Risk factors for development of hypertension in Poltava region

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ABSTRACT

Introduction: Given the very dangerous situation in relation to cardiovascular morbidity, purpose of the study was to identify the main risk factors of hypertension among the population of Poltava region, to determine their role in the formation of this pathology.

Aim: study the factors for development of hypertension in Poltava region

Material and methods: The study was conducted by anonymous questionnaires of adults of Poltava region (1285 individuals in 2 groups: 563 individuals with hypertension, 722 people - healthy). The data, obtained in the study, were processed using special software - IBM SPSS Statistic Version 22.0. By logistic regression were identified risk factors that significantly affect the development of hypertension.

Results: According to the study identified major, statistically significant risk factors of hypertension among the population of Poltava region. Proved reliable impact these risk factors: age (over 40 years) – OR – 7.9, CI – 6,132-10,176, (p<0,001), gender (male) - OR – 1.899, CI – 1,512-2,386, (p<0,001), BMI (obesity) - OR – 3.9632, CI – 2,881-4,580, (p<0,001), smoking - OR – 1.918, CI – 1,263-2,913, (p=0,002), consumption of dairy products (occasionally) - OR – 1,553, CI – 1,215-1,985, (p<0,001), consumption of pork (often) - OR – 1,805, CI – 1,422-2,290, (p<0,001), consumption of beef (occasionally) - OR – 1,547, CI – 1,229-1,949, (p=0,006), consumption of smoked meat (often) - OR – 1,341, CI – 1,070-1,678, (p=0,006), consumption of sweets (often) - OR – 1,510, CI – 1,210-1,884, (p<0,001), night sleep (restless) - OR – 1,762, CI – 1,279-2,426, (p<0,001), duration of sleep (less than 6 hours) OR – 1,648, CI – 1,126-2,411, (p=0,01), physical activity (low) - OR – 2,734, CI – 2,102-3,555, (p<0,001), nature of the rest (passive) - OR – 2,476, CI – 1,970-3,112, (p<0,001), feeling stress (always) - OR – 1,537, CI – 1,227-1,926, (p<0,001), relations at home (tense) - OR – 3,072, CI – 1,517-6,221, (p=0,001), CVD in the family – OR – 1,397, CI – 1,110-1,758, (p=0,004), discomfort in the heart aria - OR – 3,090, CI – 2,453-3,893, (p<0,001), self-treatment - OR – 1.942, CI – 1,553-2,428, (p<0,001).

Conclusions: The study found regional differences in risk factors of hypertension among the population of Poltava region, emphasized the need to increase attention of health professionals of primary care for problems of cardiovascular disease, make a point of the need to intensify primary prevention, modernization of behavior on health among population, promotion of the principles of a healthy lifestyle.

Key words: Hypertension, risk factors, Poltava, Ukraine

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INTRODUCTION

Hypertension is a condition that is characterized by a long-term elevation of blood pressure above 140/90 mmHg. About 95% of all hypertension cases are cases of so-called essential (primary) hypertension [1]. It is a chronic condition caused by a combination of genetic, environmental and behavioral factors [2]. The other 5 % are cases of secondary hypertension – hypertension caused by a medical reason such as kidney disease, thyroid and parathyroid problems and treatment.

According to WHO's global brief on hypertension in 2008 about 40 % adults aged 25 years or older had diagnosed hypertension in the world. Hypertension is more prevalent in low- and middle-income countries [3]. The prevalence is highest in Africa (46%) and lowest in America and Europe (35%). [3,4] In 2000 about 1 billion people were hypertensive and it is predicted that this number will rise up to 1.56 billions in 2025 [5]. Hypertension is one of the leading factors of mortality in the world. It causes coronary heart disease, which is the most common factor of death worldwide [6]. Studies found arterial hypertension also as a significant risk factor of stroke [7]. About 45 % of all deaths due heart disease and 51% due stroke are caused by hypertension [3]. Another major public health problem that can be caused by hypertension is renal disease [8].

In accordance with researches performed on the inhabitants in England, USA and Canada the level of hypertension cases increases with age [9]. A study on American Indian tribes showed 38 % more hypertension incidence among persons that are 65 years or older than aged between 55 and 54 and 64 % than the aged 45 to 54 [10].

Several studies show that gender does not significantly affect blood pressure. [11, 12]. According to studies performed at Birmingham University, women generally had lower diastolic blood pressure, but higher systolic blood pressure than men. They also had more cardiovascular risk factors in men, such as central obesity and elevated level of cholesterol and high-density lipoprotein [11].

Studies have shown contra indicatory results relatively to the relation between sleep duration and hypertension, but, in general, they showed that decreased sleep duration (less than 5-6 hours), caused by lifestyle, might affect development of hypertension. This association varies with gender and age: female adults younger than 60 years have a higher risk to develop hypertension. This association was not found among elderly people. Insomnia can also affect the development of high blood pressure, substantially in middle-aged people [13].

Among well-known risk factors for hypertension is obesity. Researchers from John Hopkins University conducted a long-term study (46 years) of relations between BMI, age and high blood pressure. According to this study, overweight men had 1.5 times increased risk of developing hypertension compared to men with normal BMI. The study also showed that men with normal BMI when they were 25 years old and became obese at the age of 45 had lover risk for developing high blood pressure than men with obesity at the age of 25 and remained obese when they were 45 years old [14].

A Western dietary pattern that includes red meat, flour grains, potatoes, light-colored vegetables, peanuts and fresh milk seems to increase systolic and diastolic blood pressure [15]. There is a connection between high blood pressure and high sodium chloride intake and low potassium intake [16]. It is also observed an inverse association between diary and linolenic acid consumption and prevalent hypertension among US population [17].

Influence of alcohol consumption on development of high blood pressure depends on frequency and quantity of the consumption. According to the study preformed by Howard D. Sesso and cooperators, heavy alcohol intake (4 or more drinks per day) increases significantly the risk of hypertension for both women and men. It is possible that light-to-moderate alcohol intake (from 1 drink per month to 1 drink per day) can decrease the hypertension risk in women (8% to 21%), while in men it is found a linear association between alcohol consumption and hypertension risk with no significant benefits of light and moderate alcohol consumption [18].

Smoking and other tobacco consumption can also affect blood pressure. Some studies have shown that smoking can elevate blood pressure, but other studies had a paradoxical result: some smokers had lower blood pressure than nonsmokers [19, 20]. Data of the annual Health Survey for England was used to investigate the association between blood pressure and smoking. According to the results, older moderate-to-heavy smokers (more than 45 yeas old) had significantly higher systolic, but not diastolic blood pressure than nonsmokers. Light smokers among women had lower blood pressure than heavy smokers and nonsmokers, but this result was significant only for diastolic blood pressure in the youngest group. The association between smoking and weight was found: moderate and heavy overweight smokers had a significant increase in systolic blood pressure [19].

Stress both in home and at work affects development of hypertension. Divorced people have more chances to develop hypertension than single and married people [21]. Researchers showed that blood pressure generally is higher in workdays comparing to nonworking days. All in all, it is estimated that people with chronic work stress have increased systolic blood pressure both in working hours and in nonworking hours. Work stress does not affect diastolic blood pressure [22].

WHO's statistic of death causes show that Ukraine is one of the countries with highest rates of death caused by ischemic heart disease and cerebrovascular disease [3]. The high level of tobacco and alcohol consumption is also unsatisfactory. Against the background of increased inflation and unemployment, that found place in latest years, the level of stress in the population has risen. Food price and price on antihypertensive drugs became higher. It complicates possibility to control blood pressure and follow healthy diet. The level of hypertension morbidity is rising among the Ukrainians. It is important to study risk factors that influence development of hypertension in Ukrainian society with Poltava region as appropriate representative of Ukrainian population. This study will increase the level of awareness about hazards associated with hypertension and its risk factors among Ukrainian population. It will also assist Ukrainian physicians to work out practical recommendations that will help their patients to avoid hypertension even in hard socioeconomic conditions, which are presented in today's Ukraine.

Aim: study the factors for development of hypertension in Poltava region

MATERIAL AND METHODS

Sample

The Poltava Study, which has been in operation since 2013, has been conducting an epidemiologic investigation of possible factors related to development of hypertension. A study group of 1285 men and women, aged 30 to 62 years 563 (43.8%) of them were hypertensive disease and 722 (56.2) healthy. Established procedures and examinations for cardiovascular epidemiological surveys were employed [23].

Data collection

A self-administered questionnaire including information about smoking and alcohol intake, leisure time physical activity, socioeconomic status. All questionnaires were checked during the examination by the staff in collaboration with the participant; when data from the questionnaire were examined, we found significant discriminative power. In these associations between dichotomized risk factors and development of hypertension were tested with logistic regression. The predictors were:

- age (over 40 years);
- gender (male);
- education (secondary);
- body mass index (BMI) (obesity);
- smoking (smoking cigarettes);
- alcohol (abuse);
- fruits (occasionally);
- vegetables (occasionally);
- milk (occasionally);
- fish (occasionally);
- poultry (occasionally);
- pork (often);
- beef (occasionally);
- lard (often);
- smoked meat (often);
- sweets (often);
- night sleep (restless);
- the duration of sleep(less than 6 hours);
- physical activity (low);
- relations at home (tensed);
- feeling stress (always);
- the nature of the rest (passive);
- working conditions (hard);
- CVD in the family (the presence of relatives);

• control of blood pressure (yes);
• discomfort in the heart area (available);
• treatment (self-treatment).

The data was analyzed using IBM SPSS Statistic Version 22.0.

RESULTS

While determining the distribution of development of high blood pressure (BP) in dependence of the age, it was estimated that 72,4% respondents older than 40 years have high blood pressure. The OR is 7,900 (95% CI 6,132-10,176) (p<0.001).

The study of relation between elevated BP relatively and gender showed that 53,6% of men has elevated BP. The OR is 1,899 (95% CI 1,512-2,386) (p<0.001).

The comparison of the distribution of high blood pressure relative to excess body weight showed that 60,5% of respondents, who are overweight, suffer from elevated BP. The OR is 3,632 (95% CI 2,881-4,580) (p<0.001).

The comparison of high blood pressure of smoking respondents, shows that 59,6% people that smokes have a stable rise of blood pressure level. The OR is 1,918 (95% CI 1,263-2,913) (p=0,002).

We have studied the influence of different groups of food products on the rise of BP. The results of the study shows the ratio between AH and consumption of different food products:

researching the influence of diary products on the level of BP, we have compared persons with high level of BP with low level of intake of diary products. The results shows, that 51,7% of respondents, who neglect the intake of milk and diary products, have consistently higher BP. The OR is 1,553 (95% CI 1,215-1,985) (p<0.001);

researching the correlation between beef consumption and blood pressure it was estimated that 47,8% of respondents, who neglect eating beef have elevated blood pressure. The OR is 1,547 (95% CI 1,229-1,949) (p<0.001);

exploring the impact of frequent pork consumption on the high blood pressure it was estimated that 51,3% of respondents, those, who frequently consume pork, have high level of BP. It is determined that OR is 1,805 (95% CI 1,422-2,290) (p<0.001);

the comparison of frequent use of smoked meat and elevated blood pressure showed that 53,2% of respondents, who frequently use smoked meat in their diet have consistently high blood pressure. The OR for this group is 1,341 (95% CI 1,070-1,678) (p=0,006);

during the study of the group of people, who often consumes various sweets relatively to elevation of BP it was estimated that 51,1% of people, who consume sweets in excessive quantities had elevation of BP. It is estimated that OR is 1,510 (95% CI 1,210-1,884) (p<0.001).

We performed a study of the effect of two characteristics of night sleep (quality and quantity) on BP. The comparison of high BP and restless sleep showed that high level of BP was found in 55,9% respondents with violation of the sleep-nature. The comparison of BP level and sleep duration shows that elevated level of BP is observed in 55.1% of cases. The OR for those groups are: the OR for violation of the sleep nature is 1,762(95% CI 1,279-2,426) (p<0.001); the OR for violation of the sleep duration is 1,648 (95% CI 1,126-2,411) (p=0,010).

During the comparison of the level of BP and low physical activity it was found that 62,4% of respondents in this group, who daily have low physical activity have high numbers of BP. The OR is 2,734 (95% CI 2,102-3,555) (p<0.001). A similar pattern is observed under the comparison of BP relatively to passive way of rest. It was found that 53,7% of respondents, that prefers passive recreation have consistently higher BP. The OR is 2,476 (95% CI 1,970-3,112) (p<0.001).

In our study we evaluated the impact of mental stress on BP. The two indicators were: the presence of stress and tensed family relations. Comparing the level of BP and constant influence of stress, it was defined that 51,8% of respondents, who notes constant influence of stress have elevated BP numbers. The OR is 1,537 (95% CI 1,227-1,926) (p<0.001). During the comparison of BP and tensed relationships in the family it was revealed that 55,3% of respondents with tensions in the family have high BP. The OR is 3,072 (95% CI 1,517-6,221) (p<0,001).

We have compared the dependence of high BP relatively to burdened cardiac history and found that 53,1% of respondents, who have one or more close relatives with proved cardiovascular disease have increased level of BP. The OR is 1,397 (95% CI 1,110-1,758) (p=0,004).

During the survey we compared high BP in respondents, who controls their level of BP and found that 39% of respondents in this group have high numbers of BP. The OR is 0,249 (95% CI 0,117-0,349) (p<0.001).

Exploring the relationship between BP and presence of complains from the side of the heart (discomfort in the chest, disruption of the heart rhythm, pain in the heart area) it was found that 56,6% of respondents with complains have elevated level of BP. The OR is 3,090 (95% CI 2,453-3,893) (p<0.001).

Appeal for medical help – self-treatment: 64,3% BP. The OR is 1,942 (95% CI 1,553-2,428) (p<0.001).

In this way through a simple regression analyses we identified risk factors, which are authentically associated with the development of arterial hypertension. To predict development of hypertension we used multiple logistic regression analysis, where we inserted predictors that were significant under simple logistic analysis.

Taking into account all factors contemporaneously in this model it was revealed that diary consumption, consumption of beef and smoked meat food, physical activity, night sleep, stress, character of recreation, presence of cardiovascular disease and appeal for medical help were not significant. It means those factors were confounders (factors that interpose and influence the results).

Factors that actually increases the risk of hypertension-development are: age above 40 years OR 4,608 (95% CI 3,415-6,219) (p<0.001), male gender OR 2,367 (95% CI 1,733 - 3,232) (p<0.001), BMI (obesity) OR 2,274 (95% CI 1,715 - 3,014) (p<0.001), cigarette-smoking OR 1,761 (95% CI 1,193 – 2,600) (p=0.004), alcohol abuse OR 1,683 (95% CI 1,139 - 2,488) (p=0.009), frequent consumption of pork OR 1,523 (95% CI 1,109 - 2,090) (p=0.009), frequent consumption of sweets OR 1,657 (95% CI 1,241 - 2,214) (p=0.001), the duration of sleep (less than 6 hours) OR 1,727 (95% CI 1,032 - 2,891) (p=0.038), complains from the side of the heart OR 1,938 (95% CI 1,435 - 2,617) (p<0.001), tensed relations in the family OR 2,902 (95% CI 1,251 – 6,729) (p=0.013).

Table 1. Demographic, medical and behavioral factors associated with the occurrence of hypertension

Risk factors	Main group Arterial hypertension (n=) n(%)	Control group Normal blood pressure (n=) n(%)	OR (CI)	P
Age (over 40 years)	370 (72,4)	141 (27,6)	7,900 (6,132-10,176)	<0.001
Gender (male)	263 (53,6)	228 (46,4)	1,899 (1,512-2,386)	<0.001
Education (secondary)	277 (45)	338 (55)	1,100 (0,883-1,372)	0,396
Body mass index (obesity)	356 (60,5)	232 (39,5)	3,632 (2,881-4,580)	<0.001
Smoking (smoking cigarettes)	223 (59,6)	151 (40,4)	1,918 (1,263-2,913)	0,002
Alcohol (abuse)	120 (52,9)	107 (47,1)	1,177 (0,883-1,569)	0,150
Fruits (occasionally)	59 (39,6)	90 (60,4)	0,822 (0,580-1,165)	0,270
Vegetables (occasionally)	13 (31,7)	28 (68,3)	0,586 (0,301-1,142)	0,112
Milk (occasionally)	185 (51,7)	173 (48,3)	1,553 (1,215-1,985)	<0.001
Fish (occasionally)	371 (42,8)	496 (57,2)	0,880 (0,696-1,113)	0,288
Poultry (occasionally)	214 (41,1)	307 (58,9)	0,829 (0,662-1,038)	0,102
Pork (often)	433 (51,3)	411 (48,7)	1,805 (1,422-2,290)	<0.001
Beef (occasionally)	418 (52,2)	383 (47,8)	1,547 (1,229-1,949)	<0.001
Lard (often)	431 (44,6)	536 (55,4)	1,133 (0,877-1,464)	0,340
Smoked meat (often)	399 (53,2)	351 (46,8)	1,341 (1,070-1,678)	0,006
Sweets (often)	326 (51,1)	312 (48,9)	1,510 (1,210-1,884)	<0.001
Night sleep (restless)	99 (55,9)	78 (44,1)	1,762 (1,279-2,426)	<0.001
The duration of sleep (less than 6 hours)	65 (55,1)	53 (44,9)	1,648 (1,126-2,411)	0,010
Physical activity (low)	196 (62,4)	118 (37,6)	2,734 (2,102-3,555)	<0.001
The nature of the rest (passive)	377 (53,7)	325 (46,3)	2,476 (1,970-3,112)	<0.001
Relations at home (tense)	684 (55,3)	553 (44,7)	3,072 (1,517-6,221)	<0,001
Feeling stress (always)	384 (51,8)	358 (48,2)	1,537 (1,227-1,926)	<0.001
Working conditions (hard)	90 (42,5)	122 (57,5)	0,936 (0,695-1,260)	0,662
CVD in the family (the presence of relatives)	426 (53,1)	376 (46,9)	1,397 (1,110-1,758)	0,004
Control of blood pressure (yes)	427 (39,0)	669 (61,0)	0,249 (0,177-0,349)	<0.001
Discomfort in the heart aria (available)	382 (56,6)	293 (43,4)	3,090 (2,453-3,893)	<0.001
Treatment (self-treatment)	411 (64,3)	228 (35,7)	1,942 (1,553-2,428)	<0.001

Table 2. Predictors of hypertension after multiple regression analysis

	Mean square error	P	Exp (B)	95% CI for EXP(B)	
				lower	higher
Age (over 40 years)	,153	,000	4,608	3,415	6,219
Gender (male)	,159	,000	2,367	1,733	3,232
BMI (obesity)	,144	,000	2,274	1,715	3,014
Smoking (smoking cigarettes)	,199	,004	1,761	1,193	2,600
Alcohol (abuse)	,199	,009	1,683	1,139	2,488
Milk (occasionally)	,177	,940	1,013	,717	1,433
Pork (often)	,162	,009	1,523	1,109	2,090
Beef (occasionally)	,159	,481	,894	,654	1,221
Smoked meat (often)	,177	,256	1,222	,865	1,729
Sweets (often)	,148	,001	1,657	1,241	2,214
Night sleep (restless)	,229	,328	,799	,510	1,253
The duration of sleep (less than 6 hours)	,263	,038	1,727	1,032	2,891
Physical activity (low)	,190	,234	1,254	,864	1,821
Relations at home (tense)	,429	0,013	2,902	1,251	6,729
Feeling stress (always)	,183	,621	,913	,638	1,308
The nature of the rest (passive)	,161	,204	1,228	,895	1,684
CVD in the family (the presence of relatives)	,151	,527	1,100	,818	1,480
Control of blood pressure (yes)	,212	,000	,445	,293	,674
Discomfort in the heart area (available)	,153	,000	1,938	1,435	2,617
Treatment (self-treatment)	,147	,267	,849	,636	1,133
Constant	1,406	,000	,001		

The factor that decreases the risk of the development of hypertension is control of blood pressure OR 0,445 (95% CI 0,293 - 0,674) ($p<0.001$).

DISCUSSION

The results showed that the main factors that influence the formation of arterial hypertension are: age (above 40 years), male gender, BMI, bad lifestyle habits (smoking and alcohol consumption), dietary factors, duration of night sleep, character of physical activity, character of recreation, relations in the family and complains from the side of the heart (pain, discomfort).

It is well known that one of the main risk factors for development of cardiovascular disease (CVD) is age. According to the literature, the risk for development of disorders, form the side of cardiovascular system, elevates with the age – many researches consider in this relation age above 50-55 years, but taking in to account that cardiovascular diseases tends to develop in younger age groups in recent years, there are found evidences of increased risk among the group of 35-40 years [24, 25]. Another important risk factor for development of cardiovascular pathology is male gender. According to the literature, the development of cardiovascular diseases in women generally starts 10 years later than in men [26].

Among the main risk factors for cardiovascular disease is overweight and obesity. The influence of overweight on formation of cardiovascular pathologies is proved by a number of clinical and epidemiological researches [27, 28]. The analyses of 57 prospective studies (n=900 thousands) showed that obesity reduces the potential duration of life by an average of 8-10 years. Obesity is also a predictor of stroke and coronary heart disease.

Certainly one of the major risk factors is presence of bad habits. Smoking is one of the leading modified factors of cardiovascular disease. The fact of smoking is related to 10% of the death rate in the world. Almost a half of those 10% is associated with cardiovascular causes [29, 30]. Many researchers discuss the influence of alcohol on development of CVD. Numerous studies describe the ambivalent influence of alcohol on cardiovascular system. [31-33].

The character of nutrition (the products that prevails in the diet) dominate in the functioning of all systems in the body. In order to reduce cardiovascular mortality World Health Organization (WHO) developed a global strategy on diet, physical activity and heath in 2004. This strategy considered that one of the main risk factors for development of noninfectious diseases was the lack of fruits and vegetables in the diet. It also was registered that consumption of diary products and low-fat meat has prophylactic influence. On the other hand, sausages and smoked meat food, which is a popular part of modern diet, influence the elevation of cholesterol in the blood. According to the literature the abuse of sugar is a risk factor for metabolic disorders in the human body – the excessive consumption of sweets is one of the reason for overweight and obesity [34-38].

Due to geography and traditions one of the common components of the diet is pork. According to the researches excessive consumption of pork creates a favorable background for development of cardiovascular events [39, 40].

According to recent foreign studies one of the factors that causes disorders in the cardiovascular system is disturbed sleep, especially its duration (less than 6 hours). The violation of circadian rhythms causes an imbalance in autonomic and hormonal regulation of body functions [41].

In accordance with numerous studies among the risk factors for cardiovascular disease are physical inactivity and sedentary lifestyle. Physical inactivity became more influential recent 30-40 years due to rapid scientific and technological progress. The manifestation of decreased physical activity is observed both in daily physical activity and in the predominance of passive recreation over active leisure in the spare time [27, 30, 34].

One of the main factors that influence the development of cardiovascular disease and above all arterial hypertension is exposure to nerve strain. The literature emphasizes the role of psycho-emotional factors as predictors of cardiac pathology. This group of predictors consists of two subgroups: chronic stressors (family situation, work situation, low social support, low social status) and emotional factors (depression, anxiety, somatic disorders caused by mental disorders) [42, 43].

The key to early detection and prevention of the cardiac pathology is properly caring about own health. The important factor that should awake concerns relatively to CVD is the presence of complains from the side of the heart. Self-treatment is one of the risk factors for CVD due to unresolved release of prescription drugs. Due to that in case of illness people refuse to visit a doctor. Instead of that, they purchase drugs that their friends recommended or drugs they have seen in commercials.

CONCLUSIONS

On the assumption of the data collected form the literature and results obtained in our study we can make following conclusions:

Taking into consideration of the epidemiological situation regarding the cardiovascular diseases: their prevalence, morbidity, mortality and disability caused by them, it is necessary to focus on the prevention of CVD, clear understanding of the mechanism of risk factors and especially on the features of their detection and removal. It is also necessary to focus on the issues of lifestyle modification and changes in the attitude to proper health.

The disturbance among WHO´s specialists and primary health care providers relatively to CVD is directed to patients, who have present statistical significant risk factors: age above 40 years, IMT (more than 25), smoking and alcohol, malnutrition (insufficient consumption of milk, excessive consumption of pork, sweets and smoked meat), lack of sleep (duration of sleep less than 6 hours), low level of physical activity, neurological stress, burdened cardiac history end especially complains from the side of cardiovascular system.

Efforts should be made to prevent bad lifestyle and modify people's behavior regarding their own lifestyle on all levels of influence: population, group and individual level.

Especially attention should be paid to WHO´s recommendation plan to reduce noninfectious diseases for the years 2013-2020.

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