no	574 (89.5)/158 (85.0)	67 (10.5)/29 (15.5)	p = 0.057
Knowledge from health professionals yes/no	359 (93.0)/373 (84.4)	27 (7.0)/69 (15.6)	p < 0.001
Knowledge from the press. TV and newspapers. books yes/no	483 (91.3)/249 (83.3)	46 (8.7)/50 (16.7)	p < 0.001
Knowledge from family and friends yes/no	213 (86.6)/519 (89.2)	33 (13.4)/63 (10.8)	p = 0.287
Knowledge from the Internet yes/no	270 (90.0)/462 (87.5)	30 (10.0)/66 (12.5)	p = 0.280
Obesity no/yes	657 (88.8)/75 (85.2)	83 (11.2)/13 (14.8)	p = 0.325
Currently smoking nicotine yes/no	196 (83.4)/536 (90.4)	39 (16.6)/57 (9.6)	p < 0.001

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

**Table VII.** Factors affecting knowledge of the influence of large amounts of fat on the development of HT

n = 846*	Significant impact**	No impact***	p
Female/male	512 (92.9)/256 (86.8)	39 (7.1)/39 (13.2)	p = 0.003
Age < 49 years/> 49 years	562 (90.8)/206 (90.7)	57 (9.2)/21 (9.3)	p = 0.985
Married/single	557 (90.6)/211 (91.3)	58 (9.4)/20 (8.7)	p = 0.729
Rural/urban residence	322 (92.3)/446 (89.7)	27 (7.7)/51 (10.3)	p = 0.211
Primary education or vocational/secondary or higher	155 (82.4)/613 (93.2)	33 (17.6)/45 (6.8)	p < 0.001
Professionally active yes/no	592 (91.1)/176 (89.8)	58 (8.9)/20 (10.2)	p = 0.587
Knowledge from health professionals yes/no	363 (92.4)/405 (89.4)	30 (7.6)/48 (10.6)	p = 0.137
Knowledge from the press. TV and newspapers. books yes/no	501 (92.8)/267 (87.2)	39 (7.2)/39 (12.8)	p = 0.008
Knowledge from family and friends yes/no	230 (91.6)/538 (90.4)	21 (8.4)/57 (9.6)	p = 0.577
Knowledge from the Internet yes/no	290 (94.5)/478 (88.7)	17 (5.5)/61 (11.3)	p = 0.005
Obesity no/yes	687 (90.6)/81 (92.0)	71 (9.4)/7 (8.0)	p = 0.665
Currently smoking nicotine yes/no	203 (85.6)/565 (92.8)	34 (14.4)/44 (7.2)	p < 0.001

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

**Table VIII.** Factors affecting knowledge of the influence of irregular diet on the development of HT

n = 714*	Significant impact**	No impact***	p
Female/male	302 (65.4)/129 (51.2)	160 (34.6)/123 (48.8)	p < 0.001
Age < 49 years/> 49 years	322 (59.7)/109 (62.3)	217 (40.3)/66 (37.7)	p = 0.550
Married/single	317 (61.7)/114 (57.0)	197 (38.3)/86 (43.0)	p = 0.252
rural/urban residence	185 (60.7)/246 (60.1)	120 (39.3)/163 (39.9)	p = 0.891
primary education or vocational/secondary or higher	82 (53.6)/349 (62.2)	71 (46.4)/212 (37.8)	p = 0.053
Professionally active yes/no	340 (60.6)/91 (59.5)	221 (39.4)/62 (40.5)	p = 0.800
Knowledge from health professionals yes/no	221 (67.2)/210 (54.5)	108 (32.8)/175 (45.5)	p < 0.001
Knowledge from the press. TV and newspapers. books yes/no	279 (61.3)/152 (58.7)	176 (38.7)/107 (41.3)	p = 0.489
Knowledge from family and friends yes/no	124 (59.9)/307 (60.5)	83 (40.1)/200 (39.5)	p = 0.872
Knowledge from the Internet yes/no	171 (63.1)/260 (58.7)	100 (36.9)/183 (41.3)	p = 0.242
Obesity no/yes	393 (60.5)/38 (58.5)	256 (39.5)/27 (41.5)	p = 0.742
Currently smoking nicotine yes/no	101 (50.7)/330 (64.1)	98 (49.3)/185 (35.9)	p < 0.001

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

**Table IX.** Factors affecting knowledge of the influence of small amounts of fibre and vegetables and skimmed protein products on the development of HT

n = 713*	Significant impact**	No impact***	p
Female/male	323 (67.6)/147 (62.5)	155 (32.4)/88 (37.5)	p = 0.184
Age < 49 years/> 49 years	353 (66.9)/117 (63.2)	175 (33.1)/68 (36.8)	P = 0.372
Married/single	344 (66.5)/126 (64.3)	173 (33.5)/70 (35.7)	p = 0.571
Rural/urban residence	199 (68.1)/271 (64.4)	93 (31.9)/150 (35.6)	p = 0.295
Primary education or vocational/secondary or higher	89 (59.7)/381 (67.5)	60 (40.3)/183 (32.5)	p = 0.073
Professionally active yes/no	373 (67.4)/97 (60.6)	180 (32.6)/63 (39.4)	p = 0.109
Knowledge from health professionals yes/no	235 (69.1)/235 (63.0)	105 (30.9)/138 (37.0)	p = 0.085
Knowledge from the press. TV and newspapers. books yes/no	309 (67.6)/161 (62.9)	148 (32.4)/95 (37.1)	p = 0.202
Knowledge from family and friends yes/no	140 (67.6)/330 (65.2)	67 (32.4)/176 (34.8)	p = 0.537
Knowledge from the Internet yes/no	192 (73.6)/278 (61.5)	69 (26.4)/174 (38.5)	p = 0.001
Obesity no/yes	422 (66.1)/48 (64.0)	216 (33.9)/27 (36.0)	p = 0.711
Currently smoking nicotine yes/no	117 (60.0)/353 (68.1)	78 (40.0)/165 (31.9)	p = 0.041

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

**Table X.** Factors affecting knowledge of the influence of overweight and obesity on the development of HT

n = 891*	Significant impact**	No impact***	p
Female/male	560 (96.2)/284 (91.9)	22 (3.8)/25 (8.1)	p = 0.006
Age < 49 years/> 49 years	621 (95.7)/223 (92.1)	28 (4.3)/19 (7.9)	p = 0.036
Married/single	619 (95.7)/225 (92.2)	28 (4.3)/19 (7.8)	p = 0.039
Rural/urban residence	353 (95.1)/491 (94.4)	18 (4.9)/29 (5.6)	p = 0.633
Primary education or vocational/secondary or higher	183 (88.8)/661 (96.5)	23 (11.2)/24 (3.5)	p < 0.001
Professionally active yes/no	653 (95.6)/191 (91.8)	30 (4.4)/17 (8.2)	p = 0.033
Knowledge from health professionals yes/no	390 (96.1)/454 (93.6)	16 (3.9)/31 (6.4)	p = 0.103
Knowledge from the press. TV and newspapers. books yes/no	537 (95.5)/307 (93.3)	25 (4.5)/22 (6.7)	p = 0.149
Knowledge from family and friends yes/no	250 (94.7)/594 (94.7)	14 (5.3)/33 (5.3)	p = 0.981
Knowledge from the Internet yes/no	305 (98.1)/539 (92.9)	6 (1.9)/41 (7.1)	p = 0.001
Obesity no/yes	764 (95.9)/80 (85.1)	33 (4.1)/14 (14.9)	p < 0.001
Currently smoking nicotine yes/no	242 (94.2)/602 (94.9)	15 (5.8)/32 (5.1)	p = 0.633

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

vs. 3.5%;  $p < 0.001$ ), people professionally inactive (8.2% vs. 4.4%;  $p = 0.033$ ), not receiving information from the Internet (7.1% vs. 1.9%;  $p = 0.001$ ) and obese people (14.9% vs. 4.1%;  $p = 0.001$ ) had incorrect information (Tables II and X).

As many as 87.6% of the respondents claimed that high cholesterol had an effect on the development of HT, although no association was found in clinical trials. Incorrect responses were more likely to be found in patients with secondary and higher education (95.4% vs. 88.5%;  $p < 0.001$ ) (Tables II and XI).

In the study group, 10.9% of the respondents had false knowledge about the lack of influence of little physical activity on the development of HT. More

often men (15.7% vs. 9.5%;  $p = 0.007$ ), single people (15.2% vs. 10.3%;  $p = 0.043$ ), with education lower than secondary (16.2% vs. 10.4%;  $p = 0.029$ ), not receiving information from family and friends (13.1 vs. 8.2%;  $p = 0.041$ ), not receiving information from the Internet (13.9% vs. 7.8%;  $p = 0.007$ ) had incorrect knowledge (Tables II and XII).

Incorrect knowledge about the effects of stressful lifestyle on the HT was present in 6.5% of the respondents, especially men (10.8% vs. 4.7%;  $p < 0.001$ ), people with education below secondary (12.4% vs. 5.1%;  $p < 0.001$ ), people not receiving information from health professionals (9.2% vs. 4.0%;  $p = 0.002$ ) not receiving information from the press, television and newspapers (9.0% vs. 5.5%;  $p = 0.049$ ) and not

**Table XI.** Factors affecting knowledge of the influence of high cholesterol on the development of HT

n = 867*	Significant impact**	No impact***	p
Female/male	560 (96.2)/284 (91.9)	22 (3.8)/25 (8.1)	p = 0.006
Age < 49 years/> 49 years	621 (95.7)/223 (92.1)	28 (4.3)/19 (7.9)	p = 0.036
Married/single	619 (95.7)/225 (92.2)	28 (4.3)/19 (7.8)	p = 0.039
Rural/urban residence	353 (95.1)/491 (94.4)	18 (4.9)/29 (5.6)	p = 0.633
Primary education or vocational/secondary or higher	183 (88.8)/661 (96.5)	23 (11.2)/24 (3.5)	p < 0.001
Professionally active yes/no	653 (95.6)/191 (91.8)	30 (4.4)/17 (8.2)	p = 0.033
Knowledge from health professionals yes/no	390 (96.1)/454 (93.6)	16 (3.9)/31 (6.4)	p = 0.103
Knowledge from the press. TV and newspapers. books yes/no	537 (95.5)/307 (93.3)	25 (4.5)/22 (6.7)	p = 0.149
Knowledge from family and friends yes/no	250 (94.7)/594 (94.7)	14 (5.3)/33 (5.3)	p = 0.981
Knowledge from the Internet yes/no	305 (98.1)/539 (92.9)	6 (1.9)/41 (7.1)	p = 0.001
Obesity no/yes	764 (95.9)/80 (85.1)	33 (4.1)/14 (14.9)	p < 0.001
Currently smoking nicotine yes/no	242 (94.2)/602 (94.9)	15 (5.8)/32 (5.1)	p = 0.633

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

**Table XII.** Factors affecting knowledge of the influence of low physical activity on the development of HT

n = 864*	Significant impact**	No impact***	p
Female/male	505 (90.5)/258 (84.3)	53 (9.5)/48 (15.7)	p = 0.007
Age < 49 years/> 49 years	562 (89.2)/201 (85.9)	68 (10.8)/33 (14.1)	p = 0.179
Married/single	557 (89.7)/206 (84.8)	64 (10.3)/37 (15.2)	p = 0.043
Rural/urban residence	312 (86.9)/451 (89.3)	47 (13.1)/54 (10.7)	p = 0.279
Primary education or vocational/secondary or higher	161 (83.8)/602 (89.6)	31 (16.2)/70 (10.4)	p = 0.029
Professionally active yes/no	589 (88.8)/174 (86.6)	74 (11.2)/27 (13.4)	p = 0.380
Knowledge from health professionals yes/no	357 (90.6)/406 (86.4)	37 (9.4)/64 (13.6)	p = 0.054
Knowledge from the press. TV and newspapers. books yes/no	488 (89.5)/275 (86.2)	57 (10.5)/44 (13.8)	p = 0.141
Knowledge from family and friends yes/no	234 (91.8)/529 (86.9)	21 (8.2)/80 (13.1)	p = 0.041
Knowledge from the Internet yes/no	285 (92.2)/478 (86.1)	24 (7.8)/77 (13.9)	p = 0.007
Obesity no/yes	688 (88.9)/75 (83.3)	86 (11.1)/15 (16.7)	p = 0.121
Currently smoking nicotine yes/no	214 (85.6)/549 (89.4)	36 (14.4)/65 (10.6)	p = 0.114

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

receiving information from family and friends (7.9% vs. 4.2%; p = 0.045) (Tables II and XIII).

## Discussion

Leading a healthy lifestyle and, at the same time, eliminating HT-inducing factors plays an important role in prevention of HT occurrence.

The study was aimed at assessing the knowledge of non-HT patients about the factors contributing to the development of HT and determinants influencing this knowledge. Already about 30 years ago it was proved, and in subsequent years confirmed, that alcohol has the influence on the development of HT [4, 5]. Despite this, in the present study, up to 17% of respondents had incorrect information in

this area. This situation was more prevalent among men, people with primary or vocational education, not receiving information from health professionals or the Internet. It seems appropriate to spread this information further, possibly on alcohol-based products.

Coffee consumption not only does not affect the development of HT, but it can also contribute to reducing mortality due to other diseases, including diabetes [21]. Nearly 59% of people in the study group had incorrect knowledge of the subject. This phenomenon was particularly true for single people as well as for people under the age of 49, rural residents, people with secondary or higher education and obtaining information from the Internet. In a study published in 2013, the student's knowledge of the factors influencing the development of HT

**Table XIII.** Factors affecting knowledge of the influence of stressful lifestyle on the development of HT

n = 884*	Significant impact**	No impact***	p
Female/male	550 (95.3)/274 (89.2)	27 (4.7)/33 (10.8)	p < 0.001
Age < 49 years/> 49 years	593 (92.4)/231 (95.4)	49 (7.6)/11 (4.6)	p = 0.104
Married/single	602 (93.6)/222 (92.1)	41 (6.4)/19 (7.9)	p = 0.427
Rural/urban residence	341 (92.9)/483 (93.4)	26 (7.1)/34 (6.6)	p = 0.767
Primary education or vocational/secondary or higher	176 (87.6)/648 (94.9)	25 (12.4)/35 (5.1)	p < 0.001
Professionally active yes/no	635 (93.1)/189 (93.6)	47 (6.9)/13 (6.4)	p = 0.821
Knowledge from health professionals yes/no	389 (96.0)/435 (90.8)	16 (4.0)/44 (9.2)	p = 0.002
Knowledge from the press. TV and newspapers. books yes/no	530 (94.5)/294 (91.0)	31 (5.5)/29 (9.0)	p = 0.049
Knowledge from family and friends yes/no	252 (95.8)/572 (92.1)	11 (4.2)/49 (7.9)	p = 0.045
Knowledge from the Internet yes/no	295 (95.2)/529 (92.2)	15 (4.8)/45 (7.8)	p = 0.091
Obesity no/yes	735 (92.9)/89 (95.7)	56 (7.1)/4 (4.3)	p = 0.314
Currently smoking nicotine yes/no	233 (91.4)/591 (94.0)	22 (8.6)/38 (6.0)	p = 0.166

Data is presented as n (%); \*not including people who replied "I have no opinion"; \*\*combination of response high and moderate impact; \*\*\*combination of low and no impact

was even worse, as 75% of the respondents considered that such a factor was coffee [22].

Despite the fact that smoking contributes to cardiovascular disease, there is no link between it and the development of HT [15, 16]. In the study population, more than 70% of people believed that nicotine was associated with hypertension. This situation was more frequent for women, people with secondary or higher education, cigarette smokers, people receiving information from health professionals and those receiving information from newspapers, television, and books. It is particularly disturbing that the population of people who obtain information from doctors and nurses had a misconception about smoking cigarettes and HT. This may mean that people working in health care also have incorrect knowledge.

So far, many studies have been conducted to confirm the adverse effects of excessive salt intake on HT development. It has also been possible to determine how much the RR value decreases when a diet with low sodium content is applied [5]. About 11% of people had no opinion on the effect of salt intake on HT and more than 10% had an incorrect knowledge of the subject. This was more often the case for men, people with vocational or primary education, those who did not receive information from health professionals or the press, television and newspapers, smokers and, to a lesser extent, single and professionally inactive people. Similar data were obtained in the study about obese patients. In that study, there were also about one in five people who did not think about the effect of salt on HT or had an incorrect knowledge [23]. Thus, it seems that knowledge in this area has not changed significantly in the last few years.

Despite a number of studies evaluating the effect of different dietary components on the development of HT, it has not been proven that reduction of fat intake alone decreases RR [20]. Less than 83% of respondents had incorrect knowledge of the effect of high fat intake on HT development, and almost 11% had no opinion on this effect. So, unfortunately, only an insignificant percentage of people possess knowledge consistent with the results of recent research. More often women, people with education above secondary, people who get information from the press, television and newspapers, those receiving information from the Internet and non-smokers had misleading information. Likewise, evidence of a low level of knowledge was obtained from the previous study [23].

Despite the general belief that regular food consumption can prevent many diseases, it has not been proven so far that it could, as a single factor, affect the development of HT. In this study, incorrect knowledge about the influence of irregular diets on the onset and severity of HT was reported by over 46% of respondents, and more than 23% had no opinion on this issue. More often, women, people receiving information from health professionals, non-smokers and, to a lower extent, those with secondary education or higher were misinformed.

At the end of the last century, a positive effect of the DASH diet has been confirmed, i.e. diets rich in fibre, vegetables and skimmed dairy products which affect RR decrease [18, 19]. Incorrect knowledge about the lack of influence of such a diet on the development of HT was present in over 26% of the respondents, and about 23% of them had no opinion on this issue. Therefore, only slightly more than half of the study group gave the correct answer. More

often people not receiving knowledge from the Internet, non-smokers, people with lower than secondary education and those who did not receive information from health professionals had incorrect information. It seems necessary to spread the knowledge on the positive aspects of such a diet because it is the first but also indispensable step to change eating habits of Poles for better.

Overweight and obesity are closely correlated with the incidence of HT, and it has also been established that the greater the weight reduction, the greater the effect of lowering RR [9]. In the survey, the respondents showed relatively good knowledge about the connection between overweight and HT, because only slightly over 5% gave the wrong answer. Among those with incorrect knowledge were men, people over 49, single people, people with lower than secondary education, professionally inactive people, those not receiving information from the Internet and obese people. The latter group is particularly disturbing, because they should be firstly informed about the need for weight reduction and about the health consequences of such a change.

Despite the proven effect of high cholesterol on cardiovascular diseases, including ischaemic heart disease, the correlation between lipid disorders and the onset and severity of hypertension has not yet been shown. Only 5.6% of the study group correctly answered the question on the cause-and-effect relationship between high cholesterol and HT, which was the worst result of the survey. Especially people with secondary and higher education, those professionally active, people receiving information from health professionals, those acquiring knowledge from

the press, television, newspapers, books had incorrect knowledge.

Regular physical activity reduces the risk of HT and improves its control [5]. In the study group, almost 11% of the respondents had false information about the lack of influence of low physical activity on the development of HT, and 7% had no opinion on it. Especially men, single people, with education lower than secondary, not receiving information from family and friends and not receiving information from the Internet had the incorrect knowledge.

Frequent recurrent stress can cause HT [12]. In this study, 6.5% of respondents did not agree with this proven statement. This was especially true for men, those with education lower than secondary, people who did not receive information from health professionals, those who did not receive information from the press, television and newspapers and those who did not obtain information from family and friends. Moreover, those who did not obtain information from the Internet had incorrect information slightly more often.

## Conclusions

1. Incorrect knowledge of HT-related factors was particularly associated with raised cholesterol, excessive fat intake, smoking and coffee consumption.
2. Most often mistaken answers were given by men, people with primary or vocational education, and non-smokers.
3. The greatest emphasis on the promotion of health should be placed on the above-mentioned groups.