

# Problems of Physical Rehabilitation of Patients Suffering Type I Diabetes and Abdominal Obesity

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## Abstract

Type I diabetes mellitus is endocrine pathology, which is increasingly detected in young people, usually at the age of 35 years. Diabetes is often combined with an increase in cholesterol in the blood, a decrease in the functions of the thyroid gland and adrenal glands, metabolic disorders, heart diseases, gout, osteochondrosis, obesity, exacerbations in the respiratory system. Often there are pinpoint hemorrhages associated with vascular rupture, including in the vascular system of the eye. Because of the slow flow of protein synthesis processes, the processes of regeneration of damaged tissue are significantly delayed. The patient develops asthenia, depression and many other phenomena. In the intestine, the fermentation of excess carbohydrates is activated and its biochemical environment changes, which leads to suppression of intestinal flora and decay of proteins. It is clear that properly selected physical activities can contribute to this reduction in body weight, improve metabolic processes, and help prevent cardiovascular disease. Daily exercise helps to strengthen the human body, develop muscle corset and reduce subcutaneous fat in diabetes and abdominal obesity. Properly selected physical activity improves the susceptibility of insulin receptors, while reducing the glucose level in the blood. Regular moderate muscular activity helps patients to reduce the dose of insulin, adjust the diet and reduce body weight. Particularly useful in this regard is circular training, which is able to have a number of effects in the patient's body: improves the functioning of the cardiovascular system; accelerates metabolism; burns subcutaneous fat.

**Keywords:** Diabetes; Abdominal obesity; Metabolism; Physical activity; Physical rehabilitation

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## Introduction

Diabetes mellitus type I-endocrine pathology, which is increasingly detected in young people, usually under the age of 35 years [1,2]. This disease is associated with a significant lack of insulin in the body, thereby provoking disruption in metabolism [3,4]. This is due to the fact that the cells of the pancreas cease to produce their own hormone-insulin [5,6].

According to the WHO (World Health Organization), the number of Type I diabetics increased from 108 million in 1980 to 422 million in 2017. At the same time among people over 18 years of age, the percentage increased from 4.7% in 1980 to 8.5% in 2017.

Deep biochemical disorders of metabolic processes lead, in the final analysis, to severe damage to the internal organs and nervous system of the patient. Diabetes is often combined with increased cholesterol in the blood, a decrease in the functions of the thyroid gland and adrenal glands, metabolic disorders, heart diseases, gout, osteochondrosis, obesity, exacerbations in the respiratory system, etc. [7]. Often there are pinpoint hemorrhages associated with vascular rupture, including in the vascular system of the eye. Because of the slow flow of protein synthesis processes, the processes of regeneration of damaged tissue

are significantly delayed. The patient develops asthenia (increased fatigue), depression (depression) and many other phenomena. In the intestine, the fermentation of excess carbohydrates is activated and its biochemical environment changes, which leads to suppression of intestinal flora and decay of proteins [8].

According to the World Health Organization, since 1975, the number of obese people has more than tripled worldwide. As early as 2016, over 1.9 billion people over the age of 18 were overweight and out of them over 650 million were obese. To date, almost every second resident suffers from grade 1 obesity, which causes a lot of discomfort to a person.

About excessive weight should be said only when a significant amount of fat accumulates in the body, and its ratio to the active mass of the body, represented mainly by muscle tissue, shifts to equilibrium. Normally, the regulator of this ratio in the body is the correspondence between the arrival and the expenditure, and if a person moves a little, then a certain part of the energy of the consumed food turns into fat [1,9].

Android (abdominal, visceral or upper type) obesity is called obesity, where the accumulation of adipose tissue is predominantly in



the upper half of the trunk and on the abdomen. At the same time, the figure resembles an apple in its shape. Fatty deposits accumulate in the subcutaneous fat, but most of them are localized around the internal organs [10,11].

The appearance and progression of these diseases is directly related to the adverse effect of excess fat on internal organs. Fat mass accumulates in various parts of the body. Most of it accumulates in the subcutaneous fat and in the abdominal cavity (in special organs-omentums, directly on the heart, stomach, intestines, etc.). As a result, the work of these organs, which is exerted by external pressure with a large inert mass, is considerably hampered [12,13]. In this connection, the goal of the study is to study the problems of physical rehabilitation in Type 1 diabetes and abdominal obesity.

### **Features of Motor Functions in Individuals with Type 1 Diabetes Mellitus and Obesity**

In comparison with healthy people, patients with type I diabetes and obesity are usually not prone to motor activity. This is due to the lack of compliance with the recommendations of doctors in whom this group of patients are on a dynamic observation [14].

General lethargy, overeating, large injections of insulin, obesity and the appearance of concomitant diseases of the cardiovascular system (hypertension), the gastrointestinal tract (constipation, or flatulence), the musculoskeletal system (curvature of the spine because of high weight, pain in the joints), the respiratory system (bronchial asthma, pneumonia), the liver (the development of obesity of the liver), the reproductive system (menstrual disorders in women and impotence in men), etc. are important factors in the development of the psyche of these patients [15].

The capacity of patients with type 1 diabetes and obesity is affected by the severity of the disease, impaired functions of the organ of vision, the nervous system, and the kidneys.

Typical movement disorders, typical for people with type I diabetes and obesity: inaccuracy in coordination of movements, lack of dexterity; lack of smoothness of movements, excessive stiffness and tension, limitation of the amplitude of movements, fear of incorrect movement [16].

The use of physical activity in type I diabetes and obesity differs in some features: at the beginning of regular activities in the presence of complications of diabetes and during their exacerbation, reduce the volume and intensity of physical activity. Check with your doctor; Without prior preparation, intensive training is not allowed to prevent hypoglycemia; You cannot abruptly stop regular intensive training, because of the possibility of the appearance of hyperglycemia; it is necessary to plan and calculate the physical load in advance, coordinate it with other regime factors, such as adherence to the diet and the intake of medicines [17,18].

The main means in the fight against this ailment is eating habits, which is also the basic principle of combating obesity, weight loss. The principle of losing weight is simple-limiting calorie intake. For this, several recommendations should be observed: the creation of a food diary, the reflection of all consumed food throughout the day; control of appetite, complete exclusion of foods that provoke a person's appetite-sweets, and also have low-calorie vegetables on hand; slowing down the process of eating, controlling the process of food consumption. For this, patients are asked to take each sip taken and with an understanding of the food consumed [19].

In general, type I diabetes mellitus and obesity for rapid weight loss show psychotherapeutic methods that are symptom-oriented: behavior therapy, the creation of a self-help group, concentration on the individual [20].

These patients again have a need for self-knowledge, self-consciousness is formed, tasks of self-development, self-improvement are set. It is important for them to understand who they will become after the realization of their goals.

Thus, the presented moments of behavior help to expand the luggage of knowledge about the features of psychophysical development and motor functions. Given the above, it is clear that properly selected physical activities can help reduce body weight, improve metabolic processes, help prevent cardiovascular diseases, which is especially important for people with diabetes and obesity.

### **Wellness Opportunities of Physical Activity in Patients with Type I Diabetes and Obesity**

A very effective means of physical rehabilitation in diabetes mellitus is a moderate intensity muscular load, in which medium and large muscles are involved with a significant number of repetitions. With such work per unit time, the energy expenditure of the organism is small, however, due to the long exercise time; the total energy expenditure is significant. Aerobic mode of work contributes to the adequate absorption of glucose from the blood and its complete combustion in the muscles with a decrease in the sugar content in the blood. With mild and moderate severity of the disease, regular endurance training increases the effectiveness of diabetes treatment, blood glucose levels are stabilized, resulting in a decrease (on average 25%) in the dosage of insulin administered [21].

In the introductory period, you can start from aerobic exercise with walking and, if the patient's functional allows, run (you can run on the spot). It should be performed at such a rate that the pulse was within the range of 110-140 per minute. Do not increase the running speed-it is dangerous in diabetes; the emphasis should be on gradually increasing the load due to the length of walking (running). The main criterion for the acceptability of the exercise is the patient's well-being. You should gradually bring the duration of the movement to 40-60 minutes. Some patients will need two to three months, others-six to eight, or even more months. But every patient should have his own, suitable only for him, the regime of increasing the time of the load. As the functional capacity of the body increases, which can be determined by the indices of the working pulse, an ever increasing place in performance of endurance exercises should take a run in return for walking [22,23].

Running is best about one and a half to two hours after a meal. Before running you can drink a glass of fruit or vegetable juice. In the first period, if the exercise is performed outside the home, the patient should always take a piece of sugar with him, because diabetics sharply fluctuate the sugar content in the blood, especially in muscular work [24,25].

Daily exercise helps to strengthen the human body, develop muscle corset and reduce subcutaneous fat. Especially useful is physical rehabilitation in diabetes mellitus. Physical exercise improves the susceptibility of insulin receptors, while reducing blood glucose. These actions help patients to reduce the dose of insulin, adjust the diet and reduce weight [26,27].

Regular exercise stimulates protein metabolism, which causes weight loss, as well as reduces the risk of developing cardiovascular



diseases, diseases of the gastrointestinal tract, musculoskeletal system, respiratory system, liver, reproductive system and so on. But, as with the drug, it is necessary to observe the simplest rules before starting physical activity [28,29].

The basic rules for patients with type I diabetes and abdominal obesity: you need to consume 1 XE (apple) every 30 minutes, so as not to fall into the hypoglycemic coma; with high-intensity training should reduce the dose of insulin by 20-50%; when hypoglycemia occurs, it is necessary to compensate for it due to easily digestible carbohydrates (juice); Before you start the main kind of physical activity, you must necessarily warm up, which will warm up all the joints; pick up a sports form, which is convenient for physical exercise, especially pay attention to the fact that there is nothing to cheerfully and in wearable sneakers it was as comfortable as possible to stop; always have a bottle of water with you. For one workout the human body loses from 1 to 3 liters of liquid, secreting water in the form of sweat. If the reserves are not replenished in time, then "Failures" begin to appear, which in the future can lead to not the best consequences. During training, water is needed for thermoregulation and normal metabolism [30].

Therapeutic physical culture in diabetes is used in conjunction with other elements of treatment: insulin therapy, diet, self-control.

People who suffer from this ailment are physically loaded. Patients with obesity in addition to physical activity need control and weight reduction.

Much to our regret, humanity has not yet learned how to treat diabetes and therefore the treatment of this disease goes through the patient's whole life. To avoid various complications and slow the progression of the disease, the patient must constantly monitor his health, while following the recommendations of the doctor.

Therapeutic exercises improves vitality and mood, helps to believe in them. Specially selected complex of exercises will help to normalize all the metabolic process in the body of patients [31].

## Features of Physical Activity in Diabetes Mellitus Type I and Obesity

In order for the classes to bring increased mood and result, you need to know the features of physical activities: load planning, compliance with the regime; the volume and intensity of training should be necessarily coordinated with the attending physician; It is inadmissible to begin intensive studies at once. Before the very beginning of physical activity, you must first prepare his body for the load; abruptly stop regular exercise is also not recommended, due to the fact that in this case, the blood glucose content can increase dramatically; remember the concept of "hypoglycemia", while giving an average burden on the patient; the effectiveness of physical exercises will be achieved if they are carried out regularly [32,33].

Physical activity is not only gymnastics and sports, but everyday loads that a person encounters daily, let it be walking, climbing stairs, cleaning the apartment. But even with such loads, it is necessary to keep records.

There are contraindications to the conduct of therapeutic physical culture. They depend not only on the compensation of the disease, but also on the complications that accompany it.

Contraindications: diabetic retinopathy. Due to the fact that physical exercises increase blood pressure; they can contribute to the development of retinopathy (retinal detachment, eye

hemorrhage); diabetic nephropathy. Renal damage provokes severe pain. With a strong launch of nephropathy, dialysis, or transplantation, is required [34].

Thus, any physical load must be built individually, taking into account the characteristics of each patient.

## Rehabilitation Opportunities for Circular Training

Often, the term "rehabilitation" refers to a set of exercises or procedures that help restore the lost functions of the body.

However, the possibilities of physical rehabilitation with fitness elements are much wider. This makes it possible not only to restore, but also to develop human capabilities, and sometimes to teach special skills [35].

As in any other form of fitness, the basis of restorative fitness is movement. However, trainings in it are carried out according to special programs, which differ from the usual ones: for the restoration of the functionality of the body, combinations of physiotherapy exercises, manual techniques and standard exercises on strength and endurance are used [36,37].

Each recovery program is compiled individually. It takes into account the recommendations of doctors, add exercises for proper breathing [38]. And in training, the correct amplitude of movements is strictly observed and special equipment is used.

For the experimental group of patients with type I diabetes and obesity, a circular training was chosen, which implies a high-intensity method of training, which is used not only to reduce body weight, but also to increase endurance. This type of training is not suitable for stimulating the growth of muscle tissue in the body and increasing strength, especially when performing it on an ongoing basis [39]. Circuit training can consist of strength exercises, which are used in such areas of fitness as bodybuilding and powerlifting, and aerobic exercises-gymnastics, athletics, fitness. Why this type of training is usually called "circular"? The thing is that one "circle" consists of several exercises (4-10), which is performed sequentially on different parts of the body according to 1 approach. Each of the exercises chosen by the methodologist is performed either for a certain period of time, or with a certain number of repetitions. Between each exercise in one circle a rest takes place, lasting 30 seconds or more, a long rest in 2-3 minutes is given after the complete completion of one circle [40,41].

All basic muscle groups of the body (each exercise for a separate group) are studied for one workout, one session can include from 2 to 6 circles, the total duration of the training is 30-60 minutes (no more). The technique is suitable both for beginners (preparation of the organism for loads), and for more experienced athletes for solving various tactical tasks (drying, endurance, strength). Circuit training can be of a wave character (weak, medium and high). The intensity increases with the growth of the number of circles, repetitions and shortening of rest periods [42].

Before the beginning of such training, warm-up is performed, after the end of the hitching. To perform one exercise, you need to spend 20-30 seconds. It is necessary to use such a weight that at the end of this time a failure occurs (as a rule, these are small weights from 1 to 3 kg for beginners). After each exercise, break 30 seconds. After completing one lap, you should take a break for 2-5 minutes [43,44].

Circular training is able to have a number of effects in the patient's body: improves the cardiovascular system; strengthens



muscles; accelerates metabolism; burns subcutaneous fat [45,46].

To improve efficiency, circular training is based on the principle of periodization:

- 1 week: light intensity
- 2 week: moderate
- 3 week: heavy
- 4 week: recovery/selection of weights [47]

Adjust the intensity can be by: increasing the number of exercises of the circle and the number of circles; duration of rest; speed and number of repetitions.

## Results

Results from training appear after the first session and remain up to a week. At this time, tissue metabolism improves freedom of movement increases, pain decreases. 10 workouts can save the effect of recovery for several months. During this time, the body tissues are reconstructed, the motor stereotype changes, the morphology completely changes, the innervation and joint condition improves [48]. The body restores its original functionality. At the same time, restorative fitness is also fitness in its original understanding [49]. As the functions of the musculoskeletal system improve, the trainer can include exercises for "losing weight" or building muscle mass, which also take into account the peculiarities of your physique [50,51].

Thus, the circular training method helps to "burn" 30% more fat than regular workouts in the gym. It's all about the intensity that needs to be set for each patient.

## Conclusion

Diabetes is often combined with an increase in cholesterol in the blood, a decrease in the functions of the thyroid gland and adrenal glands, metabolic disorders, heart diseases, gout, osteochondrosis, obesity, exacerbations in the respiratory system. Often there are pinpoint hemorrhages associated with vascular rupture, including in the vascular system of the eye. Because of the slow flow of protein synthesis processes, the processes of regeneration of damaged tissue are significantly delayed. The patient develops asthenia, depression and many other phenomena. In the intestine, the fermentation of excess carbohydrates is activated and its biochemical environment changes, which leads to suppression of intestinal flora and decay of proteins. It is clear that properly selected physical activities can contribute to this reduction in body weight, improve metabolic processes, and help prevent cardiovascular disease. Daily exercise helps to strengthen the human body, develop muscle corset and reduce subcutaneous fat in diabetes and abdominal obesity. Properly selected physical activity improves the susceptibility of insulin receptors, while reducing the glucose level in the blood. Regular moderate muscular activity helps patients to reduce the dose of insulin, adjust the diet and reduce body weight. Particularly useful in this regard is circular training, which is able to have a number of effects in the patient's body: improves the functioning of the cardiovascular system; accelerates metabolism; burns subcutaneous fat.

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