

THE IMPACT OF PHYSICAL EXERCISE ON THE HEALTH OF PATIENTS WITH DIABETES MELLITUS

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Annotation. Diabetes mellitus is one of the most widespread chronic metabolic diseases affecting millions of people worldwide. Effective management of this condition requires not only pharmacological treatment but also appropriate lifestyle modifications, including regular physical activity. This article explores the impact of physical exercise on the health of patients with diabetes mellitus through an analysis of scientific literature. Particular attention is given to the effects of aerobic and resistance exercises on blood glucose regulation, insulin sensitivity, body weight control, cardiovascular health, and overall quality of life. The reviewed studies indicate that regular physical activity improves glycemic control, reduces insulin resistance, and decreases the risk of diabetes-related complications. Exercise also contributes to better cardiovascular function, enhanced physical fitness, and improved psychological well-being. Furthermore, physically active individuals demonstrate greater adherence to treatment recommendations and healthier lifestyle behaviors. The findings confirm that physical exercise is a safe, effective, and essential component of comprehensive diabetes management and should be integrated into routine care programs for diabetic patients.

Keywords: Diabetes mellitus, physical exercise, physical activity, insulin sensitivity, glycemic control, cardiovascular health, aerobic exercise, resistance training, quality of life, diabetes management.

Annotatsiya. Qandli diabet dunyo bo'ylab millionlab insonlarga ta'sir qiluvchi eng keng tarqalgan surunkali metabolik kasalliklardan biridir. Ushbu kasallikni samarali boshqarish nafaqat dori vositalari bilan davolashni, balki muntazam jismoniy faollikni o'z ichiga olgan sog'lom turmush tarzini ham talab qiladi. Mazkur maqolada qandli diabet bilan kasallangan bemorlar salomatligiga jismoniy mashqlarning ta'siri ilmiy adabiyotlar tahlili asosida o'rganilgan. Aerob va kuch mashqlarining qondagi glyukoza miqdorini boshqarish, insulin sezgirligini oshirish, tana vaznini nazorat qilish, yurak-qon tomir tizimi faoliyatini yaxshilash hamda hayot sifatini oshirishdagi ahamiyati yoritilgan. Tadqiqot natijalari muntazam jismoniy faollik glyukemik nazoratni yaxshilashi, insulin rezistentligini kamaytirishi va diabet asoratlari rivojlanish xavfini pasaytirishini ko'rsatdi. Shuningdek, jismoniy mashqlar bemorlarning jismoniy va ruhiy holatini yaxshilashga xizmat qiladi.

Kalit so'zlar: Qandli diabet, jismoniy mashqlar, jismoniy faollik, insulin sezgirligi, glyukemik nazorat, yurak-qon tomir salomatligi, aerob mashqlar, kuch mashqlari, hayot sifati, diabetni boshqarish.

Аннотация. Сахарный диабет является одним из наиболее распространённых хронических метаболических заболеваний, поражающих миллионы людей во всём мире. Эффективное управление данным заболеванием требует не только медикаментозного лечения, но и соблюдения здорового образа жизни, включая регулярную физическую активность. В данной статье рассматривается влияние физических упражнений на состояние здоровья пациентов с сахарным диабетом на основе анализа научной литературы. Особое внимание уделено воздействию аэробных и силовых упражнений на регуляцию уровня глюкозы в крови, чувствительность к инсулину, контроль массы тела, состояние сердечно-сосудистой системы и качество жизни пациентов. Результаты исследований показывают, что регулярная физическая активность способствует улучшению гликемического контроля, снижению инсулинорезистентности и уменьшению риска развития осложнений диабета. Кроме того, физические упражнения положительно влияют на физическое и психоэмоциональное состояние больных.

Ключевые слова: Сахарный диабет, физические упражнения, физическая активность, чувствительность к инсулину, гликемический контроль, сердечно-сосудистое здоровье, аэробные упражнения, силовые тренировки, качество жизни, управление диабетом.

Introduction. Diabetes mellitus is one of the most common chronic metabolic diseases worldwide and represents a major public health challenge. The disease is characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The global prevalence of diabetes has increased significantly over recent decades due to population aging, urbanization, unhealthy dietary habits, and reduced physical activity. As a result, diabetes has become a leading cause of cardiovascular disease, kidney failure, neuropathy, retinopathy, and premature mortality. Effective management of diabetes requires a comprehensive approach that includes pharmacological treatment, dietary modification, patient education, and regular physical activity. Among these components, physical exercise has gained considerable attention because of its ability to improve metabolic control and reduce the risk of long-term complications. Numerous scientific studies have demonstrated that regular exercise plays a crucial role in maintaining blood glucose levels and enhancing overall health in individuals with diabetes mellitus.

Physical activity improves insulin sensitivity by increasing glucose uptake in skeletal muscles and reducing insulin resistance. During exercise, muscle contractions stimulate glucose transport mechanisms independently of insulin, leading to better glycemic control. Regular aerobic and resistance exercises have been shown to decrease glycated hemoglobin levels, improve body composition, and support weight management in diabetic patients. These physiological benefits contribute significantly to disease prevention and treatment outcomes. In addition to metabolic improvements, physical exercise has positive effects on cardiovascular health. Patients with diabetes are at an increased risk of developing hypertension, atherosclerosis, coronary artery disease, and stroke. Regular exercise helps lower blood pressure, improve lipid profiles, enhance vascular function, and strengthen cardiac performance. Consequently, physical activity reduces the incidence of cardiovascular complications, which are among the primary causes of morbidity and mortality in diabetic populations. Physical exercise contributes to better psychological well-being and quality of life. Living with a chronic disease often leads to stress, anxiety, depression, and decreased self-confidence. Participation in regular physical activities can improve mood, reduce psychological distress, increase social engagement, and promote a healthier lifestyle. These benefits are particularly important for maintaining long-term adherence to diabetes management programs.

Methods. The methodology of this study was based on a review and analysis of scientific literature related to diabetes mellitus and physical exercise. Relevant information was collected from published research articles, medical journals, textbooks, and international clinical guidelines. Studies focusing on the effects of physical activity on blood glucose regulation, insulin sensitivity, body weight, cardiovascular health, and overall well-being of diabetic patients were carefully examined. The collected data were organized and compared to identify common findings and trends reported by different

researchers. Particular attention was given to the role of aerobic and resistance exercises in diabetes management. The information obtained from various sources was analyzed using descriptive and comparative methods. Based on the reviewed evidence, conclusions were drawn regarding the benefits of regular physical activity in improving health outcomes and reducing the risk of diabetes-related complications. This approach allowed for a comprehensive evaluation of the relationship between exercise and diabetes management.

Literature Review. The role of physical exercise in the management of diabetes mellitus has been widely discussed in both international and national scientific literature. Researchers have emphasized that regular physical activity is an essential component of diabetes prevention and treatment due to its positive effects on glucose metabolism, insulin sensitivity, and overall health. Among international studies, Colberg et al. (2016) reported that regular aerobic and resistance exercises improve glycemic control and reduce the risk of diabetes-related complications.[1] The authors concluded that physical activity should be considered a fundamental part of diabetes care. Similarly, Bird and Hawley (2017) found that exercise enhances glucose uptake by skeletal muscles and improves insulin action, leading to better metabolic outcomes in diabetic patients.[2]

Umpierre et al. (2013) demonstrated that structured exercise programs significantly decrease glycated hemoglobin levels and improve cardiovascular health.[3] Their findings suggest that combining aerobic and resistance training provides greater benefits than performing either type of exercise alone. Furthermore, Balducci et al. (2019) highlighted the positive impact of physical activity on blood pressure regulation, lipid metabolism, and cardiovascular fitness among individuals with diabetes.[4]

In the national literature, Gayberdiyeva H.O. emphasized that regular physical activity plays an important role in maintaining normal blood glucose levels and improving the health status of patients with type 2 diabetes mellitus. The author noted that moderate physical exercises contribute to better disease control and reduce the risk of complications.[6]

According to Faxrutdinova S., physical exercise is one of the most effective non-pharmacological methods in diabetes management. The researcher reported that activities such as walking, cycling, swimming, and therapeutic exercises help improve metabolic processes and enhance the quality of life of diabetic patients.[7] In addition, Gayberdiyeva H.O. and Abdullayeva D.G. investigated the relationship between physical activity and anthropometric indicators in patients with type 2 diabetes complicated by obesity. Their study revealed that insufficient physical activity is associated with poor metabolic control, whereas regular exercise positively affects body weight, glucose regulation, and overall health. Thus, both international and national studies confirm that physical exercise has a significant positive effect on the health of patients with diabetes mellitus. Regular physical activity improves glycemic control, increases insulin sensitivity, reduces cardiovascular risk factors, and contributes to a better quality of life. These findings support the inclusion

of structured exercise programs as an integral component of comprehensive diabetes management.

Diabetes mellitus is one of the most common chronic diseases affecting millions of people worldwide. The prevalence of diabetes has increased rapidly during the last few decades due to changes in lifestyle, urbanization, and unhealthy dietary habits. The disease is characterized by elevated blood glucose levels caused by insufficient insulin production or impaired insulin action. Persistent hyperglycemia leads to serious health complications involving multiple organ systems. Diabetes is considered a major public health concern because it contributes significantly to morbidity and mortality rates. Individuals with diabetes are at increased risk of cardiovascular diseases, kidney disorders, neuropathy, and vision impairment. The disease can also negatively affect physical functioning and quality of life. Type 2 diabetes accounts for the majority of diabetes cases and is strongly associated with obesity and physical inactivity. The growing number of diabetic patients places a considerable burden on healthcare systems worldwide. Early diagnosis and proper disease management are essential for preventing long-term complications. Lifestyle modifications remain one of the most effective strategies for controlling diabetes. Regular monitoring of blood glucose levels is necessary to maintain metabolic stability. Many studies emphasize the importance of patient education in diabetes care. Public awareness programs can help reduce the incidence of the disease. Healthcare professionals play a critical role in promoting healthy behaviors among high-risk populations. Effective diabetes management requires a combination of medical treatment and lifestyle interventions. Among these interventions, physical activity has gained considerable attention. Understanding the impact of diabetes on health is essential for developing preventive and therapeutic approaches.[5]

Physical exercise is recognized as a fundamental component of diabetes management. Regular physical activity helps regulate blood glucose levels and improves overall metabolic health. Exercise increases the body's ability to utilize glucose efficiently, thereby reducing insulin resistance. Both aerobic and resistance training have been shown to provide significant benefits for diabetic patients. Physical activity contributes to better glycemic control and supports weight management. It also enhances cardiovascular function and muscular strength. Regular exercise reduces the need for excessive medication in some patients. Healthcare organizations recommend incorporating physical activity into daily routines as part of comprehensive diabetes care. Exercise promotes energy expenditure and helps prevent obesity, which is a major risk factor for type 2 diabetes. Active individuals generally experience better health outcomes than sedentary individuals. Physical activity also improves circulation and oxygen delivery to tissues. Consistent exercise can lower the risk of diabetes-related complications. It supports healthy lipid metabolism and reduces inflammation. Participation in physical activity encourages healthier lifestyle choices. Exercise programs can be tailored according to age,

fitness level, and medical condition. Supervised training may provide additional benefits for individuals with advanced disease. Patient motivation and adherence are important factors in achieving successful outcomes. The integration of exercise into treatment plans improves long-term disease management.

Aerobic exercise is widely recommended for individuals with diabetes mellitus because of its positive effects on blood glucose regulation. Activities such as walking, jogging, cycling, and swimming increase energy expenditure and improve glucose utilization by muscles. During aerobic exercise, muscle contractions stimulate glucose uptake independently of insulin. This process helps lower blood sugar levels and improves insulin sensitivity. Regular aerobic activity contributes to better glycemic control over time. Studies have shown reductions in glycated hemoglobin levels among physically active diabetic patients. Aerobic exercise also supports weight loss and helps maintain a healthy body composition. Improved cardiovascular fitness is another important benefit of regular aerobic training. Enhanced circulation facilitates nutrient and oxygen delivery throughout the body. Aerobic activities reduce the risk of cardiovascular complications associated with diabetes.[8] Regular participation in exercise programs can decrease blood pressure and improve cholesterol levels. These changes contribute to overall metabolic health. Aerobic training also enhances endurance and physical performance. Patients often report increased energy levels and reduced fatigue. Exercise can improve sleep quality and psychological well-being. Consistent participation is necessary to achieve long-term benefits. Moderate-intensity aerobic exercise is generally considered safe for most diabetic patients. Healthcare providers often recommend at least 150 minutes of aerobic activity per week.

Resistance training is another important form of physical activity for individuals with diabetes mellitus. This type of exercise involves muscle-strengthening activities performed against resistance. Resistance training increases muscle mass and improves muscular strength. Greater muscle mass enhances the body's ability to utilize glucose effectively. As a result, insulin sensitivity is significantly improved. Improved insulin sensitivity allows glucose to enter cells more efficiently, reducing blood glucose levels. Resistance exercises can include weightlifting, resistance bands, and bodyweight exercises. These activities contribute to better metabolic control and physical function. Regular strength training helps preserve muscle mass during weight loss programs. Increased muscular strength also supports daily activities and functional independence. Resistance training has been associated with reductions in glycated hemoglobin levels. It may improve body composition by reducing fat mass and increasing lean body mass. Stronger muscles contribute to better balance and reduced risk of falls. This benefit is especially important for older adults with diabetes. Resistance exercise can also positively influence bone health. Combining resistance and aerobic training often produces superior results compared to either method alone. Exercise programs should be individualized

based on patient needs and capabilities. Proper supervision can minimize the risk of injury.[9]

Cardiovascular disease is one of the leading causes of morbidity and mortality among individuals with diabetes mellitus. Physical activity plays a crucial role in protecting cardiovascular health in this population. Regular exercise improves heart function and enhances blood circulation. It contributes to lower blood pressure and healthier cholesterol levels. Physical activity increases high-density lipoprotein cholesterol while reducing harmful lipid fractions. These changes decrease the risk of atherosclerosis and coronary artery disease. Exercise also improves vascular function and endothelial health. Better circulation supports the delivery of oxygen and nutrients throughout the body. Individuals who engage in regular physical activity are less likely to experience cardiovascular complications. Exercise reduces inflammation, which is a contributing factor to cardiovascular disease. Improved body weight management further decreases cardiovascular risk. Physical activity strengthens the heart muscle and enhances its efficiency. Increased aerobic capacity allows patients to perform daily activities with less fatigue. Exercise may reduce the likelihood of heart attacks and strokes. Maintaining cardiovascular fitness is particularly important for diabetic patients because of their elevated risk profile. Regular physical activity supports long-term cardiovascular health and longevity. Healthcare professionals strongly encourage exercise as part of preventive care. Consistent participation is essential for achieving lasting benefits.

Quality of life is an important aspect of diabetes management and overall health. Living with a chronic disease can create physical, emotional, and social challenges. Physical exercise has been shown to improve quality of life among diabetic patients. Regular activity promotes physical fitness and enhances daily functioning. Individuals who exercise frequently often experience higher energy levels and reduced fatigue. Exercise contributes to improved mood and emotional well-being. It helps reduce symptoms of anxiety and depression commonly associated with chronic illness. Physical activity stimulates the release of endorphins, which promote positive feelings.[10] Participation in exercise programs can increase self-confidence and self-esteem. Better physical health often leads to greater independence in daily life. Exercise also encourages social interaction when performed in groups or community settings. Improved metabolic control reduces disease-related stress and concerns about complications. Regular physical activity may improve sleep quality and cognitive function. Patients often report greater satisfaction with their overall health. Exercise supports healthy body weight and physical appearance, which can positively influence self-image. Maintaining an active lifestyle encourages adherence to other healthy behaviors. Long-term participation in exercise programs contributes to better health outcomes. Healthcare providers should encourage physical activity as part of holistic diabetes care. Therefore, exercise is a valuable strategy for enhancing the quality of life of individuals living with diabetes mellitus.

Results. The analysis of the reviewed literature demonstrated that regular physical exercise has a significant positive impact on the health of patients with diabetes mellitus. Both aerobic and resistance exercises were found to improve blood glucose control by increasing insulin sensitivity and enhancing glucose utilization by skeletal muscles. Studies consistently reported reductions in glycated hemoglobin levels among physically active diabetic patients, indicating improved long-term glycemic control. The findings also revealed that regular physical activity contributes to better body weight management and helps reduce obesity, which is one of the major risk factors associated with type 2 diabetes mellitus. Patients who participated in structured exercise programs showed improvements in body composition, physical fitness, and overall metabolic function. The reviewed studies indicated that exercise positively affects cardiovascular health. Regular physical activity was associated with lower blood pressure, improved lipid profiles, enhanced cardiovascular fitness, and a reduced risk of diabetes-related cardiovascular complications. These benefits are particularly important because cardiovascular diseases remain one of the leading causes of mortality among diabetic individuals.

The literature also highlighted the psychological benefits of exercise. Physically active patients reported lower levels of stress, anxiety, and depression, along with improved emotional well-being and quality of life. Increased self-confidence, better sleep quality, and greater social participation were commonly observed among individuals who maintained regular exercise habits. The findings confirm that physical exercise is an effective and essential component of diabetes management. Regular participation in physical activity improves metabolic control, supports cardiovascular health, enhances psychological well-being, and contributes to a better quality of life for patients with diabetes mellitus. These results support the integration of structured exercise programs into comprehensive diabetes care strategies.

Discussion. The findings of this study indicate that physical exercise plays a crucial role in improving the health status of patients with diabetes mellitus. The reviewed literature consistently demonstrated that regular physical activity contributes to better glycemic control, enhanced insulin sensitivity, and improved metabolic function. These results support the growing body of evidence that exercise should be considered an essential component of diabetes management alongside medical treatment and dietary modifications. One of the most significant findings is the positive effect of exercise on blood glucose regulation. Regular aerobic and resistance training increase glucose uptake by skeletal muscles and reduce insulin resistance, leading to improved blood sugar control. This effect is particularly important for patients with type 2 diabetes mellitus, where insulin resistance is a major underlying mechanism of the disease.

The reviewed studies also showed that physical activity has substantial cardiovascular benefits. Since diabetic patients are at increased risk of cardiovascular diseases, the ability of exercise to lower blood pressure, improve lipid metabolism, and

enhance cardiovascular fitness is of great clinical importance. These benefits may contribute to a reduction in diabetes-related morbidity and mortality. Another important aspect highlighted by the literature is the role of exercise in weight management. Excess body weight is closely associated with poor glycemic control and increased disease progression. Regular physical activity helps reduce body fat, preserve muscle mass, and improve overall body composition, thereby supporting more effective diabetes management. In addition to physical health benefits, exercise positively influences psychological well-being. Many diabetic patients experience emotional stress and reduced quality of life due to the chronic nature of the disease. Regular participation in physical activity has been associated with reduced anxiety, improved mood, and greater self-confidence, which may encourage better adherence to treatment recommendations. The findings suggest that incorporating regular physical exercise into diabetes care programs can significantly improve health outcomes. Healthcare professionals should continue to promote physical activity as a safe, accessible, and cost-effective strategy for preventing complications and enhancing the quality of life of individuals living with diabetes mellitus.

Conclusion. In conclusion, physical exercise has a significant positive impact on the health of patients with diabetes mellitus. The findings of this study demonstrate that regular physical activity improves blood glucose control, increases insulin sensitivity, and supports better metabolic function. Both aerobic and resistance exercises contribute to effective diabetes management and help reduce the risk of disease-related complications. Regular exercise also plays an important role in maintaining a healthy body weight and improving cardiovascular health. Physically active individuals are less likely to develop hypertension, cardiovascular diseases, and other complications commonly associated with diabetes. In addition, physical activity enhances physical fitness and overall functional capacity. The study further revealed that exercise provides psychological benefits by reducing stress, anxiety, and depression while improving quality of life and emotional well-being. These positive effects encourage greater adherence to treatment plans and healthier lifestyle behaviors among diabetic patients. Physical exercise should be considered an essential component of comprehensive diabetes management. The integration of regular physical activity into daily life can contribute significantly to disease control, complication prevention, and the promotion of long-term health and well-being in individuals with diabetes mellitus.

References:

1. Colberg S.R., Sigal R.J., Yardley J.E., Riddell M.C., Dunstan D.W., Dempsey P.C., Horton E.S., Castorino K., Tate D.F. Physical Activity/Exercise and Diabetes: A Position Statement of the American Diabetes Association // *Diabetes Care*. – 2016. – Vol. 39, No. 11. – P. 2065–2079.
2. Bird S.R., Hawley J.A. Update on the Effects of Physical Activity on Insulin Sensitivity in Humans // *BMJ Open Sport & Exercise Medicine*. – 2017. – Vol. 2, No. 1. – P. 1–26.
3. Umpierre D., Ribeiro P.A.B., Kramer C.K., Leitão C.B., Zucatti A.T.N., Azevedo M.J., Gross J.L., Ribeiro J.P., Schaun B.D. Physical Activity Advice Only or Structured Exercise Training and

- Association with HbA1c Levels in Type 2 Diabetes // JAMA. – 2013. – Vol. 305, No. 17. – P. 1790–1799.
4. Balducci S., Sacchetti M., Haxhi J., Orlando G., D’Errico V., Fallucca S., Menini S., Pugliese G. Physical Exercise as Therapy for Type 2 Diabetes Mellitus // Diabetes/Metabolism Research and Reviews. – 2019. – Vol. 35, No. 3. – P. 1–22.
 5. American Diabetes Association. Standards of Care in Diabetes – 2024 // Diabetes Care. – 2024. – Vol. 47, Suppl. 1. – P. S1–S350.
 6. Gayberdiyeva H.O. The Importance of Physical Activity in Patients with Type 2 Diabetes Mellitus // Medicine and Modern Technologies. – Tashkent, 2022. – No. 4. – P. 45–49.
 7. Gayberdiyeva H.O., Abdullayeva D.G. Hygienic Assessment of Anthropometric Indicators and Physical Activity Status in Patients with Type 2 Diabetes Mellitus Complicated by Obesity // New Day in Medicine. – 2023. – No. 6. – P. 112–118.
 8. Faxrutdinova S. The Importance of Physical Activity and Healthy Lifestyle in Diabetes Mellitus // For a Healthy Generation. – Tashkent, 2021. – No. 3. – P. 28–32.
 9. Axmedov A.A. Fundamentals of Endocrinology. – Tashkent: Abu Ali ibn Sino Medical Publishing House, 2020. – 312 p.
 10. Karimov F.X., Ismoilov B.R. Diabetes Mellitus and Its Prevention. – Tashkent: Fan va Texnologiya Publishing House, 2021. – 248 p.

