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THE IMPACT OF A SEDENTARY LIFESTYLE ON HUMAN HEMODYNAMICS

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Abstract
This article examines the transition of people to a sedentary lifestyle and what its dangers are; what diseases of the circulatory system it can lead to and the causes of these pathologies; the causes of hemodynamic disorders are given; it indicates how to combat this problem.

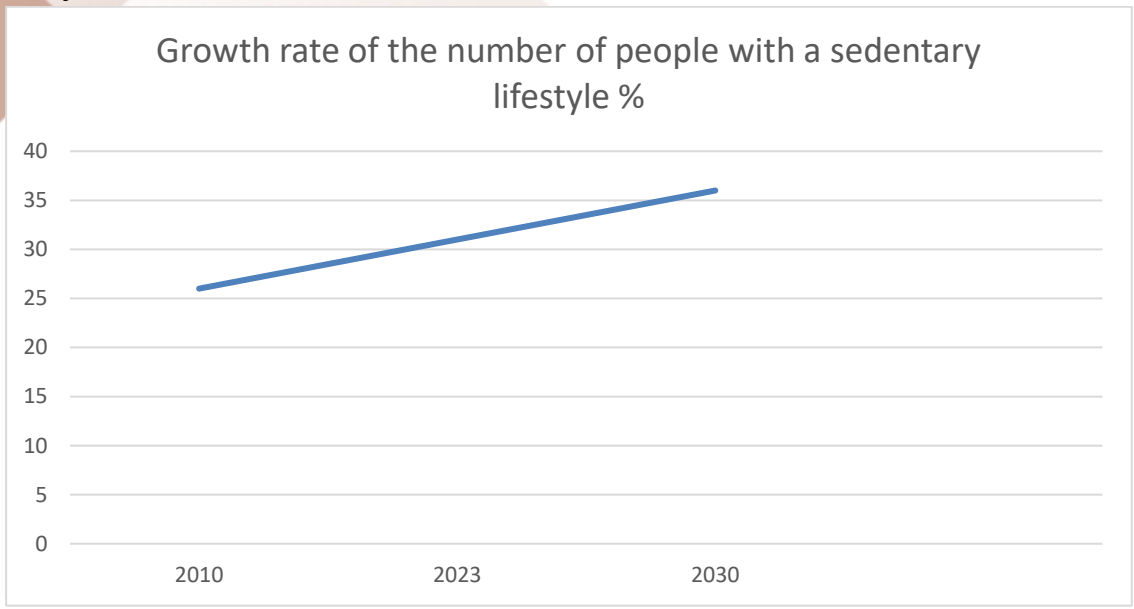
Keywords: sedentary lifestyle, hypertension, varicose veins, thrombosis, atherosclerosis, turbulence, hydraulic resistance.

Introduction

In the modern world, all areas of life are more advanced than ever before. New technologies have been developed that make our life easier and today the vast majority of jobs do not require much physical effort, and people spend their time sitting at work, at the computer or in a position that puts strain on the back and hip joints. All this leads to a number of health problems, mainly with the activity of the circulatory system.

For example, according to "World Health Organization (WHO)" in 2023, about 31% of adults worldwide did not meet the recommended levels of physical activity, equivalent to about 1.8 billion people. Compared with 2010 levels, the level of physical inactivity has increased by about 5%, and given the circumstances and the progressive development of modern technology, it is projected that by 2030, the percentage of sedentary people could reach 35% globally. The problem is most acute in high-income countries, particularly in Asia-Pacific and South Asia, where inactivity rates reach 48% and in countries such as the UK, up to 25% of adults are also considered “inactive”, meaning they spend less than 30 minutes a week on physical activity. This trend is associated with factors such as age, gender and socioeconomic status, which confirms the need for an integrated approach to solving this problem at the national and local levels.

As you can see from the graph, the number of people with a sedentary lifestyle is growing linearly



These findings highlight the need for more aggressive policies and strategies to combat low physical activity, as it increases the risk of cardiovascular disease, diabetes and some cancers, which we will discuss in more detail below.

Why is prolonged sitting dangerous? The fact is that humans have existed for over 50,000 years, but humans have never spent as much time sitting as they do now, i.e. for the last few years, half of our species have spent most of the day in a non-anatomical, unhealthy, and completely new position for the body (from an evolutionary point of view).

A sedentary lifestyle, lack of physical activity and many hours of work at a desk contribute to the development of diseases associated not only with cardiac activity, but also from muscles to digestive problems. These include hemorrhoids, varicose veins, thrombosis, atherosclerosis, increased blood pressure (hypertension), type 2 diabetes and sometimes cancer.

According to research by scientists, every hour spent in a chair shortens life by 21 minutes. Lack of physical activity is the cause of approximately 6% of all deaths in the world, 30% of coronary heart disease, 21-25% of colon cancer cases and 27% of diabetes cases, according to the World Health Organization (WHO).

How does a sedentary lifestyle (SL) affect hemodynamics?

To begin with, Let's look at the essence of hemodynamics, this is a science that examines the movement of blood through the vessels, taking into account the speed of its flow, pressure, energy, the change in each of the parameters of which has a direct impact on the work of the human cardiovascular system.

It is necessary to know what kind of diseases can develop with a sedentary lifestyle, which leads to changes in the normal parameters of human systemic hemodynamics.

Firstly, these are: hypertension, atherosclerosis, varicose veins and thrombosis. Not only the heart but also the skeletal muscles that surround the veins participate in blood circulation. And as a result of a sedentary lifestyle, the muscles become less active and do not contribute

to the flow of blood, and everything remains on the heart and its overload (i.e., the systolic volume of the heart will increase by 2-3 times), which leads to hypertension. With CG, the elasticity of blood vessels is also lost, which contributes to a decrease in blood flow velocity, but an increase in blood pressure. The reason for this is that with the loss of elasticity (elasticity), the hydraulic resistance of the vessels is lost, i.e. they expand and contract worse in response to changes in blood pressure, which contributes to turbulent blood flow.

Secondly, obesity, due to a sedentary lifestyle, the content of low-density lipoproteins (bad cholesterol) increases in the blood, which can also contribute to turbulent blood flow due to their deposition on the walls of blood vessels, while atherosclerosis develops. This disease can also develop with hypertension, high blood pressure causes damage to the walls of the arteries, and cholesterol (plaques) is deposited faster on the inflamed surface, which narrows the lumen of the vessel and contributes to the difficulty of blood flow. With further development of atherosclerosis, blood clots begin to accumulate at the site of plaque accumulation, forming a thrombus, which can break off at any time and enter vessels with a smaller diameter with the flow of blood, which can lead to blockage of the vessels, as a result of which we can observe edema, lack of oxygen in the blocked areas, so that its further development can end in death. The reason for the formation of blood clots is that due to a decrease in the blood shear rate to less than 100 $s^{-1,}$ the red blood cells become deformed and stick together.

Thirdly, the loss of elasticity in the veins leads to such a disease as varicose veins. This disease develops due to stagnation of blood in the lower extremities and thinning of the vessel walls, which can sometimes contribute to the release of plasma from the vessels and swelling of the lower extremities. The cause of this disease is a number of factors, such as atrophy of the skeletal muscles surrounding the veins and the loss of their elasticity will not be able to contribute to the outflow of blood to the top, and stagnation to their enlargement, and as a result of their enlargement, the valves will not be able to close and this leads to greater stagnation of blood in the lower extremities and to their even greater enlargement, but this process lasts a very long time and the expansion also occurs very slowly.

How can this problem be solved?

Doctors often encounter patients who have the above-mentioned problems due to their sedentary lifestyle; in many ways, this lifestyle cannot be changed because their jobs are such that after a hard day at work it is difficult to refuse rest.

Prevention of this problem includes physical activity and the introduction of a healthy diet.

Physical prevention of this problem consists of the following measures:

- It is necessary to introduce activity into your life in small intervals of time, but throughout the day. This helps to get used to this way of life and you will be able to find a few minutes for a warm-up at any time. Movement and regular breaks improve microcirculation and venous outflow, the vessels become more flexible, the risk of vascular diseases decreases.
- If possible, use standing workstations. When a person stands, the muscles of the body and legs are forced to support the body in an upright position, which helps improve metabolism.
- If possible, walk as much as possible. For example, almost all people use their own or public transport, instead you need to use bicycles or just walk or run. This activates the muscles and

increases blood circulation, as a result, the risk of blood clots is reduced. As a result of muscle activity, lipolysis (fat breakdown) is stimulated, which in turn reduces the risk of atherosclerosis.

- In your free time, engage in physical activity and exercise. Muscles generate heat and secrete lactic acid during work. As a result, heat exchange in the body is stimulated, blood circulation is enhanced, which contributes to better tissue nutrition. Active muscles make the heart's work easier by stimulating blood circulation in the veins. With regular physical exercise, the endurance of the heart muscles increases.

Healthy eating plays a vital role in maintaining health with a sedentary lifestyle. It helps to cope with the negative effects of prolonged sitting and keep the body in optimal condition. And maintaining a healthy diet consists of the following:

- Balancing the ratio of macronutrients (proteins, fats, carbohydrates). You should not eat only meat or high-calorie foods, you need to follow the norm, for example, the amount of proteins and fats consumed per day should be the same, and the amount of carbohydrates should be 4 times more than the amount of proteins/fats.
- High fiber content in food. Fiber is a carbohydrate that is not digested and helps cleanse the digestive system, stimulates bowel function and improves metabolism. Foods rich in fiber include vegetables, fruits, whole grains and legumes. With GI tract, it helps avoid constipation and maintain healthy intestinal microflora.
- Adequate water intake. With GC, you need to monitor your water balance, you need to drink at least 1.5-2 liters of water per day. It optimizes blood viscosity, organ function and cell condition.
- Control over portion sizes and frequency of meals. With ZH, excess calorie consumption can quickly lead to weight gain. Avoid overeating and do not skip meals. It is best to eat small portions 4-5 times a day. Such meals will help avoid obesity and increased cholesterol and blood sugar levels, which will result in diseases such as atherosclerosis, diabetes, and coronary heart disease.

In conclusion, summarizing all the above aspects, we can say that a sedentary lifestyle leads to many problems associated with almost all organ systems in accordance with the disruption of the cardiovascular system, accompanied by further deterioration of metabolism and metabolism. Measures taken to prevent these consequences with a sedentary lifestyle are physical activity and regular breaks along with a healthy diet, which in turn activate physiological processes, increasing energy costs, stimulating more complete work of the whole organism and leading to an improvement in the general condition of our cells. With a sedentary lifestyle, it is necessary to comply with the preventive measures specified in the article, which in turn will help to maintain the health of both our cells in particular and our body as a whole, even despite a sedentary lifestyle.

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