ISSN NO: 2770-2936
January, 2026

The Influence Of Climatic And Geographical Factors On The Development Of Arterial Hypertension In The Fergana Valley

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Abstract. Arterial hypertension (HTN) remains one of the leading causes of cardiovascular disease worldwide. Climatic and geographical conditions influence the course of the disease, exacerbating or mitigating its clinical manifestations. In the Fergana Valley (continental climate, hot, dry summers, and moderately cold winters), the prevalence and severity of hypertension may vary depending on temperature and environmental factors. This study aims to examine the relationship between climatic and geographical conditions and hypertension in the adult population of the region.
Keywords: climate, hypertension, factors, course, complications.

Introduction. Arterial hypertension is a chronic cardiovascular disease with multiple etiologies, representing a serious medical and social problem due to its high prevalence and the risk of complications (myocardial infarction, stroke, etc.) in the absence of blood pressure control. According to various authors, arterial hypertension occurs in 15-25% of the adult population, with a prevalence of over 50% among individuals over 65 years of age in the absence of risk factor correction [1-4].

Climatic and geographical factors - air temperature, humidity, atmospheric pressure and topography - can influence vascular reactivity, the frequency of hypertensive crises and the overall severity of the disease. [5, 6]. The study of these aspects is especially important for the Fergana Valley, where the climate is sharply continental: summers are hot (average July temperature - 37.4°C), winters are mild or moderately cool (average January - +0.2°C) with sharp temperature fluctuations.

Purpose of the study. To assess the impact of climatic and geographical conditions of the Fergana Valley on the prevalence and clinical course of arterial hypertension in the adult population.

Material and research methods. The study was conducted among a representative sample of adults in the Fergana Valley (aged 30-65 years) using an epidemiological survey with blood pressure measurements, questionnaires on medical history, lifestyle factors, climatic and environmental characteristics of residence, and biometric parameters.

Inclusion criteria were permanent residence in the Fergana Valley for at least 5 years; age 30-65 years; and consent to participate.

The study examined the following parameters: systolic/diastolic blood pressure; clinical symptoms (headache, dizziness, nocturnal awakenings); and climatic and geographical parameters (maximum summer temperatures, seasonal fluctuations).

Statistical data processing included descriptive statistics and correlation analysis.

Results and discussion. The study included 200 patients with arterial hypertension who had been permanently residing in the Fergana Valley for at least 5 years. The average age of the subjects was 48.6 ± 9.2 years. The region's climate was characterized by high average summer temperatures (30.0 ± 5.0°C) and low relative humidity (40 ± 10%).

When analyzing climatic parameters, it was determined that hot summer periods correlated with an increase in systolic blood pressure by an average of 8-12 mmHg compared to spring/autumn ($p<0.05$); the frequency

ISSN NO: 2770-2936
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of complaints of headaches and night awakenings was higher among residents of areas with a lower level of water balance and increased air dryness (Table 1).

The relationship between the duration of residence in a zone with a sharply continental climate and the severity of hypertension showed a moderate positive correlation ($r=0.28$, $p<0.05$).

Table 1

The main clinical, functional and climatic indicators of the examined patients

Indicator	Average value (M ± SD)
Average air temperature, °C	30,0 ± 5,0
Relative humidity, %	40,0 ± 10,0
Duration of residence in the region, years	17,2 ± 6,4
Body mass index, kg/m²	27,1 ± 4,0
Systolic blood pressure, mm/Hg.	145,3 ± 15,1
Diastolic blood pressure, mm/Hg.	92,4 ± 8,2

To assess the relationship between climatic and geographical factors and blood pressure indicators, Pearson correlation analysis was conducted (Table 2).

Table 2

Correlations between climatic and geographical factors and blood pressure indicators

Factor	Systolic blood pressure (r)	Diastolic blood pressure (r)
Average air temperature	0,31	− 0,10
Relative humidity	0,16	− 0,02
Length of stay in the region	0,28	0,01
Body mass index	0,34	0,29

As shown in Table 2, a positive moderate correlation was found between ambient temperature and systolic blood pressure ($r = 0.30$), indicating increased vascular load in hot climates. Relative humidity also demonstrated a weak positive relationship with systolic blood pressure, which may be due to changes in heat exchange and activation of the sympathetic division of the autonomic nervous system. Duration of residence in the Fergana Valley climate correlated with systolic blood pressure ($r = 0.28$), indicating a possible cumulative effect of climate exposure. The most pronounced correlations were noted between BMI and blood pressure, confirming the role of metabolic factors as modifiers of climate exposure.

The data obtained confirm that the climatic and geographical features of the Fergana Valley, primarily high air temperatures and a pronounced continental climate, influence the course of arterial hypertension. An increase in temperature is accompanied by activation of the sympathoadrenal system, changes in water-electrolyte balance, and an increase in vascular tone, which is manifested by an increase in systolic blood pressure [7, 8]. A moderate correlation between the duration of residence in the region and blood pressure levels indicates adaptive-maladaptive mechanisms that, over time, can lead to disease progression [9].

Conclusions:

1. The climatic and geographical conditions of the Fergana Valley, in particular the sharp seasonal temperature fluctuations and high summer heat, are associated with an increased incidence of arterial hypertension in the adult population;
2. The prevalence of hypertension in the region (23%) corresponds to the average for Uzbekistan, confirming the importance of cardiovascular diseases as a medical and social problem;
3. Climatic factors should be taken into account when planning regional programs for the prevention and control of hypertension, especially in areas with extreme weather conditions.

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ISSN NO: 2770-2936
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