

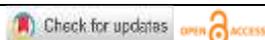
## Risk Factors for The Development of Renal Pathology, Cardiovascular and Cerebrovascular Systems

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### ABSTRACT

**Objective:** This study aims to identify and analyze common risk factors contributing to the development of renal pathology, cardiovascular diseases, and cerebrovascular disorders, highlighting the interconnected pathophysiological mechanisms among these systems. **Method:** A comprehensive literature review and comparative analysis were conducted to examine the overlapping pathogenetic pathways and shared risk factors across renal, cardiovascular, and cerebrovascular conditions. The study synthesized data from peer-reviewed articles, clinical studies, and epidemiological reports to identify key mechanisms influencing disease progression. **Results:** The analysis revealed that risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, and chronic inflammation are common to all three systems, contributing to endothelial dysfunction, atherosclerosis, and impaired vascular regulation. These shared mechanisms underscore the parallel progression of pathology within the brain, heart, and kidneys, increasing the susceptibility to comorbid conditions. **Novelty:** This study provides new insights into the integrated pathophysiological processes linking renal, cardiovascular, and cerebrovascular diseases, emphasizing the need for holistic prevention strategies and multidisciplinary management approaches to address these interrelated health risks effectively.

## INTRODUCTION

Cardiovascular diseases are the main cause of death worldwide: there is no other cause eh, the more people die each year, the more people do not cardiovascular diseases. It is estimated that 17,1 million people died from cardiovascular disease in 2004, accounting for 29% of all deaths in the world. Therefore, 7,2 million people died of coronary heart disease and 5,7 million died of stroke. K 2030 approximately 23,6 million people die from cardiovascular disease, mainly from heart disease and stroke, which is estimated to remain the only major causes of death [1-3].

With an emphasis on cardiovascular disease, less attention is often paid to renal pathology. According to the large registers of the B population, the prevalence of chronic kidney disease is at least 10%, compared to 20% or more in certain categories of people (poor, Type 2 diabetes). For comparison: chronic heart failure occurs in 1% of the population, bronchial asthma – in 5% of the adult population, diabetes – in 4-10%, arterial

hypertension – in 20-25%. There is reason to believe that the actual prevalence and prevalence of chronic kidney disease with Trom is underestimated [4-7].

K sohalenia, to date, there is almost no information in the literature about the spread of joint pathology of the heart, brain and kidneys, especially when it comes to older and older people. It is known that the geriatric patient differs significantly from young patients, first of all, with multi-organ and multi-systemic pathology [8-11].

B on average, a person over 60 years of age has 4 to 6 pathologies at a time and is often a combination of pathology of the heart, brain, peripheral blood vessels and kidneys. A feriatric patient is not moxet only considered cardiac or nephrological or neurological sick. B in this case, approach such a patient dolchen to be multi-disciplined. And the prognosis of such patients will be directly related to the timely identification of risk factors for development and development or early identification of clinically significant pockets of the cardiovascular, cerebrovascular systems and kidneys. B to date, such an approach to the management of a geriatric patient in such a context did not exist. But the risk factors for the development and development of cerebrovascular and cardiovascular diseases, as well as kidney diseases, are the same, which to some extent facilitates the Prevention of these pathologies [12-16].

Rpsk concept of øaktops. The ideological basis for the Prevention of cerebrovascular and cardiovascular diseases and kidney diseases is the concept of risk factors. H. A. Mukhin and B. S. According to the definition given by Moiseev [17], risk factors represent a number of moments of the external and internal environment, which: according to instantaneous population studies, are associated with a high frequency of diseases; according to prospective population studies, increase the risk of developing diseases; eliminating or correcting them can help reduce the risk of developing the disease or prevent exacerbations [18-20].

B in recent decades, a huge collection of factual materials has been collected that emphasize the dependence of the disease on various zndogenic and zkzogenic factors, which are directly or indirectly involved in the pathogenesis of the above diseases [21-23].

According to modern concepts, risk factors are potentially hazardous health properties of the behavioral, biological, zcological, genetic, social environment, which increase the likelihood of developing diseases, their development and negative outcome [24].

## RESEARCH METHOD

In a comparative analysis, the mechanisms of development and development of diseases common to the brain, cardiovascular and renal systems are determined by risk factors. The concept of " risk factor " refers to the predictive role of signs recognized as such factors. However, B. B. Simonenko [25-27] noted that huge data on risk factors collected by researchers over the past 50 years did not lead to the main task of prevention – to alleviate the disease.

## RESULTS AND DISCUSSION

Risk factors are usually divided into non-modifiable (irreparable) and potentially modifiable (detachable). This is the division of vakhno for preventive purposes [28].

K the first group includes risk factors (non-modifiable) voerast, gender, racial and ztnik characteristics, heredity, body weight with roxdenia, socio-zkzonomik status; the second includes arterial hypertension, dyslipidemia, microalbuminuria, exacerbation, metabolic syndrome, diabetes mellitus, infections, smoking. According to who zksperets, modifiable risk factors such as hypertension, hypercholesterolemia, exacerbation, smoking, alcohol consumption, low xizni behavior account for 75.6 percent of the risk of developing myocardial infarction and Stroke [29-31].

According to a study conducted in fremingham, USA, having one risk factor increases the number of deaths from cardiovascular disease by 2 times, a combination of two risk factors-by 4 times, three risk factors - by 8 times compared to the control group of individuals who do not have such factors [32-34].

Everything that cannot be changed by risk factors that cannot be affected is taken into account in the practice of any practitioner, especially in the geriatric doctor, in combination with potentially modifiable factors. Potentially modifiable risk factors have a significant impact on the formation of predisposition to cerebrovascular, cardiovascular disease and chronic kidney disease in the general population. Control of the removed risk factors allows you to significantly distance yourself, and in some cases - completely prevent the development of acute forms of diseases. In any case, the stubbornness of managing risk factors is important in one way or another in slowing down the aging processes of the body and in general in preventing the development of timely aging [35-37].

Arteriapnae hypertension. Leading risk factors for coronary artery disease, development and development of the brain and kidneys are arterial hypertension. The relevance of the problem of Arterial hypertension, before all, is due to its prevalence, which is zpidemic in nature. According to major Russian epidemiological studies, this figure is almost 40%. Control blood pressure remains unsatisfactory: only 59% of henschins and 37% of mukhchins know that there is arterial hypertension, only 46% of Hyun - Shin and 21% of muhchins are treated, but target indicators blood pressure are achieved in only 17.5% of khenschins and 5.7% of muhchins. It is known that if not adequately controlled, blood pressure significantly increases the frequency of cerebrovascular and cardiovascular diseases [38-41].

Long-term arterial hypertension leads to the development of diseases and increases the risk of death. It induces changes in mohet zndotelial cells, thereby inducing microcirculation disorders in chronic brain ischemia. The importance of hypertension as risk factors for all the listed diseases, despite the modern outrage of antihypertensive therapy, is clear and ongoing.

Not only acute, uncontrolled hypertension leads to the development of moxet glomerulosclerosis and the death of patients from kidney failure, since traditionally been taken. The formation of hypertensive nephropathy begins in the ear arterial

Hypertension Stage I. Global nephrosclerosis, which includes the structures of the Glomerulus and tubulointerstitium, is growing, which is complemented by improper adjustment of the vascular bed inside the kidney, mainly in the area of the microcirculatory canal [42-44]. A moderate decrease in kidney function corresponding to stage III of chronic kidney disease is observed in 13-30% of patients with adequately controlled essential hypertension [45]. Dahe's so-called "high normal blood pressure" is associated with an increased risk of chronic kidney disease [46].

The development of hypertensive nephropathy is significantly accelerated in the presence of prolonged arterial hypertension, the absence or inadequacy of anti-hypertensive therapy, and especially with metabolic disorders: exacerbation, insulin resistance and Type II diabetes [35].

Deterioration of the functional state of the kidneys arterial hypertension is associated with a deterioration in cardiovascular prognosis [36]. In particular, with increased renal dysfunction and duration, arterial hypertension increases in the inhibition of vasomotor and nitroxide-producing endothelial functions in chronic kidney disease, which is manifested by a decrease in the indicators that characterize endothelium-dependent vasodilation, general non-activity and endothelial reactivity index [37]. According to Takha, patients with creatinine clearance of less than 60 ml/min are associated with a clear increase in cardiovascular failure in arterial hypertension [38]. Normalization of high levels is one of the main factors that prevent the development of chronic kidney disease in patients with high blood pressure coronary artery disease, left ventricular hypertrophy and other diseases of the cardiovascular system. However, excessive softness increases the risk of death from cardiovascular causes of arterial hypertension in patients with certain blood pressure. Blood supply to the myocardium through the coronary vessels during cardiac diastole, coronary artery disease Niche critical values in patients with diastolic blood pressure (dad) help increase the risk of major coronary events and develop myocardial infarction [39].

Arterial hypertension refers to risk factors that are important in the development of cardiovascular and cerebrovascular pathology [40]. The risk of ischemic stroke in patients is 4 times higher than in normotensive patients with arterial hypertension. With Thom, there is no critical level of blood pressure, in which the number of brain infarcts increases, but any increase in blood pressure leads to an increase in their frequency. Isolated systolic hypertension as-moz-ga, W. B. the channel and others are associated with an increase in the number of infarcts. systolic blood pressure (sad) has been isolated as independent risk factors for stroke. Later epidemiological studies have proven the treatment of arterial hypertension, specifically isolated systolic hypertension, reducing stroke incidence and mortality in old age [41]. A diastolic increase in Takha was detected blood pressure by 5 mm HG. increases the risk of coronary artery disease by 21% and stroke by 34% [42].

The results of the above study show that aggressive antihypertensive therapy for patients with Stage III-V chronic kidney disease focused on effective nephroprotection is

associated with an increased risk of cardiovascular disease and increased mortality from cardiovascular causes.

**Dyslipidemia.** Dyslipidemia plays an important role in causing ischemic diseases of the brain and heart. This applies to the development of acute and chronic diseases of the brain and coronary circulation. Violation of Takhe lipid metabolism leads to a decrease in kidney function.

Disorders of Lipoprotein metabolism, including hypercholesterolemia and hypertriglyceridemia, increase the risk of developing atherosclerosis and thrombosis, therefore, disorders of coronary, cerebral and renal hemodynamics, especially in the presence of other synergistic-acting risk factors [43].

It is noted that patients with occlusion diseases of the branches of the aorta arc and combined holes of other vascular basins often lead to the development of cerebrovascular pathology, there are insured disorders in the exchange of proteins and lipoproteins, free radical peroxidation of lipids and antioxidant protection of the body, hemocoagulation and hemorrhoids, central and regional hemodynamics. These disorders have stable correlation relationships that are high with the development of cardiovascular atherosclerosis [44].

Dyslipidemia is prone to chronic kidney disease and promotes its development [45]. The main purpose of excess atherogenic fractions of cholesterol (low and very low density lipoproteins) is renal glomeruli endothelium, takhe mesangocytes and epitheliocytes of proximal tubules. Dyslipoproteinemia contributes to atherosclerotic porachenia of renal vessels and direct renal tissue, in which focalnoseg-a special variant of mental glomerulosclerosis - is called lipoprotein glomerulopathy [46].

In the early stages of ear chronic kidney disease, patients experience changes in lipidogram indicators and develop vasomotor dysfunction of endothelium, which, together with risk factors (arterial hypertension, increased body mass index, etc.), contributes to the development of the pre-clinical stage of atherosclerosis [47].

In patients with chronic kidney disease with no clinical signs of cardiovascular pathology, vasodilation was found to be insufficient in the vessels of the coxi microcirculatory canal away from the kidney using pharmacological samples with vasoactive substances, indicating systemic disruption of vasodilator reactions [48]. More insured disruption of endothelium-dependent vasodilation mechanisms occurred in patients with instrumental symptoms of atherosclerosis insurance of the carotid arteries. Given the versatility of the mechanisms of capillary tone regulation, the authors justify the fact that similar changes in tone regulation in patients with chronic kidney disease are present in other vascular basins, including internal organs. moxet indicates the onset of cardiovascular disease in patients with chronic kidney disease long before the onset of clinical symptoms.

**Diabetes.** The presence of diabetes mellitus leads to the faster development of atherosclerosis. The result of this is the development of cerebrovascular, cardiovascular diseases and Chronic Kidney Diseases.

Increased risk of developing stroke in patients with Type II diabetes is significantly associated with albuminuria [49]. Diabetes mellitus is especially important as a risk factor for deadly diseases of the cerebral circulation, especially for patients with blood glucose levels > 160 mg/L. The blood vessel develops twice as quickly as the microvessels [50].

Carbohydrate metabolism disorders play a role in the development of chronic kidney disease of the early stage at the insulin resistance stage; Type II diabetes is one of the main risk factors for chronic kidney disease in the general population. Diabetic timing-prevention or at least stabilization after kidney disease has gained tight control over morning glycemia and associated risk factors (arterial hypertension, impaired lipoprotein metabolism) [51].

Diabetic nephropathy is one of the main causes of kidney failure [52]. Severe glycemic control and positive effects of "intensive" insulin therapy on macro- and microalbuminuria levels were found in diabetic patients [53]. Which observed 110 patients with Type II diabetes, in the presence of large amounts of insulin injections, the development of diabetic nephropathy was reported in 6.6% of cases, compared to 28% of conventional insulin therapy.

## CONCLUSION

**Fundamental Finding:** This study concludes that the development of renal pathology, cardiovascular diseases, and cerebrovascular disorders is driven by shared pathogenetic mechanisms and common risk factors, such as hypertension, diabetes, and chronic inflammation. These overlapping factors contribute to the progression of disease across these systems, supporting the concept of a unified "cerebrocardiorenal syndrome."

**Implication:** Recognizing this interconnected framework emphasizes the importance of a multidisciplinary approach in managing elderly patients, focusing on comprehensive risk factor control to slow biological aging and prevent premature organ dysfunction.

**Limitation:** The study's limitations include reliance on literature-based data without longitudinal clinical validation, and potential variability in the characterization of risk factors across different populations. **Future Research:** Future research should focus on longitudinal and interventional studies to validate the cerebrocardiorenal syndrome model, explore the efficacy of integrated treatment strategies, and identify novel biomarkers for early detection and prevention of comorbid conditions.

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