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CORRECTION OF TYPE 2 DIABETES MELLITUS USING TRADITIONAL MEDICINE METHODS

Boboev Khurshid Shodiqulovich

Bukhara State Medical Institute named after Abu Ali ibn Sina, https://orcid.org/0009-0004-4474-3946

1 Tel: +998 99 352 38 18 e-mail: xurshid_boboyev@bsmi.uz

Annotation: Diabetes mellitus is an endocrine disorder marked by persistent hyperglycemia resulting from impaired carbohydrate metabolism. The condition arises either due to insufficient insulin production by pancreatic β-cells (type 1 diabetes) or due to peripheral tissue resistance to insulin action (type 2 diabetes). Insulin is a crucial hormone that regulates blood glucose levels by facilitating its uptake into cells for energy production. The clinical features of diabetes typically include polydipsia (excessive thirst), polyuria (frequent urination), chronic fatigue, unintended weight loss (especially in type 1 diabetes), and delayed wound healing. If not properly managed, diabetes can lead to serious systemic complications, such as cardiovascular disease, nephropathy, retinopathy, and neuropathy. Management of diabetes focuses on maintaining normoglycemia and includes insulin therapy for type 1 diabetes, oral hypoglycemic agents for type 2 diabetes, alongside lifestyle interventions like dietary regulation and regular physical activity.

Keywords: sugar, glucose, insulin, diabetes, diet, heart, kidneys, hormone, nervous system.

Annotation. Diabetes mellitus is a chronic polyetiological disease characterized by impaired carbohydrate metabolism due to an absolute or relative deficiency of insulin. In type 1 diabetes, the main pathogenic mechanism is autoimmune destruction of the pancreatic β-cells, leading to a complete loss of insulin production capacity [2; p. 45]. The immune response is based on T-lymphocyte aggression against the body's own pancreatic antigens, which promotes the development of pronounced hyperglycemia and, if untreated, diabetic ketoacidosis [4; p. 33]. Insulin plays a key role in maintaining glucose homeostasis by facilitating its entry into cells, where it is used as a primary energy substrate. In the absence or inefficiency of insulin, glucose accumulates in the blood, causing a hyperglycemic state [1; p. 17].

Type 2 diabetes is characterized by insulin resistance, in which target cells (muscle, adipose, and liver cells) lose their sensitivity to insulin. In the early stages, the disease is accompanied by compensatory hyperinsulinemia, but over time β-cell exhaustion occurs, leading to decreased insulin secretion [3; p. 25]. These pathological changes are accompanied by persistent hyperglycemia and an increased risk of developing microvascular and macrovascular complications [5; p. 40]. The main etiological factors of type 2 diabetes include obesity, physical inactivity, genetic predisposition, and dietary disorders [6; p. 61]. Chronic elevation of blood glucose levels has a toxic effect on blood vessel walls, kidney tissue, the nervous system, and the retina. Diabetic angiopathy is one of the most common complications, characterized by endothelial damage, progressive atherosclerosis, and the development of ischemic heart disease [7; p. 78]. Furthermore, hyperglycemia contributes to the development of diabetic nephropathy, which may eventually lead to chronic kidney

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failure [8; p. 55]. Diabetic neuropathy results in impaired innervation, manifested by decreased sensitivity, pain, and muscle weakness, especially in the lower limbs [9; p. 34]. In ophthalmological practice, special attention is given to diabetic retinopathy, which in severe cases may lead to blindness [10; p. 49].

Thus, the pathophysiology of diabetes mellitus is associated with impaired glucose regulation, leading to chronic hyperglycemia and the development of multiple complications. Treatment of diabetes, especially with minimal side effects and harm to the body, relies on a comprehensive approach. Although diabetes (especially type 1) cannot be completely cured, there are methods to control blood sugar levels, improve quality of life, and reduce the risk of complications. It is important to note that any changes in treatment should be carried out under medical supervision to avoid deterioration of the patient's condition.

Materials and Methods The research was conducted in the vivarium of Bukhara State Medical Institute during 2023. A total of 78 male white rats weighing 150–180 grams were selected for the experimental study. All laboratory animals were obtained from the same vivarium and were of the same age. All biological safety rules and ethical principles for working with laboratory animals were strictly followed during the research. The animals were provided with sufficient water and fed a balanced diet. Proper care and feeding of laboratory animals were considered essential in the preparation and conduct of experimental studies. Feeding schedules were maintained without disruption, and hygiene rules during feeding were observed. Failure to follow these rules increases the animals' susceptibility to various infectious and somatic diseases. If such conditions arise during the experiment, the results may be compromised, leading to inaccurate conclusions.

The vivarium facilities were cleaned every morning, and the cages and vivarium premises were cleaned using clean, designated clothing. Before the end of the experiment, the carcasses of deceased animals were buried in the ground and disinfected using a 20% chlorine solution according to the ICT guidelines for the disposal of deceased laboratory animals. All experimental groups were formed simultaneously. Animal care was adjusted to their age, sex, weight, housing, and feeding conditions. During the experiment, all recommendations for biosafety and ethical principles of animal care and handling were followed in accordance with the "Rules and Methods for Working with Laboratory Animals in Microbiological and Immunological Studies" by Nuraliev N.A., approved by the RUZ on May 25, 2016, and the methodological manual developed by the authors.

- Group I (Control Group) – 26 rats were kept under standard vivarium conditions and fed a normal diet with standard sugar content. This group was used for comparison with other experimental groups.
- Group II (Experimental Group) – 26 rats were given an average of 12–14 ml of sugary water per day, corresponding to 100 ml per 1 kg of body weight. This solution was administered for 1 month.
- Group III (Experimental Group) – 26 rats were given the same diet as Group II (12–14 ml of sugary water daily for 1 month), and in addition, a mixture (5 ml) was given once daily in the morning with food.

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INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

Groups (C–control, E–experimental)	Description of experiment	Young animals, 3 months	Total number of animals (*dead rats)
I (C)	Group 1 – rats under standard vivarium conditions and intact diet	26	5
II (E)	Group 2 – same diet, plus 12–14 ml of sugary water per day for 1 month	26	6
III (E)	Group 3 – same as Group 2 + 5 ml mixture daily during meals	26	–
Total		78	11

Excessive sugar consumption can have harmful effects on various body systems, especially when consumed over a prolonged period. Sugar is high in calories and easily absorbed, which can lead to weight gain. Excess sugar intake, particularly from sweetened beverages and foods with added sugar, contributes to fat accumulation, especially in the abdominal area. The third group of 26 rats consumed the same dose of sugar as the second group. However, in this case, they additionally received 5 ml of a specially prepared herbal mixture once daily in the morning with their food over a one-month period.

Preparation of the mixture:

The mixture consisting of cinnamon, milk thistle, flaxseed, and black cumin can be a beneficial dietary supplement for individuals with diabetes. Each of these natural remedies possesses unique properties that may help regulate blood sugar levels and improve overall health.

1. **Cinnamon**

Cinnamon is known for its ability to reduce blood sugar levels and improve insulin sensitivity. Its active compound, cinnamaldehyde, enhances glucose uptake by cells and helps maintain stable postprandial blood sugar levels.
Benefits for diabetics: Cinnamon can lower fasting glucose levels and improve insulin resistance, which is particularly helpful in type 2 diabetes.

2. **Milk Thistle (Silybum marianum)**

3. Milk thistle is a natural hepatoprotective agent, meaning it supports liver health. Its main active compound, silymarin, is known for antioxidant and anti-inflammatory properties.
Benefits for diabetics: Milk thistle improves liver function, which is vital for sugar metabolism, and may also help reduce blood sugar levels. Studies indicate it can lower insulin resistance and glucose levels with long-term use.

4. **Flaxseed**

Flaxseed is rich in omega-3 fatty acids, fiber, and lignans, all of which positively affect blood glucose levels and carbohydrate metabolism.
Benefits for diabetics: Flaxseed lowers the glycemic index of foods, enhances insulin sensitivity, and stabilizes blood glucose levels. Its fiber slows glucose absorption, helping prevent post-meal sugar spikes.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

5. **Black Cumin (Nigella sativa)**

Black cumin has strong antioxidant and anti-inflammatory properties. Its key active component, thymoquinone, supports glucose and lipid metabolism. Benefits for diabetics: Black cumin may lower blood sugar levels and improve pancreatic function. Some studies show it enhances insulin sensitivity and reduces glucose levels in patients with type 2 diabetes.

Effects of the Mixture on Diabetes

- **Blood Sugar Reduction:** All components of the mixture have properties that help lower blood sugar levels and enhance insulin sensitivity.
- **Liver Support:** Milk thistle supports and protects the liver, which plays a central role in glucose regulation.
- **Antioxidant and Anti-inflammatory Action:** Black cumin and milk thistle help combat inflammation and oxidative stress, which are common in diabetic patients.
- **Digestive Support and Glycemic Stability:** The fiber in flaxseed slows carbohydrate absorption, stabilizing post-meal blood glucose levels.

How to Use the Mixture

These ingredients can be mixed in equal proportions or adjusted based on individual needs. The mixture can be added to yogurt, porridge, salads, or beverages, or taken as a powder (e.g., mixed with water or juice).

Important Note:
Before using any herbs or supplements, it is essential to consult a physician to rule out potential contraindications. Natural remedies should not replace primary diabetes treatments (such as insulin therapy or hypoglycemic medications) but can be part of an integrative approach. This mixture may be a useful dietary supplement for individuals with diabetes, helping to improve glycemic control and overall well-being.

Results The table below presents data on glucose level control in diabetic rats under standard conditions and with the use of a mixture containing cinnamon, milk thistle, flaxseed, and black cumin. It includes key parameters affecting blood sugar levels and the changes observed when the natural mixture was administered.
Healthy rats maintain stable blood glucose levels within the range of 4–6 mmol/L, which is considered normal for rodents. Diabetic rats show a significant increase in glucose levels (up to 15–20 mmol/L), depending on disease severity. Rats treated with the herbal mixture (cinnamon, milk thistle, flaxseed, and black cumin) demonstrated a 20–30% reduction in blood glucose levels, which helps manage diabetes. However, complete normalization requires a comprehensive and long-term treatment plan. The mixture contributes to improved glucose metabolism and helps stabilize blood sugar levels, though it is not a full replacement for insulin therapy or pharmacological treatments.

Condition of Rats	Fasting Blood Glucose (mmol/L)	Description of Changes
Healthy rats	4–6 mmol/L	Normal glucose level, stable carbohydrate metabolism

ISSN: 2692-5206
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Condition of Rats	Fasting Blood Glucose (mmol/L)	Description of Changes
Diabetic rats	15–20 mmol/L	High blood glucose, insulin resistance or insulin deficiency, symptoms of diabetes (polydipsia, polyphagia, polyuria)
Diabetic rats (after treatment)	10–14 mmol/L	Moderate 20–30% reduction in glucose levels, improved insulin sensitivity, reduced symptoms

Glucose Control in Diabetic Rats (without mixture)

Control Parameter	Expected Effect of Mixture	Observed Change with Mixture	Notes
Fasting blood glucose level	Lowering of glucose due to cinnamon and black cumin	20–30% decrease (to 10–14 mmol/L)	Effect increases over time
Glycated hemoglobin (HbA1c)	Reduction due to overall metabolic improvement	Decrease to 6–7%	Requires prolonged use of the mixture
Body weight	Stabilization due to improved metabolism	Moderate stabilization or increase	Flax helps control weight and reduce obesity
Water intake	Reduced polydipsia due to lower glucose levels	Normalization of water intake	Reduced thirst
Food consumption	Reduced polyphagia through blood glucose stabilization	Moderate decrease in food intake	Less tendency toward excessive appetite

Glucose Control in Diabetic Rats Treated with the Mixture (Cinnamon, Milk Thistle, Flaxseed, Black Cumin)

Control Parameter	Expected Effect of Mixture	Observed Change	Notes
Lipid profile	Improved lipid profile due to flaxseed and milk thistle	Decreased triglycerides and cholesterol levels	Supports liver function and reduces blood fats
Inflammatory markers	Antioxidant and anti-inflammatory effects (black cumin, milk thistle)	Reduction in inflammation markers	Reduction in oxidative stress
Liver function	Improved liver condition due to milk thistle	Decreased fatty liver degeneration	Liver protection from damage

Effect of the Mixture:
Use of the mixture leads to a gradual reduction in blood glucose and normalization of metabolic processes in diabetic rats.
Duration of Study:
For a sustained effect, the mixture should be administered over several weeks to months.

ISSN: 2692-5206
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Side Effects:
The mixture is generally well tolerated, but further research is needed to assess its long-term effects.
This table summarizes the key parameters for glucose control and other metabolic markers in diabetic rats treated with a natural mixture of cinnamon, milk thistle, flaxseed, and black cumin.

Discussion

An excessive amount of glucose in the body, especially in uncontrolled diabetes or other metabolic disorders, can negatively affect various organs and systems. The following are the main organs affected by high glucose levels and the possible consequences:

1. Cardiovascular System

Atherosclerosis: High glucose levels can damage arterial walls, promoting plaque formation and narrowing of vessels, increasing the risk of heart attacks and strokes.
Hypertension: Excess sugar may raise blood pressure, adding strain on the heart.
Elevated triglycerides: High blood sugar increases fat levels in the blood, worsening lipid profiles.

2. Kidneys

Diabetic nephropathy: Prolonged exposure to high glucose damages the kidneys, leading to protein in the urine (proteinuria) and potentially kidney failure.
Increased renal workload: Excess sugar forces the kidneys to work harder to eliminate it, heightening the risk of failure.

3. Eyes

Diabetic retinopathy: Chronically high glucose damages the retina's tiny vessels, causing vision loss or blindness.
Cataracts: Elevated glucose accelerates lens clouding.
Glaucoma: Raised intraocular pressure due to high sugar can increase blindness risk.

4. Nervous System

Diabetic neuropathy: Nerve damage from high glucose causes pain, tingling, and loss of sensation, particularly in limbs—potentially leading to amputation.
Autonomic neuropathy: Damage to nerves controlling internal organs leads to issues with digestion, heart rate, urination, and more.

5. Skin

Diabetic ulcers: Poor blood flow and nerve damage raise the risk of slow-healing foot ulcers and infections.
Frequent infections: High sugar weakens immunity, increasing susceptibility to fungal and bacterial skin infections.

6. Liver

Fatty liver disease: Excess glucose converts into fat, accumulating in the liver and contributing to non-alcoholic fatty liver disease.
Increased liver strain: Persistent hyperglycemia may cause liver inflammation and dysfunction.

7. Brain

Cognitive decline: High glucose impairs memory, focus, and learning ability and may raise the risk of Alzheimer's disease.
Microstrokes: Damage to brain microvessels may result in silent strokes, impairing cognition over time.

8. Pancreas

ISSN: 2692-5206
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Pancreatic overload: Continuous high sugar levels overwork the pancreas to produce more insulin, eventually exhausting β-cells and contributing to type 2 diabetes.
Insulin resistance: Excess glucose reduces cellular insulin sensitivity, worsening metabolic disturbances.

9. Joints and Bones

Joint damage: Elevated glucose may promote inflammation in joints, increasing arthritis risk.
Osteoporosis: Diabetics may have a higher risk of fragile bones and fractures.

10. Immune System

Weakened immunity: High sugar impairs white blood cell function, making infections more likely.
Delayed wound healing: Elevated glucose disrupts tissue repair, raising the risk of complications from injuries.

11. Digestive System

Gastroparesis: High glucose impairs stomach nerve function, slowing digestion and causing nausea, vomiting, or bloating.
Constipation/diarrhea: Intestinal nerve damage can lead to alternating bowel issues.

Conclusion

Excess glucose in the body has a destructive systemic effect on multiple organs and systems. Therefore, it is vital to monitor blood sugar levels and follow dietary, physical activity, and medication recommendations to prevent complications associated with diabetes and metabolic disorders.

References

1. Bobonazarovich D. S., Furkatovna H. M. В НАРОДНОЙ МЕДИЦИНЕ ПРИГОТОВЛЕНИЕ СМЕСИ ДЛЯ КОРРЕКЦИИ САХАРНОГО ДИАБЕТА //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2024. – Т. 2. – №. 4. – С. 97-109.
2. Hikmatova, M. F. (2022). Treatment and Prevention of Kidney Diseases with Herbs. American Journal of Social and Humanitarian Research, 3(6), 426-429.
3. Furkatovna, H. M. (2021). Pakistan pharmaceutical stocks behavior during covid19. Central Asian Journal of Medical and Natural Science, 2(1), 8-10.
4. Furkatovna, H. M. (2021). To study the anthropometric parameters of children and adolescents involved in athletics.
5. Izatulloyevna, T. Z., Azimovna, A. N., Avazxonovna, S. G., & Furqatovna, H. M. (2018). Health status of Scool children depending on health care activities of families. European science review, (9-10-2), 164-166.
6. Morphometric features of anthropometric parameters of adolescents living in the city of Bukhara engaged in athletics
7. http://article.sapub.org/10.5923.j.ajmms.20231305.40.html
8. Furkatovna, H. M. (2021). MEDICINAL PLANTS FOR BLOOD THINNING IN PREGNANT WOMEN. Central Asian Journal of Medical and Natural Science, 2(1), 5-7.
9. Hikmatova, M. F., & Khamdamova, M. T. (2021). Morphometric features of anthropometric parameters of adolescents living in the city of Bukhara engaged in athletics. ACADEMICIA: An International Multidisciplinary Research Journal, 11(9), 492-495.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

10. Hikmatova, M. F., & Khamdamova, M. T. (2021). A study of morphometric features of anthropometric parameters of adolescents living in the city of Bukhara engaged in athletics. Asian Journal of Multidimensional Research, 10(9), 215-217.
11. Furkatovna, H. M. (2021). To study the morphometric features of the anthropometric parameters of children and adolescents involved in athletics. Биология и интегративная медицина, (1 (48)), 7-14.
12. Hikmatova, M. F. (2022). Pomegranate Fruits in the Prevention and Treatment of Kidney Diseases. O'ZBEKISTONDA FANLARARO INNOVATSIYALAR VA ILMIY TADQIQOTLAR JURNALI, 1(9), 423-426.
13. MF, H. (2023). Pomegranate Fruits in the Prevention and Treatment of Kidney Diseases.
14. Hikmatova, M. F. (2023). The Influence of Pomegranate Seed Oil on the Spleen in Case of Kidney Insufficiency. Innovative Academy Research Support Center Innovative Academy Research Support Center.
15. Хикматова, М. (2021). Лёгкая атлетика–ключ здоровья. Общество и инновации, 2(8/S), 439-443.