MEDICAL-ECONOMIC EFFECTIVE MONITORING SYSTEM AND FORECASTING MODEL OF ARTERIAL HYPERTENSION IN FARMER POPULATION

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ANNOTATION

In this review of the literature, the authors highlighted today's and tomorrow's promising strategies for the introduction of a new system of increasing the AG index against the background of inconsistencies in the effectiveness of arterial hypertension control, risk factors and epidemiological status. In order to implement them and/or to obtain scientifically based "basic data" in the direction of AG epidemiology and prevention, taking into account the positive and negative trends presented in the review of the literature, it is necessary to continue modern substantive research. In the regions of Uzbekistan, there was a great need and necessity to solve the problems of AG in this way. The lack of scientific study of this issue, especially among the large population of Uzbekistan engaged in farming, undoubtedly requires science to fill the "gap" in this direction.

Key words: arterial hypertension (AG), cardiovascular diseases (CVD), non-infectious diseases (NC), arterial pressure (AB), excess body weight (OTV), type 2 diabetes mellitus (QD 2).

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Official statistical methods (arterial hypertension) cannot present the true prevalence rate of AH in the population. It is done in such a way that in every second patient, AH is not detected in time, AB remains out of control and/or the effectiveness of treatment is drastically reduced, even completely lost [4; 5; 18].

Basic and clinical research, in the case of AH, needs to fill the "gap" to demonstrate their progress. Otherwise, the level of detection of AH will continue to increase, studies conclude that it will "increase" by 15-20% worldwide by 2025, and the number of infected people will reach 1.5 billion [20].

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In line with the increase in AH, the problem of the epidemic of "hard end-points" related to it will intensify: AH alone has been confirmed to be the cause of disability in 200 million cases [10].

It is no exaggeration to draw such a conclusion: AH "pressure" should be studied on a large scale and repeated - epidemiological studies at the population level and have real data about it. This allows for an accurate assessment of the factors associated with AH and requires consideration of the epidemiological characteristics of AH and early prevention and treatment measures based on the place of residence of the population. As a result, the effective control rate of AH increases by 50% in the period of prehypertension and AH I stage; 2) it provides pharmacoeconomic effect (at the family level, at the level of medical institutions, at the national level), pharmacocontrol is beneficial, the quality of treatment fully meets international standards, and the annual death of 10 million people from AH is reduced by at least 90%, or such a promising "horizon" Anti-pandemic AH is starting to show.

Therefore, the study and evaluation of these issues in the modern population is of scientific and practical importance, especially the lack of epidemiological and preventive solutions to AH problems among the population engaged in farming activities draws attention. In the conditions of Uzbekistan, preventive programs have not been implemented and developed in the population engaged in farming activities.

In order to evaluate the modern origin and prevention of AH, regular epidemiological studies have been carried out and are currently being carried out in the near and far foreign countries. For example, Kobya Kova O.S. et al. (2019) – in the Russian Federation (RF) [14], Latyshevakaya N.I. and co-authors [2021]– in Volgagrad region of Russia [7], Balanova Yu.A. and all. [2014] - ESE RF study [2], Tolebaeva N.A. and co-author [2021] - in the Kyrgyz Republic [9], Oshoa - Aviles A. et al. (2014) - in Ecuador [117], IDE - FICS study (2014) in distant foreign countries [15], National Health and Nutrition Examination Survey (2020) -

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study in USA [13], Marti S. and co-author (2015) - in distant foreign countries [16], Frec C. and co-author (2013) - in distant foreign countries [12] Park L.C. and co-author (2016) - in 8 foreign countries [17], Dzau V.S. et al. (2019) - in the population of distant foreign countries [3], the ESSE-RF 2 study in Russia [4]. EPOXA - AH (2019) - Studies conducted in Russia [1], Brunstrom M. Et al (2017) - included 74 epidemiological studies and 300,000 population observation (2017) - including [19].

It appears from them that it is difficult to achieve and control the delivery of AB to the target level, even in developed countries. No country has achieved complete elimination of its risk at the population level.

Studies have confirmed a unanimous result: the problem of AH is so huge for humanity and public health that it is difficult to assess. Despite advances in clinical and basic research, the prevalence of AH in the population is increasing. Its control rate at the population level remains low. In such conditions, epidemiological investigations to determine the factors affecting the formation, course and treatment of AH, the trend observed in the world, expansion and strengthening are considered to be the priority and promising topic of the science of Uzbekistan.

The purpose of the study is to study the epidemiology and prevention aspects of arterial hypertension among the population engaged in farming activities.

RESEARCH MATERIAL AND METHODS

The study design is a simultaneous epidemiological investigation. In accordance with it, standardized and unified methods that meet the requirements of the WHO were used, a special training course was organized and trained for the scientific staff of the comprehensive examination and they were trained to work with the methods of "Prophylactic medicine" [WHO, 2021].

The place of the research is Pakhtaabad District, Andijan Region, Fergana Valley. Reasons for the selection site: the local population has not been involved

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in epidemiological studies before, it is very convenient to connect with the screening site by transport, there is no population migration, the population is densely populated, farming activities are well established and all its types (horticulture, rice, cotton, livestock, fishing, vegetable growing) , grain farming, etc.) developed, it is possible to attract the material and technical capabilities and employees of local health institutions to the research, the interest of the regional leadership in the results of the investigation is high, and the region with its ecological, meteorological, climatic, heliogeophysical, medical and epidemiological characteristics covers the entire Fergana Valley can represent, the results of the inspection can be presented at the valley level.

The object of research is the organized population of Pakhtaabad district engaged in farming. A representative group of this population - 2182 residents was involved in the study and examined according to the full examination program: • ≥ 18-70 years old women - 1113 (50.5%) and men - 1069 (49.5%); • 18-30-year-olds - 435 (women - 199 and men - 236); 31-49-year-olds - 1143 (537 women and 606 men); • 50-69-year-olds - 549 (355 women and 194 men); • 55 people ≥ 70 years old (22 women and 33 men); • people with higher education - 304 people (90 women and 214 men); • people with secondary education - 1896 (861 women and 1035 men); • unmarried - 149 people (28 women and 121 men); • married people - 2000 people (884 women and 1116 men); • divorced people - 46 people (21 women and 25 men); • widows – 26 (19 women and 7 men).

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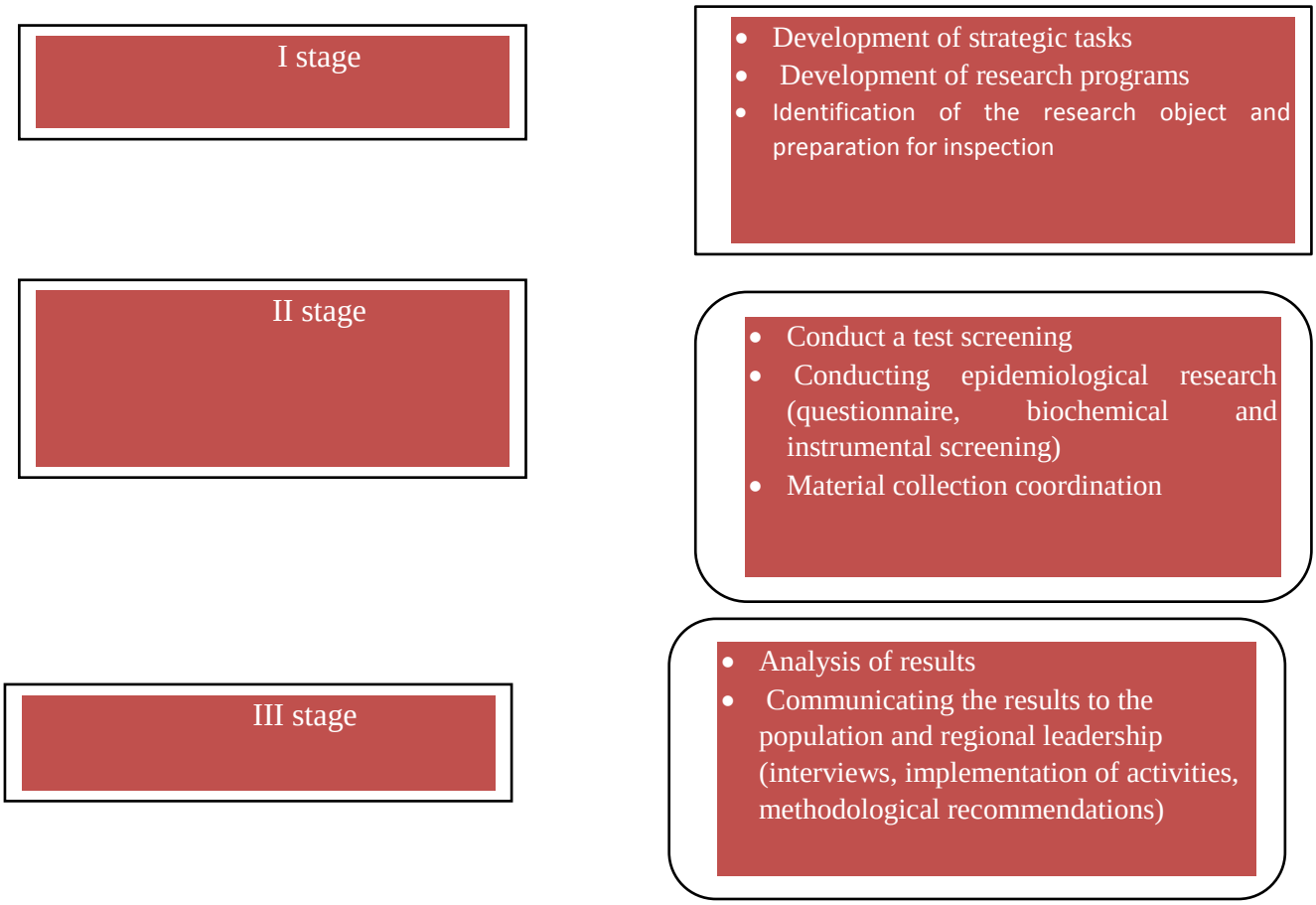

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1. Drawing. Description of the study

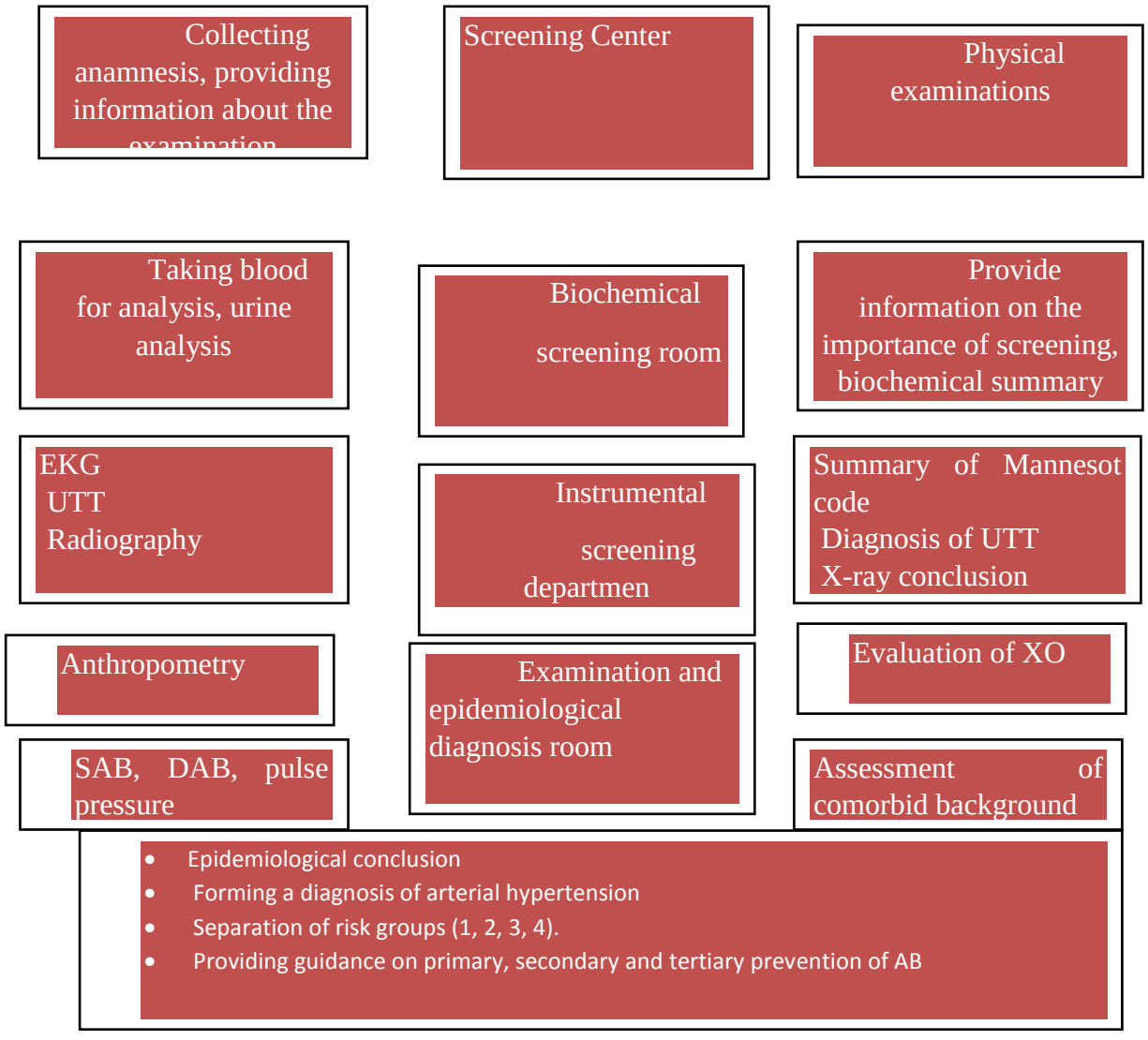
Preparations for the epidemiological research are carried out in the **first stage**

The study was carried out in three stages (Figure 1)

increased, and measures were taken to ensure its effectiveness and reliability. For this, the recommendations of Russia [6], Europe [11] and WHO [21] were used.

The research idea, program, object and its strategic tasks were developed, and the team of examiners and examinees was prepared for the epidemiological investigation.

In phase II, trial screening was conducted in a population of 50 farmers and training of the inspection program was carried out (Figure 1).



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1 – drawing. Directions of research program and work with population.

Work with the population and its movement in the screening center was carried out in the following sequence: the visit of the farmer to the population screening center was organized without dinner (giving general information about the examination, anamnesis collection and physical examinations were carried out) and the population screening department in a strict sequence. and offices, targeted examinations were carried out biochemical screening room (blood and urine analysis, bio-chemical conclusion and information on screening were carried out) instrumental screening room (ECG, UTT and X-ray examinations were carried out, appropriate conclusions were made) Inspection and epidemiological diagnosis room (anthropometry, SAB, DAB and pulse pressure assessment, diagnosis and assessment of risk factors, comorbidity assessment were performed). In the population of each farmer: an epidemiological conclusion was made, the diagnosis of arterial hypertension was fully formed according to KXT-10, and based on it, instructions on primary, secondary and tertiary prevention of AG were given to each participant.

An example of forming a diagnosis:

"Arterial hypertension detected for the first time, stage II, level 2, risk level 3 (high). Left ventricular hypertrophy. Ischemic heart disease: stable atenocardia, I fS. AB target level «130/80 mm.sim.ust. I 10; I 20.8".

Recommendation: perform secondary prevention of AG regularly (if the given instructions are followed) for up to 5 years.

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In the II stage, a test screening and an epidemiological study were conducted. Questionnaire, biochemical and instrumental examination methods are used.

The population answered questionnaire questions on the basis of "Questionnaire for screening of chronic non-infectious diseases" (prof. U.K. Kayumov, 2021). The questionnaire consists of 378 questions approved and recommended for use by the UzR SSV. In order to make an epidemiological diagnosis and demonstrate the epidemiological details of AG, it contains: passport data, complaints, disease and life anamnesis, socio-economic status of the population, questions related to narrow specialties, results of physical examination, results of clinical-laboratory and instrumental examinations, anthropometric data, total internal questions that allow for inferences about members and risk factors are well-rounded.

Biochemical screening included complete blood count, complete urinalysis, and determination and evaluation of glucose, total cholesterol (UCC), and triglyceride (TG) concentrations in blood plasma (in mmol). Their examination was carried out using traditional methods widely used in local treatment and prevention institutions (QVP, interregional treatment centers). The amount of UXS and TG in the blood plasma was determined by the "AA-2" autoanalyzer of the "Technikon" company.

Ultrasound screening (UTT) was performed on a Toshiba-32 B machine and examined the status of the gastrointestinal tract, biliary tract, liver, kidneys, and thyroid gland. ECG was recorded in 12 connections using "6 - NEK" electrocardiography in the order of rest. The electrocardiogram was scored using the Linnesot code (MC) [35]

ExoKG was used with special indicators and, together with ECG, diseases of the target organs associated with hypertension were evaluated:

Left ventricular hypertrophy according to ECG: Sokolov-Layon sign - (V1 + R (vs or v6)] 7 > 38 mm. (for teenagers).

ExoKG:

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Left ventricular myocardial mass index (in teenagers) ≥ 47.58 g/m2.7;

Left ventricular myocardial mass index (in adolescents) ≥ 44.38 g/m2.7.

Sokov – Layon sign (for adults): [S (V1 ± R) (V5 or V6)] > 3.5 Mb Ravl > 1.1 mB; Coriella index > 244 mv xmsec or ExoKG left ventricular myocardial mass index: > 115 g/m2 for men, > 95 g/m2 for women.

Pulsating pressure ≥ 60 mm. level was also taken as a sign of asymptomatic disease of the target organs.

Pulmonological comorbidity and forms (configuration, "hypertensive heart") were evaluated in chest X-ray.

Anthropometry: height was determined with an accuracy of up to 0.50 cm in a standing position (without shoes). Body weight (BW) was measured with standard scales to the nearest 0.1 kg (without shoes and clothes). Excess TV, normal or deficient TV is determined by the Kettle index [the ratio of body weight expressed in kg to the square of height in meters].

The data obtained in the III stage of the research were analyzed. Analysis of complications used the SUDAAN (US Centers for Disease Control and Prevention) software package, meaning 95% confidence intervals were calculated for weighted prevalence analyzes and standard errors.

OBTAINED RESULTS AND THEIR DISCUSSION

One of the final tasks of the study was to improve the practice of creating an AG "construct" and predicting its antecedents in a farming population. For this purpose, a mathematical model of the origin of AG in the population engaged in farming was created (table 1 and figure 1 show its essence).

Table 1 shows that 16 risk factors with a significant negative impact on arterial hypertension were confirmed in the farming population. It is these that cause or increase the risk of the onset, exacerbation and complications of AG as follows:

1) 6 risk factors that strongly cause AG and/or have a high contribution to its origin, and their statistical/clinical significance was reliably confirmed: • comorbidity - RR = 3.86; CI = (2.82 – 5.28); $Xi^2 = 504.83$; R < 0.05; •

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hypodynamia – RR = 2.85; CI = (2.18 – 3.74), Xi² = 276.66; R < 0.05; • overweight – RR = 3.16; CI = (2.37 – 4.17), Xi² = 343.35; R < 0.05; • QD2 – RR = 11.71; CI = (6.87 – 21.22), Xi² = 236.39; R < 0.05; • DLP – RR = 10.81; CI = (6.26 – 20.08), Xi² = 100.76; R < 0.05; • STK (RR = 10.88; CI = (6.58 – 18.85); Xi² = 384.52; R< 0.05).

1 – table

Mathematical model of arterial hypertension risk in farming population

№	Statistical indicators Risk factors associated with AG	Statistical significance of XO				
		Hazard ratio (RR)	CI 95%		Xi^2	P
			↓ min	↑ max		
1	Comorbidity	3,86	2,82	5,28	504,83	< 0,05
2	STK	10,88	6,58	18,85	384,52	< 0,05
3	Hypodynamia	2,85	2,18	3,74	276,66	< 0,05
4	Excess body weight	3,16	2,39	4,17	343,35	< 0,05
5	Diabetes 2 types	11,71	6,87	21,22	236,39	< 0,05
6	Dyslipidemia	10,81	6,26	20,08	200,76	< 0,05
7	Excess salt consumption	2,26	1,75	2,93	157,47	< 0,05
8	Diseases of digestive organs	16,28	7,32	37,97	122,44	< 0,05
9	Smoking tobacco	1,87	1,45	2,42	89,97	< 0,05
10	Arrhythmia	13,47	5,88	34,31	84,25	< 0,05
11	Pharmacoepidemiological XO	1,73	1,34	2,24	69,19	< 0,05
12	Low consumption of fruits and vegetables	1,65	1,27	2,13	57,59	< 0,05
13	Male gender	1,29	1,00	1,66	5,19	< 0,05
14	Female gender	0,78	0,60	1,00	5,19	< 0,05
15	Hereditary predisposition	1,22	0,93	1,59	13,32	< 0,05
16	Alcohol consumption	0,72	0,54	0,98	2,12	< 0,145

2)6 risk factors were also distinguished as risk factors that increase the risk of AG in Fb ShP with medium strong influence, and these are "level 2 risk factors" (compared to level 1 XO), the risk of AG origin is 2.5 - 8, Giving birth 8 times less

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has prognostic significance. Their dependence on AG in this population and their statistical significance are expressed as follows: • in excessive salt consumption - RR = 2.26, CI = (1.75 – 2.93), Xi^2 = 157.47, R< 0.05; • In HAC - RR = 16.28, CI = (7.32 – 37.97), Xi^2 = 122.44, R< 0.05; • in smoking - RR = 1.87, CI = (1.45 – 2.42), Xi^2 = 89.97, R< 0.05; • in arrhythmia - RR = 13.47, CI = (5.88 – 34.31), Xi^2 = 84.25, R< 0.05; • in pharmacoepidemiological risk factors - RR = 1.73, CI = (1.34 – 2.24, Xi^2 = 69.19, R< 0.05; • in low consumption of fruits and vegetables - RR = 1.65, CI = (1.27 – 2.13), Xi^2 = 57.59, R< 0.05.

3) for this population, 4 factors (male gender, female gender, genetic predisposition and alcohol consumption) were confirmed as risk factors ("level 2 XO") that cause a low risk of AG origin (5.1 - table and 5.1 - shown in the figure): • statistically significant significance of dependence on male gender - RR = 1.29, CI = (1.00 – 1.66), Xi^2 = 5.19, R< 0.05; • in women - RR = 0.78, CI = (0.60 – 1.00), Xi^2 = 5.19, R< 0.05; • genetic predisposition - RR = 1.22, CI = (0.93 – 1.59), Xi^2 = 13.32, R< 0.05; • in alcohol consumption - RR = 0.72, CI = (0.54 – 0.98), Xi^2= 2.12, R< 0.145;

These factors "calling effects" of AG are significant, but 2.7 - 33 times weakly expressed or confirmed compared to "2nd degree XO".

These data provide a basis for implementing strong, effective, and reasonable AG prevention in the agricultural labor population.

A mathematical model representing the role of the comorbidity background in the development of mild, moderate and severe AG in the examined population was created and put into practice (table 2 shows this process).

The above analysis confirms that 7 factors have strong (3), moderate (2) and weak (2) effects on the development of EAG and increase its risk and reach statistical significance.

Urinary stone disease is confirmed as the strongest factor in the origin of AG 1-chi level and/or increasing the risk of its development. The statistical significance of its dependence on EAG is proved and expressed as follows: RR =

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19.859, 95% CI = (12.263 – 32.160), Xi² = 807.095, 2.12, R< 0.145; 807.095, R = 0.000.

2 – table

A mathematical model of the origin of mild AG in a farming population

№	Statistical indicators XO, comorbidity	X Ratio (RR)	95% CI		Xi^2	P
			↓Lower	↑High		
1	Type 2 diabetes	7,630	1,844	12,017	146,160	0,000
2	• Urinary stone disease	19,859	12,263	32,160	807,095	0,000
3	Hyperlipidemia	11,931	7,550	18,852	254,129	0,000
4	• Arrhythmia	8,031	3,894	16,566	49,408	0,000
5	• Diseases of digestive organs	6,254	3,191	12,257	41,739	0,000
	Sex:					
	Male	1,449	1,001	2,098	4,382	0,036
	Female	0,690	0,477	0,999	4,382	0,036

Type 2 diabetes is a strong but 5.5-fold lower risk factor for EAG compared to STD in this population [RR = 7.630, 95 CI = (4.844 – 12.017), Xi2 = 146.160; R = 0.000].

Of secondary importance, DLP is confirmed as a factor strongly increasing the risk of EAG origin in Fb ShP [RR = 11.931, 95 % CI = (7.550 – 18.852), Xi2 = 254.129; R = 0.000]. Relatively, its "power of influence is 3.5 times" is less expressed (R< 0.01).

In relation to arrhythmia, the relative risk of EAG in Fb ShP compared to STK is 16 times lower [RR = 8.031, CI = (3.894 – 16.566), Xi² = 49.408; R = 0.000].

The relative risk of EAG origin is 19 times less, and it is proved in relation to diseases of digestive organs [RR = 6.254, 95 % CI = (9.191 – 12.257), Xi2 = 41.739; R = 0.000].

The risk of developing EAG was expressed at the lowest level in men and women when compared to other factors, and the following statistical significance

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was confirmed: 1) in men RR = 1.449, 95 % CI = (1.001 – 2.098), Xi^2 = 4.382; R = 0.036; 2) in women RR = 0.690, 95 % CI = (0.477 – 0.999), Xi^2 = 4.382 R = 0.036.

The results of the analysis to estimate the risk of developing moderate AG in this population are presented in Table 3 below. The above confirms that the risk of O'OAG - QD2 [RR = 22.4, 95 % CI = (14.2 – 35.4), Xi^2= 549.6; R = 0.00], STK [RR = 9.6, 95 % CI = (6.5 – 14.1), Xi^2 = 339.0; R = 0.00] and hyperlipidemia strongly increases Fb in CKD [RR = 14.9, 95 % CI = (9.5 – 23.4), Xi^2 = 332.8, R = 0.00].

Compared to these factors, 2.2 and 2.6 times lower relative risk of moderate arterial hypertension was observed in arrhythmic comorbidity [RR = 24.4, 95 % CI = (12.0 – 49.4); Xi^2 = 191.5; R = 0.00] and the presence of diseases of digestive organs (as a background disease) is confirmed [RR = 22.2, 95 % CI = (11.9 – 41.7); Xi^2 = 227.6; R = 0.00].

The statistical significance of the relationship between the male gender and the origin of OAG is shown in Table 3.

3 – table

A mathematical model of moderate AG origin in a farming population

№№	Statistical indicators XO, comorbidities	X Ratio (RR)	95% CI		Xi^2	P
			↓ Lower	↑ High		
1	Type 2 diabetes	22,4	14,2	35,4	549,6	0,00
2	Urinary stone disease	9,6	6,5	14,1	339,9	0,00
3	Hyperlipidemia	14,9	9,5	23,4	332,8	0,00
4	Arrhythmia	24,4	12,0	49,4	191,5	0,00
5	Diseases of digestive organs	22,2	11,9	41,7	227,6	0,00
	Sex:					
6	Male	0,98	0,69	1,39	0,91	0,01
7	Female	1,02	0,72	1,44	0,91	0,01

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Table 4 shows the relative risk of origin depending on the main risk factors (QD type 2, DLP, male gender, female gender) and comorbidity (STK, arrhythmia, diseases of the digestive organs) in the population examined at the level of AG 3.

4 - table

A mathematical model of the origin of severe AG in a farming population

№№	Arterial hypertension 3-degree combined XO and diseases	Statistical indicators				
		X Ratio (RR)	95% CI		Xi^2	P
			↓ lower	↑ high		
1	Type 2 diabetes	5,1	1,6	16,3	13,4	0,00
2	Urinary stone disease	3,2	1,0	10,2	6,6	0,00
3	Hyperlipidemia	5,6	1,8	18,0	15,4	0,00
4	Arrhythmia	8,0	1,7	37,0	11,8	0,00
5	Diseases of digestive organs	20,4	6,9	60,0	97,9	0,00
	Sex:					
6	Male	2,86	0,91	9,02	3,58	0,06
7	Female	0,35	0,11	1,10	3,58	0,06

The following conclusions are drawn from them: • A higher relative risk of OAG origin is observed depending on digestive organs [RR = 20.4, 95 % CI = (6.9 – 60.0); Xi2 = 97.9; R = 0.00]; • 6.4 times relative risk of OAG is confirmed depending on DLP [RR = 5.6, 95 % CI = (1.8 – 18.0); Xi2 = 15.4; R = 0.00]; • 8.8 times lower expression in comparison, the relative risk of origin of OAG is proved in relation to cardioarrhythmias [RR = 8.0; 95 % CI = (1.7 – 37.0); Xi2 = 11.8; R = 0.00]; • relatively 7.3 times lower relative risk of OAG origin is observed depending on QD type 2 [RR = 5.1; 95% CI = (1.6 – 16.3); Xi2 = 13.4; R = 0.00]; • 16 times less expressed in the comparative analysis, the relative risk of the origin of OAG is determined depending on STK [RR = 3.2; 95% CI = (1.0 – 10.2); Xi2 = 6.6; R = 0.00]; • such a relationship is in men [RR = 2.86, 95 % CI = (0.91 – 9.02); Xi2 = 6.6; R = 0.06] and in women [RR = 0.35, 95% CI = (0.11 – 1.10); Xi2 = 3.58; R = 0.06] was also significant and of clinical significance.

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The purpose of screening is to maintain the health and professional competitiveness of the farming population.

Duties:

- Develop a strategic screening program:
- Conducting an epidemiological study;
- Analyzing the results obtained using the SUDAAN software package and communicating them to the regional management

Screening

Continuously

Periodic

AG risk factors identified Fb ShP

Operative (once a month/3 months)

"late" (half year/year)

Provide an epidemiological summary to the AG

1 time in 1 year

1 time in 2 year

Comorbidity "-" Comorbidity "+"

- Monitoring of AG and its risk factors - DLP, OTV, HAC, smoking, arrhythmias, drugs, MSKI, male and female sex, genetic predisposition, alcohol consumption, QD2 STK, comorbidity, STK.
- Separation of risk groups (1, 2, 3, 4).

Primary and secondary prevention

Training of employees

Tertiary prevention and AG control

Screening - improving control effectiveness: • Early detection of AG increased by 50 percent; • 85% increase in involvement in prevention; • Increase AG control to 95 percent

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2 – scheme. Algorithm for the early detection, prevention and control of AG in a population engaged in farming

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These results show the principles of prevention of mild, moderate and severe arterial hypertension in the farming population and confirm the "main ways" of their control, specific measures - activities. In particular, based on them, an algorithm for early detection and prevention of arterial hypertension in the farming population was developed and put into practice (shown in Scheme 2).

Its essence: a system has been created to integrate AG and its risk factors - screening (continuous and periodic) monitoring, primary and secondary and tertiary prevention, control activities in the examined population. Working in this system increases the early detection of arterial hypertension in the farming population by 50%, the involvement of the population in prevention programs by 85%, and the control level of AG by 95%.

CONCLUSIONS

Epidemiological studies that provide an opportunity to assess the profile of arterial hypertension and its risk factors in the regions of Uzbekistan require scientific training, thorough preparation - training of researchers, formation of a representative sample and mandatory recruitment, and conducting an investigation with strict adherence to the methodology. Only in this case, their results will allow a true assessment of the frequency of arterial hypertension and its risk factors.

16 risk factors have a negative effect on the occurrence of arterial hypertension in the population engaged in agricultural work. Level 1 strong negative influencing factors (comorbidity, type 2 diabetes, dyslipidemia, excess body weight, hypodynamia and STK), "level 2 moderately strong negative influencing factors" (salt abuse, tobacco smoking, arrhythmias, "drug factor ” low consumption of fruits and vegetables) and "3-level weak negative influencing factors" (male gender, genetic factor, female gender and alcohol consumption) are distinguished.

A new algorithm/system has been created for the population engaged in farming, which combines AG and its risk factor screening (continuous and periodic) monitoring, primary and secondary and tertiary prevention, control activities.

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Working in this system increases the effectiveness of medical activity from 50% (in early detection of AG) to 85% (increasing population involvement in preventive programs) and up to 90% (in ensuring full control of AG).

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