

Hyperuricemia as a risk factor for arterial hypertension among the population of the Fergana region of the Republic of Uzbekistan

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Abstract. Today, a lot of data has been accumulated on the role of purine metabolism disorders in the development of a number of diseases, including cardiovascular diseases. However, the results of a large number of epidemiological and clinical studies aimed at detecting the pathogenetic relationship between hyperuricemia (HU) and arterial hypertension (AH) are contradictory. According to the purpose of the study - to study the epidemiological conditions in relation to hypertension in connection with HU and other risk factors in order to be able to plan multifactorial prevention on this basis, we carried out epidemiological study of hypertension due to a combination of risk factors such as HU, impaired carbohydrate tolerance (IHT), pesticideemia, dyslipoproteinemia (DLP), overweight and smoking among rural men and women of working age. We chose a continuous method of epidemiological examination with the measurement of blood pressure, ECG, anthropometric and biochemical studies. To determine the groups for primary, secondary and tertiary prevention, we have established the level of individual risk of developing hypertension. On this basis, a percentile distribution was built and the entire population of men and women was divided into 3 groups: 1-group of moderate risk (84.6%); 2-high-risk group (10.3%) and 3-group of patients (5.1%).

1 Introduction

Elevated uric acid (UA) as a predictor of cardiovascular morbidity and mortality has been studied in virtually every large population-based study, with varying results. An independent relationship has been established between the level of uric acid, morbidity and mortality from cardiovascular pathology, as well as the risk of developing coronary diseases and the frequency of hospitalizations [1-8]. However, the results of a large number of epidemiological and clinical studies aimed at detecting the pathogenetic relationship of HU, arterial hypertension, and other risk factors are contradictory [2, 4, 5].

The 2013 European Society of Cardiology and European Society of Hypertension Guidelines for the Treatment of Arterial Hypertension place particular emphasis on HU,

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which is considered as a risk factor for reduced renal blood flow and the development of nephrosclerosis [9].

Hyperuricemia is considered to be an excess of serum uric acid levels of more than 7.0 mg/ dl (420 μ mol /l) in men and 6.0 mg/ dl (360 μ mol /l) in women. In 85-90% of HU is the result of hypoexcretion urates by the kidneys. Among people with HU, only 30.5% of cases develop gout within 10 years [7].

Today, a lot of data has been accumulated on the role of purine metabolism disorders in the development of a number of diseases, including cardiovascular diseases [1, 6, 10]. In the course of numerous studies (MNAKEB I, MOMSA / KSZha, AMOSHE, RSMA, MNIT, ASS), convincing data have been accumulated on the close relationship between hyperuricemia (HU) and an increased risk of cardiovascular complications in patients with arterial hypertension (AH), metabolic syndrome (MS), coronary heart disease (CHD), heart failure (HF), chronic kidney disease (CKD). It has been proven that HU is a significant risk factor for a decrease in arterial wall elasticity, progression of MAU, an increase in serum creatinine, a decrease in GFR, the formation of LVH, and carotid atherosclerosis [11, 12].

The development and implementation of any preventive program requires a comprehensive study of the epidemiological conditions of a particular pathology. In the Republic of Uzbekistan and throughout the region of Central Asia, where about 70% of the population lives in rural areas and is engaged in agriculture, epidemiological studies on arterial hypertension (AH) due to a combination of risk factors such as hyperuricemia (HU), carbohydrate intolerance (GTU), pesticideemia, dyslipoproteinemia (DLP), overweight and smoking among rural men and women of working age were not conducted, which makes it impossible to fully assess the epidemiological situation in our region. All of the above necessitated this study.

The purpose of the study was to study the epidemiological conditions in relation to arterial hypertension due to HU and other risk factors in order to be able to plan, on this basis, multifactorial and integral prevention of arterial hypertension in rural areas of the Republic of Uzbekistan.

Research objectives _

1. To determine the prevalence of HU and other major risk factors for AH among rural men and women of working age.
2. Determine the prevalence of hypertension in the rural population
3. To study the relationship between the prevalence of hypertension and the level of risk factors.
4. Describe the distribution of the population into groups for primary, secondary and tertiary prevention.

2 Materials and research methods

To detect arterial hypertension, we chose a continuous method of epidemiological research. The object of the survey were workers and employees of both gender united by the principle of work in one institution of the Fergana region. The examination was carried out by 540 men and 539 women aged 20-59 years, which accounted for 82% of the total number of workers and employees of the specified age, which allows us to consider the data we received reliable. Measurement of blood pressure was carried out twice on the right hand in the sitting position of the subject with a mercury sphygmomanometer . The value of arterial pressure was registered with an accuracy of 2 mm Hg. The presence of AH was evidenced by SBP values >160 mm Hg , DBP - 90 mm Hg , also in the presence of normal blood pressure , if the subject has taken antihypertensive drugs for the last 2 weeks.

The determination of the level of uric acid and cholesterol in the blood serum was carried out on a Veskman autoanalyzer manufactured in the USA. The pore criterion for

uric acid is 0.12-0.43, for cholesterol 3.88-6.47 mmol / l. The concentration of triglyceride in the blood serum was determined by the Bio -La-Test method, hypertriglyceridemia corresponds to a value > 1.82 mmol / l. Determination of persistent organochlorine pesticides in blood serum was carried out on gas chromatograph Tsvet -106". The biomass index was calculated by the formula: weight (kg): height (m²). Overweight corresponded to the index value - Quetelet \geq 30.0. Those who smoked at least one cigarette were considered smokers per day. All methods of instrumental and biochemical research are standardized in the laboratories of the clinic. Mathematical processing of the material was carried out on an EVM type "Wang 2200", manufactured in the USA using a software package. A logistic model was used to calculate the individual risk of developing the disease, taking into account the presence and FR potential.

3 Results and discussion

The prevalence of HU in the male population was 4.9%, in the female population - 2.5% of those examined and increases with age from a minimum value of 20-29 years (in men - 1.2%, in women -1.0%) to maximum at 40-59 years (18.1% and 11.4%, respectively, $p < 0.001$ and $p < 0.005$). An analysis of the prevalence of HU in the presence and absence of other risk factors showed that HU is detected much more often among people with high blood cholesterol than with normal ones (in men - 29.7% and 1.8%, respectively, in women - 20.0% and 1.4%, respectively, $p < 0.001$). In men, a significant relationship between HU and HTG was found, while in women there was no such relationship. In both men and women, individuals with HU are 2.5 to 3 times more likely to have overweight than those with normal body weight.

Among male smokers, HU is detected more often than among non-smokers (5.3% and 4.2%, respectively), but this relationship is not significant. Among women with GU, there were smokers. Pesticideemia has a significant effect on the incidence of HU in men (7.1% versus 0), while HU was not associated with pesticideemia in women (2.9% versus 3.2%). However, analysis of the level of uric acid in the blood, depending on the presence in the blood of a combination of several components of pesticides, showed the highest frequency of HU in individuals with a combination of 2 or more components (5.2%), with one component - 1.8%, and in the absence of pesticides - 1.6%.

In men with HU, the frequency of ICT was 66.6%, without HU - 9.1% ($p < 0.001$), in women - 33.3% and 13.0%, respectively ($p < 0.05$).

One of the objectives of our study was to establish the true prevalence of hypertension among the rural organized population of the Ferghana Valley. The prevalence of hypertension among men aged 20-59 years was 5.9%, among women - 4.3% of the surveyed. In both men and women, the frequency of hypertension increased with age from a minimum value of 20-29 years (men - 1.0%, women - 0.8%) to a maximum of 40-59 years (20.2% and 22.6%, respectively), the differences are significant.

Evaluation of the prevalence of hypertension in the presence and absence of risk factors showed a significant relationship between the incidence of hypertension and HU. Thus, among women with HU, AH was detected in 9.0% of cases, without HU - 4.2%, while in men there was a high relationship between AH and HU (38.0% versus 3.9%, $p < 0.001$). Significant association of hypertension was noted with ICT, pesticideemia, CS, HTG and overweight in both men and women. Thus, in men, AH was detected among persons with ICT in 42.1%, without ICT - 10.8%, among women - 50.0% and 10.0%, respectively ($p < 0.001$). In the presence of HCH in men, AH was detected in 23.4%, in the absence - 3.4% ($p < 0.001$), in women - 16.0% and 3.6%, respectively ($p < 0.05$). In men with HTG - 19.0%, without HTG - 3.3% ($p < 0.001$), in women - 9.0% and 4.2% - 13%, respectively (p

< 0.05). In men with overweight - 24.2%, without overweight -3.2% ($p < 0.001$), in women - 11.9% and 2.6%, respectively ($p < 0.001$). In men with pesticideemia - 14.2%, without pesticideemia -2.0% - ($p < 0.001$), in women - 10.2% and 0, respectively. Among male smokers, AH was detected in 6.1%, among non-smokers - 5.5%, the difference is unreliable. There were no smokers among women with AH.

The prevalence of hypertension among men and women was highly dependent on the degree of RF combination. In the presence of 3 or more RFs in men, AH was detected in 56.2%, with 2 RFs - 26.0%, with 1 RF - 12.5%, without RF - 6.2%. In women - 39.1%, 26.1%, 30.4% and 4.35%, respectively.

The frequency of hypertension in the quintile distribution of blood levels of uric acid, cholesterol, triglycerides among men in the 5th quintile is 8-10 times higher than in the 1st quintile, among women - 2 times. A high difference in the frequency of AH in the I and 5 quintiles of the Quetelet index, fasting blood sugar and 2 hours after exercise in both men and women.

Using a logistic model that allows calculating the individual risk of developing the disease, taking into account the presence and potential of risk factors, it was found that in men, HU has a more prognostic value in the development of AH than in women (2.21 and 0.61, respectively). Both in men and women, the highest information content has a violation of tolerance to carbohydrates (4.86 and 5.19, respectively). Smoking is the least informative in both populations (Fig. 1).

To determine the groups for primary, secondary and tertiary prevention, we have established the level of individual risk of developing hypertension. On this basis, a percentile distribution was built and the entire population of men and women was divided into 3 groups: 1-group of moderate risk (84.6%); 2-high-risk group (10.3%) and 3-group of patients (5.1%) (Fig. 2).

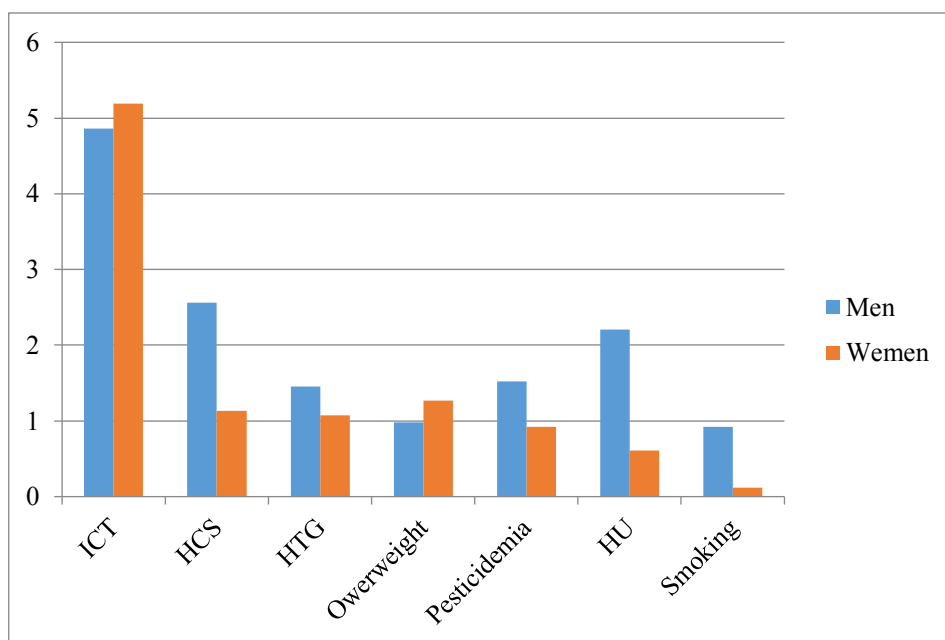


Fig. 1. Degree of informativity of risk factors for AH in men and women aged 20-59 in the rural organized population of the Ferghana Valley.

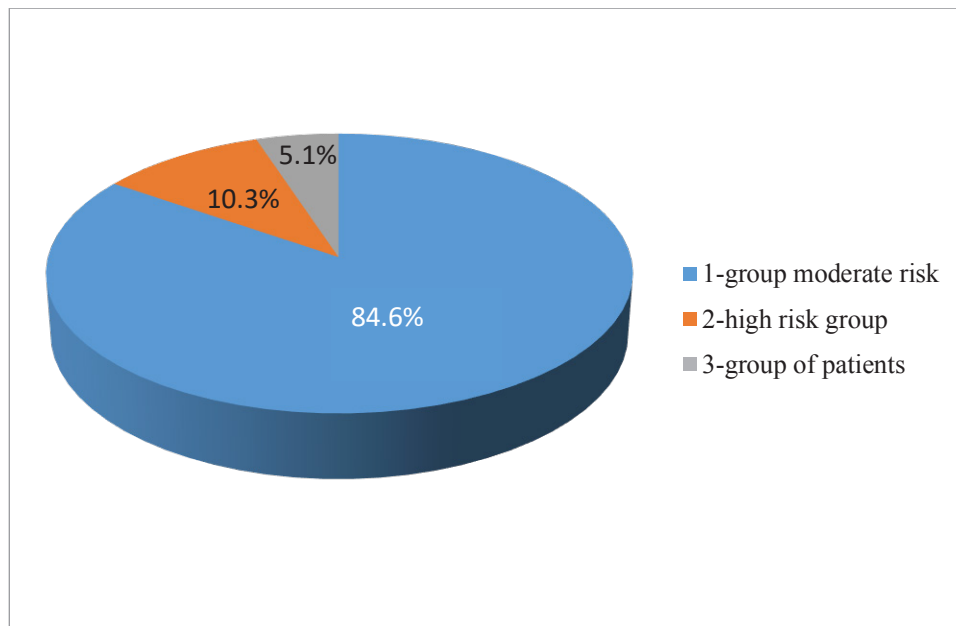


Fig. 2. Groups of active prevention according to the degree of probability of developing hypertension, depending on the information content of the RF of the rural organized population of men and women of the Fergana Valley.

4 Conclusion

Hyperuricemia among men is detected 2 times more often than among women and, in combination with other risk factors, has a high prognostic value in the development of hypertension among the population of the Fergana Valley;

In mass surveys of the population, it is necessary to conduct a wide study on the content of uric acid in the blood;

Along with the identification of HU, it is necessary to identify other risk factors so that they can be assessed collectively using a logistic model to distribute the population into appropriate groups that need a differentiated preventive intervention.

References

1. Bilchenko A. V. Hyperuricemia as a risk factor for cardiovascular morbidity and mortality. Russian Medical Journal. 2009. No. 10. P. 46–48.
2. Mychka V. B. et al., Recommendations of experts of the All-Russian Society of Cardiology for the diagnosis and treatment of metabolic syndrome (second revision). Doctor.ru. 2010. No. 3. P. 15–18.
3. Tashkenbayeva E. N. et al., Asymptomatic hyperuricemia, pathogenetic aspects, clinical prediction and correction. Tashkent, FAN, 2014. P. 176.
4. Tashkenbayeva E. N., Hyperuricemia in pathogenesis, clinic of the metabolic syndrome and the development of cardiovascular complications: dissertation for the degree. Tashkent, 2010. P. 216
5. Clinical significance of hyperuricemia and uric acid metabolism in the pathology of the cardiovascular system. B. G. Khodzhakuliyev , G. O. Begencheva , D. M. Akhmedova

- [et al.]. Young scientist. 2014. No. 18. Pp. 178-184
6. Hyperuricemia as a risk factor for target organ damage and the possibility of its drug correction in patients with metabolic syndrome. The topic of the dissertation and abstract on the Higher Attestation Commission of the Russian Federation 14.01.04, Candidate of Sciences Chumachek , Elena Valerievna
 7. Dubchak, N. New and improved strategies for the treatment of gout. N. Dubchak , G. Falasca. *Int J Nephrol Reno vase Dis.* 2010. No. 3. P. 145-166.
 8. Choi HK Independent impact of gout on mortality and risk for coronary heart disease. HK Choi, G. Curhan. *Circulation.* 2007. No. 116. R. 894-900.
 9. ESH/ESC Guidelines for management of arterial hypertension 2013. *European Heart Journal.* 2013. No. 28. P. 2159-2219.
 10. Hsu, CY Risk factors for end-stage renal disease: 25-year follow-up. CYHsu, C.Iribarren, CEMcCulloch, J.Darbinian, ASGo. *Arch Intern Med.* 2009. No. 4. P. 342-350.
 11. Obermayr R. Elevated Uric Acid Increases the Risk for Kidney Disease. R. Obermayr, C. Temml, G. Gutjahr, M. Knechtelsdorfer, R. Oberbauer , R. Klauser- Braun. *Am Soc Nephrol.* 2008. No. 12. P. 2407-2413.
 12. E. Oda, Uric acid is positively associated with metabolic syndrome but negatively associated with diabetes in Japanese men. E. Oda, R. Kawai, V. Sukumaran, K. Watanabe. *Intern Med.* 2009. No. 48. P. 1785-1791.