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High blood pressure in young adults with obesity

L. Khimion, O. Rud
Shupyk National Medical Academy of Postgraduate Education
Family Medicine Department

***The objective*: to estimate the prevalence and distribution of arterial hypertension and risk factors of high blood pressure in young adults with overweight and obesity.**
***Patients and methods*. The study was conducted in a group of 42 persons of both genders aged from 18 to 44 years: 22 patients were obese or overweight and 20 healthy controls with normal body mass index. The evaluation of the main (demographics, body mass index, lifestyle, lipids, blood pressure) and additional (high-sensitive C-reactive protein, uric acid, insulin resistance) cardiovascular risk factors has been performed; the atherosclerosis development has been evaluated by ultrasound method with measurement of the surrogate atherosclerosis markers (intima-media thickness, atherosclerotic plaques in carotid arteries).**
***Results*. High blood pressure (BP) was found in 5 (22,7%), smoking 16 (72,74%), sedentary lifestyle 13 (59%), dyslipidemia 8 (36,4%), hyperuricemia 5 (22,7%), prediabetes 8 (36,4%), insulin-resistance state 4 (20%), thickening of IMT ≥0,9 mm in 10 (45,5%), atherosclerosis plaques in 5 (22,7%). Body mass index was strongly positively correlated to BP, plasma total cholesterol, low density cholesterol, plasma triglyceride and fasting glucose level, also the medium positive correlation was estimated between HOMA index and CRP level (r=0,39), which could be the sign of higher subclinical level of inflammatory process in obese and overweigh patients which further influences the atherosclerosis development.**
***Conclusion*. High blood pressure was more frequent in subjects with overweight and obesity than in controls. In group of patients with overweight and obesity the most frequent risk factors were dyslipidemia and smoking.**
Key words: *arterial hypertension, obesity.*

Essential hypertension is characterized by increased peripheral vascular resistance to the blood flow. The endothelium is a crucial regulator of vascular tone. Its function is impaired in patients with hypertension, with reduced vasodilation, increased vascular tone associated with a proinflammatory state. Low-grade inflammation localized in vascular tissue is therefore recognized as an important contributor to the pathophysiology of hypertension, initiation and progression of atherosclerosis and development of cardiovascular diseases [7].

The prophylaxis of cardiovascular diseases, preventive strategies have become the focus of attention of both physicians and society [2, 4].

PATIENTS AND METHODS

The study was conducted in group of young patients with overweight and obesity and with demographically compared controls.

We examined 22 patients with overweight and obesity and 20 healthy people without any cardiovascular, endocrine or other serious chronic diseases or acute states.

The main group of patients includes 7 (32%) women and 15 (68%) men aged from 23 to 44 years. The average age of patients was 35,6±1,6 years. All patients (100%) of the main group had the central (abdominal) type of obesity; 3 (13,63%) patients were overweighted, 10 (45,45%) – had first degree of obesity, 8 (36,36%) patients had second degree of obesity and 1 (4,54%) – third degree of obesity. The control group consisted of 7 (35%) women and 13 (65%) men. The average age of the control group was 37,5±1,9 years.

Among the patients of the main group 16 (72,74%) were smokers and 13 (59%) patients lead the sedentary lifestyle. In the control group 3 (15%) persons were smokers and 7 (35%) – lead the sedentary lifestyle.

All participants provided written informed consent and were examined for general anthropometrical indicators: body mass (kg), height (cm), the calculation of body mass index (BMI), waist circumference (WC) (cm), hips circumference (HC) (cm), calculating the ratio WC/HC to identify the type of obesity; measurement of blood pressure (mmHg) has been performed; laboratory tests included screening glucose, lipids and proteins metabolism; level of high sensitivity C-reactive protein (CRP) and basal insulin secretion with further calculating HOMA and insulin resistance (HOMA-IR) indexes. The HOMA-IR was calculated according to the following formula: HOMA-IR= [fasting immunoreactive insulin (mlU/L)*fasting plasma glucose (mmol/L) /22,5]. Blood samples were taken from subjects who had fasted overnight.

Carotid arteries walls were examined by high-resolution B-mode ultrasonography («Ultima Pro-30», Ukraine) equipped with a 5–10 MHz transducer. The carotid arteries were examined bilaterally with the evaluation of common carotid, the bifurcation, and the internal carotid arteries from transverse and longitudinal orientations. The intima-media thickness (IMT) was measured using a computer assisted method. Carotid intima-media wall thickening was diagnosed when IMT, which was measured at the far wall of the distal 10 mm of the common carotid artery, was more than 0,9 mm [1, 3].

The data of the study was analyzed with the computer software «Statistica version 6,0», the result shown by «Microsoft Excel». A value of $P<0,05$ was taken to be statistically significant. Results are expressed as the mean M±m unless stated otherwise.

RESULTS AND THEIR INTERPRETATION

According to the analysis of the BP we found significant difference in average blood pressure between main and control groups of patients ($p<0,001$). Thus, the average level of systolic blood pressure (SBP) was 135 mmHg, diastolic blood pressure (DBP) – 88 mmHg in main group, while the average level of SBP and DBP was 113 mmHg and 72 mmHg in control group. Hence, 5 (22,7%) main group's patients had increased SBP above 140 mmHg, and 6 (27,3%) – increased DBP above 90 mmHg. In control group BP above 140/90 mmHg was not found.

According to analysis of the lipid metabolism we found mean plasma total cholesterol (TC) level – 5,75±0,26 mmol/L which was significantly higher in the main group than in controls – 4,79±0,12 mmol/L ($p<0,05$); high-density cholesterol (HDL-C) and low-density cholesterol (LDL-C) level was also different in main and control group: 1,15±0,05 mmol/L, and 3,71±0,23 mmol/L, respectively in main group, without differences between genders and 1,57±0,08 mmol/L and

Table 1

Results of laboratory tests in both groups, M±m

Indicator	Main group, n=22	Controls, n=20
TC, mmol/L	5,75±0,26*	4,79±0,12
TG, mmol/L	2,45±0,46*	1,03±0,10
HDL-C, mmol/L	1,15±0,05*	1,57±0,08
LDL-C, mmol/L	3,71±0,23*	2,78±0,13
Uric acid, мmol/L	354,53±17,18**	266,17±4,55
CRP, mg/L	3,4±0,75*	1,56±0,32

Note: * – significant difference, p<0,05; ** – significant difference, p<0,001.

Table 2

Mean fasting glucose and insulin level, (M±m)

Indicator	Main group, n=22	Group of control, n=20
Glucose, mmol/L	5,23±0,26*	4,06±0,09
Insulin, mlU/L	12,07±1,33*	5,09±0,28
HOMA IR	2,95±0,43*	0,92±0,06

Note: * – significant difference, p<0,001.

Table 3

Results of the carotids ultrasound examination

Date	Main group, n=22	Group of control, n=20
IMT, mm	0,81±0,03*	0,55±0,02
IMT ≥0,9 mm (n/%)	10/45,45*	0
Atherosclerotic plaques (n/%)	5/22,72*	0

Note: * – significant difference, p<0,001.

2,78±0,13 mmol/L respectively in control group (p<0,05). Mean level of plasma triglycerides (TG) was 2,45±0,46 mmol/L in the group of patients with overweight and obesity and 1,03±0,10 mmol/L in the control group (p<0,05).

8 (36,4%) patients in the main group and one (5%) person of the control group had the isolated decrease of HDL-C level less than 1,2 mmol/L for women and 1,1 mmol/L – for men (p<0,05).

The mean plasma level of uric acid in main group was 354,53±17,18 mmol/L, in controls – 266,17±4,55 mmol/L (p<0,001); 4 (26,7%) men and one woman (14,3%) of the main group had increased uric acid level (>450 mmol/L for men and >390 mmol/L for women).

In the main group mean plasma CRP level was 3,4±0,75 mg/L and 1,56±0,32 mg/L in controls (p<0,05) (table 1).

The prevalence of the prediabetes was higher in main group than in controls. Thus, mean fasting glucose was 5,23±0,26 mmol/L in the main group and 4,06±0,09 mmol/L in control group (p<0,001). It is important to emphasize that in 36,4% of main group the fasting glucose level was more than 5,5 mmol/L and in 18,2% – more than 6,1 mmol/L. The same patients also had insulin resistance. In 20% of patients of the main group plasma insulin level was higher than 20 mlU/L and mean plasma insulin was significantly higher (12,07±1,33 mlU/L) than in controls (5,09±0,28 mlU/L) (p<0,001) (table 2).

Analyze of the carotids ultrasound examination results shown also the significant difference in IMT. Thus, mean IMT in main group was 0,81±0,03 mm, and 0,55±0,02 mm – in control group (p<0,001). It is necessary to emphasize that among 10 (45,5%) patients of the main group the IMT thickening more than 0,9 mm was found and in 5 (22,7%) patients – atherosclerotic plaques were diagnosed (table 3).

The correlation analysis was performed further and medium positive correlation was found between BMI and SBP / DBP (r=0,48 and r=0,39) in main group's patients, while the relationships between the same items among patients of the control group showed only low positive correlation (r=0,14) and (r=0,21). The strong positive correlation between IMT and CRP level (r=0,58) was found in group of patients with overweight and obesity. Also the medium positive correlation was estimated between HOMA index and CRP level (r=0,39) in the main group.

Our study has shown that obese and overweighted people have significantly higher prevalence of arterial hypertension and higher mean level of DBP and SBP. A high body mass index was strongly associated with proatherogenic changes in lipids and glucose metabolism, more frequent hyperuricemia and higher level of subclinical inflammation which can lead to the more aggressive atherosclerosis development and increase the cardiovascular risk.

CONCLUSION

1. High blood pressure (>140/90 mmHg) was more frequent in subjects with overweight and obesity than in controls.

2. Among patients with overweight and obesity arterial hypertension was found in 5 (22,7%) for the first time.

3. In group of patients with overweight and obesity the most frequent risk factors were dyslipidemia and smoking.

4. The carotid IMT was higher and frequency of atherosclerotic plaques was also higher in main group than in healthy controls.

5. The strong positive correlation was found between BMI and SBP, DBP; TC, LDL-C, TG, fasting glucose level in patients with excess body weight and obesity.

6. Medium positive correlation was estimated between HOMA index and CRP level, which could be the sign of higher subclinical level of inflammatory process in obese and overweigh patients which further influences the atherosclerosis development.

Високий кров'яний тиск у людей молодого віку з ожирінням

Л. Хіміон, О. Рудь

Мета дослідження: визначити поширеність артеріальної гіпертензії та частоту факторів ризику підвищення артеріального тиску у пацієнтів молодого віку з надлишковою масою тіла та ожирінням.
Матеріали та методи. Було проведено обстеження 42 пацієнтів обох статей віком від 18 до 44 років: 22 пацієнта з надлишковою масою тіла та ожирінням та 20 практично здорових осіб з нормальною масою тіла. У процесі дослідження було проведено визначення основних (демографічні дані, індекс маси тіла, спосіб життя, показники ліпідного обміну, артеріальний тиск) та додаткових (рівень високочутливого С-реактивного протеїну, сечової кислоти, рівень інсуліну плазми крові та наявності інсулінорезистентності) факторів ризику серцево-судинних захворювань. Виявлення атеросклеротичного ураження судин здійснювали шляхом ультразвукової візуалізації сонних артерій з визначенням сурогатних маркерів атеросклерозу (потовщення комплексу інтима-медіа, наявність атеросклеротичних бляшок).
Результати. У групі пацієнтів із надлишковою масою тіла та ожирінням у 5 (22,7%) хворих було виявлено підвищення АТ, у 16 (72,74%) – шкідливі звички, 13 (59%) пацієнтів вели малорухомий спосіб життя, дисліпідемію виявили у 8 (36,4%), гіперурикемію – у 5 (22,7%), підвищення рівня глюкози плазми крові натще – у 8 (36,4%), наявність ІР – у 4 (20%), потовщення ТКІМ ≥0,9 мм – у 10 (45,5%), наявність атеросклеротичних бляшок – у 5 (22,7%) обстежених. У групі пацієнтів з надлишковою масою тіла та ожирінням був виявлений прямий кореляційний зв'язок між індексом маси тіла та рівнем АТ, значеннями загального холестерину та холестерину ліпопротеїнів низької щільності, тригліцеридів та рівнем глюкози плазми крові.
Заключення. Високий кров'яний тиск частіше відзначали у пацієнтів з надмірною масою тіла та ожирінням. Найбільш частими факторами ризику були дисліпідемія та куріння.

Ключові слова: *артеріальна гіпертензія, ожиріння.*

Высокое кровяное давление у людей молодого возраста с ожирением

Л. Химион, О. Рудь

Цель исследования: определить распространенность артериальной гипертензии и частоту факторов риска повышения артериального давления у пациентов молодого возраста с избыточной массой тела и ожирением.
Материалы и методы. Было обследовано 42 пациента обоих полов в возрасте от 18 до 44 лет: 22 пациента с избыточной массой тела и ожирением и 20 практически здоровых лиц с нормальным весом. В процессе исследования было проведено определение основных (демографические данные, индекс массы тела, образ жизни, показатели липидного обмена, артериальное давление) и дополнительных (уровень высокочувствительного С-реактивного протеина, мочевой кислоты, уровень инсулина плазмы крови и наличия инсулинорезистентности факторов риска сердечно-сосудистых заболеваний. Выявление атеросклеротического поражения сосудов осуществляли путем ультразвуковой визуализации сонных артерий с определением суррогатных маркеров атеросклероза (утолщение комплекса интима-медиа, наличие атеросклеротических бляшек).
Результаты. В группе пациентов с избыточной массой тела и ожирением у 5 (22,7%) больных было выявлено повышенное АД, у 16 (72,74%) – вредные привычки, 13 (59%) пациентов вели малоподвижный образ жизни, дислипидемию определили у 8 (36,4%), гиперурикемию – у 5 (22,7%), повышение уровня глюкозы плазмы крови натощак – у 8 (36,4%), наличие ИР – у 4 (20%), утолщение ТКИМ ≥0,9 мм – у 10 (45,5%), наличие атеросклеротических бляшек – у 5 (22,7%) обследованных. В группе пациентов с избыточной массой тела и ожирением была обнаружена прямая корреляционная связь между индексом массы тела и уровнем АД, значениями общего холестерина и холестерина липопротеинов низкой плотности, триглицеридов и уровнем глюкозы плазмы крови.
Заключение. Высокое кровяное давление чаще отмечали у пациентов с избыточной массой тела и ожирением. Наиболее частыми факторами риска были дислипидемия и курение.

Ключевые слова: *артериальная гипертензия, ожирение.*

AUTHORS

Khimion Ludmila – MD, PhD, chief of Department of Family Medicine, Shupyk National Medical Academy of Postgraduate education, Dorogozhytska 9 str., 04112 Kyiv, Ukraine, (050) 469-33-96. E-mail: ludmilahimion@hotmail.com

Rud Oksana – PhD researcher, Department of Family Medicine, Shupyk National Medical Academy of Postgraduate education, Dorogozhytska 9 str., 04112 Kyiv, Ukraine, (066) 508-32-18. E-mail: vv.saranciuc@gmail.com

REFERENCES

1. Castellon X. Screening for subclinical atherosclerosis by noninvasive methods in asymptomatic patients with risk factors / X. Castellon, V. Bogdanova // Clin. Interv. Aging. – 2013. – № 8. – P. 573–580.
2. Cholesterol Treatment Trialists' (CTT) Collaboration, Baigent C, Blackwell L, Emberson J, Holland LE, Reith C, Bhala N, Peto R, Barnes EH, Keech A, Simes J, Collins R. Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170,000 participants in 26 randomised trials. Lancet 2010; 376:1670–1681.
3. Early atherosclerosis detection in asymptomatic patients: a comparison of carotid ultrasound, coronary artery calcium score, and coronary computed tomography angiography /B. Schroeder, G. Francis, J. Leipsic [et al.]// Can. J. Cardiol. – 2013. – Vol. 29, № 12. – P. 1687–1694.
4. Effects of dietary approaches to stop hypertension (DASH)-style diet on fatal or nonfatal cardiovascular diseases-incidence: a systematic review and meta-analysis on observational prospective studies / A. Salehi-Abargouei, Z. Maghsoudi, F. Shirani, L. Azadbakht //Nutrition. – 2013. – Vol. 29, № 4. – P. 611–618.
5. Heart disease and stroke statistics-2012 update: a report from the American Heart Association / V.L. Roger, A.S. Go, D.M. Lloyd-Jones [et al.] // Circulation. – 2012. – Vol. 125, № 1. – P. e2-e220.].
6. Klein S, Allison DB, Heysfield SB, Kelley DE, Leibel RL, Nomas C et al. Waist circumference and cardiometabolic risk: a consensus statement from Shaping Americar's Health: Association for Weight Management and Obesity Prevention, NAASO, The Obesity Society; the American Society for Nutrition, and the American Diabetes Association. Am J Clin Nutr 2007;85:1197–1202.
7. Sinaiko AR, Steinberger J, Moran A, Prineas RJ, Vessby B, Basu S, et al. Relation of body mass index and insulin resistance to cardiovascular risk factors, inflammatory factors and oxidative stress during adolescence. Circulation 2005;111:1985–1991.
8. Townsend N, Nichols M, Scarborough P, Rayner M. Cardiovascular disease in Europe – epidemiological update 2015. Eur Heart J 2015; 36: 2696–2705.
9. 2013 ESH/ESC Guidelines for the management of arterial hypertension. The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC) // Eur. Heart J. – 2013. – Vol. 34. – P. 2159–2219.
10. Артеріальна гіпертензія. Оновлена та адаптована клінічна настанова, заснована на доказах (2012 рік): практичні рекомендації / Робоча група з артеріальної гіпертензії Укр. асоц. кардіологів // Артериальная гипертензия. – 2012. – № 1. – С. 96–152.
11. Бильченко А.В. Новые европейские рекомендации ESH/ESC 2013 по лечению артериальной гипертензии / А.В. Бильченко // Здоров'я України. Тематичний номер «Кардіологія. Ревматологія. Кардіохірургія». – 2013. – № 3 (28). – С. 10–11.
12. Коваленко В.М. Національна стратегія боротьби з артеріальної гіпертензії в Україні: соціальні та медичні аспекти / В.М. Коваленко // 2012.

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