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The Effect of Walking and Sugar-Free Intermittent Fasting on a Woman with Type 2 Diabetes

أثر المشي والصيام المتقطع خالي السكريات على امرأة مصابة بداء السكري من النوع الثاني

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Abstract

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Key words:

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physical activity.

This case study aimed to examine the effect of regular postprandial walking combined with a sugar-free intermittent fasting regimen (16/8) for one month on a woman diagnosed with type 2 diabetes. A descriptive–experimental methodology was adopted, monitoring vital indicators (blood glucose levels, body mass index, and blood pressure) before and after the intervention.

The findings revealed a noticeable improvement in the studied indicators, including a reduction in fasting blood glucose and body weight, as well as enhanced overall physical performance. The study highlights the importance of integrating simple physical activities—such as walking after each meal—alongside healthy dietary strategies, notably sugar-free intermittent fasting, as complementary therapeutic approaches for individuals with type 2 diabetes, provided that medical supervision is ensured.

الكلمات المفتاحية: ملخص

هدفت هذه الدراسة - باعتبارها دراسة حالة - إلى الكشف عن أثر المشي اليومي المنتظم بعد كل وجبة مدمجاً مع نمط الصيام المتقطع خالي السكريات (8/16) لمدة شهر كامل على امرأة مصابة بداء السكري من النوع الثاني. اعتمدت المنهجية الوصفية-التجريبية من خلال متابعة المؤشرات الحيوية (مستوى سكر الدم، مؤشر كتلة الجسم، ضغط الدم) قبل وبعد التجربة.

أظهرت النتائج تحسناً ملحوظاً في المؤشرات المدروسة، حيث انخفضت مستويات السكر الصيامي والوزن، وتحسن الأداء البدني العام. توصي الدراسة بأهمية إدماج النشاط البدني البسيط كالمشي بعد كل وجبة، مقروناً باستراتيجيات غذائية صحية مثل الصيام المتقطع خالي السكريات، ضمن البرامج العلاجية المكملية لمرضى السكري من النوع الثاني، مع ضرورة المتابعة الطبية الدقيقة.

داء السكري من النوع الثاني المشي الصيام المتقطع خالي السكريات النشاط البدني.

1. Introduction

Diabetes mellitus is considered one of the most pressing global health challenges of the 21st century. Reports from the World Health Organization (WHO, 2023) indicate that the number of individuals affected by diabetes is steadily increasing, with estimates exceeding 460 million people worldwide, the majority of whom suffer from type 2 diabetes. This growing prevalence is attributed to a combination of interrelated factors, including sedentary lifestyles, unhealthy dietary patterns, rising obesity rates, and the stresses of modern life.

Type 2 diabetes is characterized by insulin resistance, whereby the body's cells lose their ability to respond effectively to insulin produced by the pancreas, leading to the accumulation of glucose in the bloodstream. This chronic condition is closely associated with an increased risk of cardiovascular disease, nephropathy, neuropathy, and retinopathy, making early intervention and continuous management critically important.

A considerable body of research has demonstrated that regular physical activity is among the most effective non-pharmacological strategies for managing diabetes. Walking after each meal, for instance—a simple and low-cost form of exercise—has been shown to enhance insulin sensitivity, lower blood glucose levels, reduce excess weight, and improve cardiovascular health. Moreover, integrating postprandial walking into the daily routine of patients with diabetes empowers them with a sense of control over their health while reducing stress and anxiety associated with the disease.

In addition to physical activity, there has been increasing scientific interest in recent years in sugar-free intermittent fasting as a dietary strategy for regulating blood glucose and promoting weight loss. This regimen typically consists of fasting for a set period (commonly 16 hours) followed by an 8-hour eating window. Scientific evidence suggests that this approach can reduce insulin resistance, decrease fat accumulation, improve inflammatory markers, and regulate metabolic processes.

Although postprandial walking and sugar-free intermittent fasting have each been studied individually in various contexts, their combined effects have not

been sufficiently explored, particularly within case-based research involving individuals with type 2 diabetes. Investigating the dual impact of both physical activity and dietary intervention may provide deeper insights into how integrated approaches can improve health indicators while accounting for patient-specific circumstances.

Based on the foregoing, this study seeks to address the following research question: To what extent can regular daily walking, when combined with sugar-free intermittent fasting (16/8), positively influence vital health indicators in a woman with type 2 diabetes?

General Hypothesis

Regular daily postprandial walking combined with sugar-free intermittent fasting (16/8) for a full month has a positive effect on the vital and health indicators of a woman with type 2 diabetes, by lowering blood glucose levels, improving body weight, and enhancing overall physical performance.

Research Questions

1. Does regular daily postprandial walking contribute to reducing blood glucose levels in a woman with type 2 diabetes?
2. Does sugar-free intermittent fasting (16/8) improve weight-related indicators and fat regulation?
3. Can the integration of postprandial walking and sugar-free intermittent fasting produce a combined or synergistic effect greater than either intervention alone?

Specific Hypotheses

1. Regular daily postprandial walking is likely to lower fasting blood glucose levels and improve insulin sensitivity.
2. Sugar-free intermittent fasting (16/8) is likely to promote weight loss and reduce body mass index (BMI).
3. The combination of postprandial walking and sugar-free intermittent fasting is expected to generate cumulative effects that positively influence diabetes management and improve overall health indicators.

Study Objectives

To examine the effect of regular daily postprandial walking on fasting blood glucose levels in a woman

with type 2 diabetes.

To investigate the role of sugar-free intermittent fasting (16/8) in reducing body weight and improving related physiological markers (e.g., BMI and blood pressure).

To assess the combined effectiveness of postprandial walking and sugar-free intermittent fasting when applied together over a short-term period (one month).

To highlight the practical dimensions of integrating physical activity and dietary intervention as complementary therapeutic strategies alongside pharmacological treatment.

To provide a practical model that can benefit patients, physicians, and trainers in designing evidence-based therapeutic programs.

Significance of the Study

This study contributes to enriching the scientific body of knowledge concerning non-pharmacological interventions for managing type 2 diabetes.

It offers an added value by linking physical activity (postprandial walking) with dietary intervention (sugar-free intermittent fasting) through a real-world case study.

It paves the way for future research with larger sample sizes and extended durations.

It provides patients with practical evidence of the simplicity and effectiveness of behavioral interventions (postprandial walking + sugar-free intermittent fasting).

It equips physicians, nutritionists, and sports specialists with scientific indicators that can be utilized in designing complementary programs to pharmacological therapy.

It presents a model that can be gradually generalized in clinical practice, especially as it relies on simple, low-cost, and highly effective interventions.

Previous Studies

Harvie et al. (2013) examined the effects of intermittent fasting (5:2 regimen) on patients with type 2 diabetes. The findings revealed significant improvements in insulin sensitivity, reductions in fasting blood glucose levels, and notable weight loss.

The authors concluded that sugar-free intermittent fasting represents a promising alternative to conventional dietary approaches for glycemic control.

Lopez et al. (2019) aimed to investigate the impact of a moderate daily walking program (30 minutes/5 days per week) on women with type 2 diabetes. The results indicated a significant reduction in body mass index (BMI) and improvements in HbA1c levels, underscoring the effectiveness of regular postprandial walking as a non-pharmacological approach to improving disease management.

Trepanowski et al. (2017) compared intermittent fasting (alternate-day fasting) with a calorie-restricted diet in individuals with metabolic disorders. Both interventions led to reductions in glucose and triglyceride levels; however, the intermittent fasting group demonstrated higher adherence rates and faster improvements in glycemic control.

A local Algerian study by Ben Zineddine et al. (2021) investigated the effect of a structured physical activity program (walking + aerobic exercise) on patients with type 2 diabetes in Algeria. The findings showed improvements in HbA1c, weight reduction, and enhanced quality of life. The researchers recommended combining physical activity with balanced dietary strategies within therapeutic protocols.

Analysis and Discussion of Previous Studies

The collective findings suggest that both sugar-free intermittent fasting and regular postprandial walking contribute significantly to improved glycemic control, weight reduction, and enhanced insulin sensitivity. These outcomes highlight the importance of integrating both strategies as a preventive and therapeutic approach to type 2 diabetes management—an integration that this case study seeks to explore in depth.

2. Theoretical Framework

2.1. Walking

Walking is considered one of the simplest and most common forms of physical activity among humans since ancient times. It represents the primary means of mobility and one of the most accessible health practices for individuals of different ages and groups. Walking is characterized by its ease of application,

low cost, and lack of need for specialized equipment or complex skills. Numerous studies have confirmed that regular walking improves physical fitness and reduces the risk of chronic diseases such as cardiovascular conditions and diabetes.

Walking is a complex physiological process involving both the musculoskeletal and nervous systems, requiring precise coordination between muscle contractions, joint movements, and body balance. It is generally recommended to practice walking at a moderate to brisk pace for 30 to 60 minutes daily, in line with global health guidelines. Research has shown that walking at a moderate speed (equivalent to 60–70% of maximum heart rate) contributes to enhancing the body's ability to utilize oxygen and improves cardiorespiratory efficiency.

From a health perspective, walking helps reduce both systolic and diastolic blood pressure, lowers low-density lipoprotein (LDL) cholesterol, and increases high-density lipoprotein (HDL) cholesterol. It also contributes to regulating blood glucose levels by stimulating muscles to utilize glucose as an energy source, making walking one of the most important recommendations for people with diabetes. In addition, walking improves mental health by reducing anxiety and depression and enhancing sleep quality.

In modern societies, where sedentary lifestyles have increased due to technological advancements, walking has become a life necessity that should be integrated into the daily routine. Walking after each meal, for instance, helps accelerate digestion and reduces postprandial spikes in blood glucose levels. Several studies have highlighted the positive impact of light physical activity after meals on glycemic control.

Thus, walking is not merely an automatic movement but a therapeutic and preventive approach, especially when combined with other healthy lifestyle patterns. (Hassan, 2019)

2.2. Intermittent Fasting

Intermittent fasting is one of the modern dietary patterns that has received wide attention in scientific and health circles. This regimen is based on alternating between periods of fasting and eating, during which food is withheld for specific hours, with allowance for water or non-caloric beverages, followed by

food intake within a restricted time window. The most common method is the 16/8 pattern, where an individual fasts for 16 consecutive hours and consumes meals within the remaining 8 hours.

Studies have demonstrated that intermittent fasting offers several benefits, most notably weight reduction through decreased caloric intake and stimulating the body to utilize fat as an energy source after glycogen stores are depleted. This dietary pattern also improves insulin sensitivity, making it an effective option for individuals at risk of, or already diagnosed with, type 2 diabetes.

At the metabolic level, intermittent fasting enhances the process of autophagy, a natural cellular mechanism through which damaged cell components are eliminated and regenerated, contributing to the prevention of age-related chronic diseases. Additionally, this regimen lowers triglyceride levels and LDL cholesterol, while improving cardiovascular health markers.

Intermittent fasting also helps reset hunger and satiety hormones, such as ghrelin and leptin, leading to a natural decrease in appetite without strict dietary restrictions. Psychologically, this pattern fosters self-discipline and a greater sense of control over eating habits, positively impacting overall health.

In the Arab and Islamic context, fasting is deeply tied to spiritual and religious practice through Ramadan fasting, which makes acceptance of intermittent fasting easier compared to other communities. However, physicians consistently emphasize that this regimen must be practiced under medical supervision, particularly for diabetic patients or those with other chronic conditions. (Abdl-Aal, 2021)

2.3. Type 2 Diabetes mellitus

Type 2 diabetes mellitus (T2DM) is one of the most prevalent chronic diseases worldwide and poses a significant challenge to healthcare systems. It is characterized by elevated blood glucose levels resulting from impaired insulin action (insulin resistance) or reduced pancreatic insulin secretion. The onset of this condition is attributed to a complex interaction of genetic and environmental factors, notably obesity, physical inactivity, unhealthy dietary habits, and aging.

Statistics indicate that type 2 diabetes accounts for approximately 90–95% of all diabetes cases globally. Its complications are diverse, including cardiovascular disease, kidney failure, diabetic retinopathy leading to blindness, and neuropathy that may result in limb amputation. Therefore, T2DM is a major public health issue that threatens quality of life and increases socioeconomic burdens on communities.

Therapeutically, diabetes management relies on a combination of pharmacological treatment (such as metformin and, in some cases, insulin) and non-pharmacological interventions including healthy nutrition and physical activity. Scientific evidence suggests that effective glycemic control significantly reduces the risk of complications.

Insulin resistance represents the core mechanism of this disease, where body cells fail to respond adequately to insulin, leading to glucose accumulation in the blood. Hence, non-pharmacological interventions such as walking and intermittent fasting are critical for improving insulin sensitivity and reducing excess weight, thereby aiding disease management.

Furthermore, patient education plays an essential role in diabetes care, as patients must understand their condition and the importance of adhering to dietary patterns, physical activity, and regular medical follow-up. (AL-Jamal,2020)

2.4. Physical Activity

Physical activity refers to any bodily movement that results in increased energy expenditure compared to rest, and includes all forms of movement such as walking, running, swimming, stair climbing, as well as household or manual labor. It is a cornerstone for maintaining health and preventing disease, with the World Health Organization recommending at least 150 minutes of moderate-intensity physical activity per week for adults.

The importance of physical activity extends beyond physical health to encompass psychological and social aspects. It enhances mood, reduces stress and anxiety, boosts self-confidence, and provides opportunities for social interaction, especially through team sports.

Physiologically, physical activity improves cardiorespiratory efficiency, strengthens muscles and

bones, elevates basal metabolic rate, and helps regulate body weight. It also enhances cellular responsiveness to insulin, playing a direct role in preventing and managing type 2 diabetes.

Numerous studies have shown that physically active individuals have lower rates of cardiovascular disease, obesity, cancer, osteoporosis, and depression compared to sedentary individuals. On a therapeutic level, physical activity has become an integral component of treatment protocols for many chronic conditions.

In Arab societies, however, physical activity remains underutilized due to sedentary lifestyles and limited health awareness. This highlights the need for institutional interventions to encourage physical activity through national and community-based programs. (Qasim,2018)

3. Methodology

This research employed the case study method, as it focuses on examining the effects of a specific intervention program on a single patient with type 2 diabetes. This method is particularly suitable when the objective is to gain an in-depth understanding of a phenomenon within its natural context rather than to generalize findings to a broader population.

The study sample consisted of one participant ($n = 1$), a 52-year-old woman diagnosed with type 2 diabetes six months prior to the intervention. She was undergoing regular medical follow-up and did not suffer from severe complications or other chronic illnesses.

The intervention lasted for one full month (30 days), from May 15, 2023, to June 15, 2023. During this period, a protocol combining physical activity (postprandial walking after each meal) and dietary intervention (sugar-free intermittent fasting, 16/8 regimen) was implemented.

Intervention Protocol

Physical Activity (Postprandial Walking): Daily walking after each meal for 30–45 minutes at moderate intensity (60–70% of maximum heart rate). The activity was performed either outdoors or on a treadmill after each meal.

Dietary Intervention (Sugar-Free Intermittent Fasting): Adoption of the 16/8 fasting model (16 consecutive hours of fasting followed by an 8-hour

eating window). Water and calorie-free beverages were permitted during fasting hours. Meals were distributed as two main meals and one light snack within the eating window.

Measurement Tools and Variables

Both quantitative and qualitative indicators were assessed, including:

Body weight (before and after the intervention, measured regularly).

Body Mass Index (BMI).

Fasting blood glucose (monitored daily).

Resting blood pressure (before and after).

Subjective observations: sleep quality, appetite, and general activity.

Comprehensive laboratory tests (before and after), which revealed stability in key biochemical parameters such as triglycerides, renal function, HDL and LDL cholesterol, alkaline phosphatase (bone marker), liver enzymes, and absence of systemic inflammation. However, the baseline HbA1c was 13.4%, which is markedly elevated, and fasting insulin was 2.7 $\mu\text{IU/mL}$, indicating pronounced insulin resistance.

Data Collection Methods

Biological measurements (weight, fasting blood glucose, blood pressure).

Direct observation and daily self-reports by the participant.

Weekly logs documenting physical activity levels and adherence to the fasting regimen.

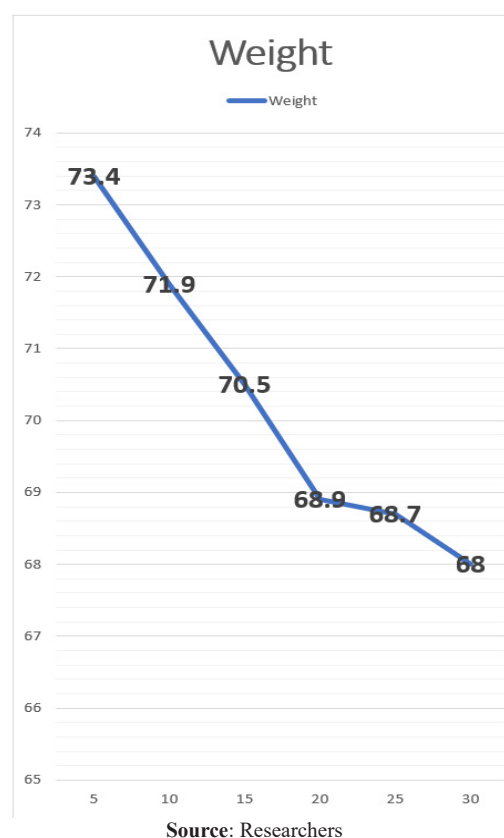
A descriptive comparative analysis was applied to compare pre- and post-intervention values, supported by graphical charts to illustrate trends. Results were further analyzed in relation to previous studies to highlight areas of convergence and divergence.

4. Results and discussion

After one full month of implementing the combined program of regular postprandial walking and sugar-free intermittent fasting (16/8), the study yielded the following outcomes:

1. Body Weight: Decreased from 75 kg to 68 kg (a reduction of 7 kg).

Figure 1: Graph illustrates the progressive reduction in weight over the month.



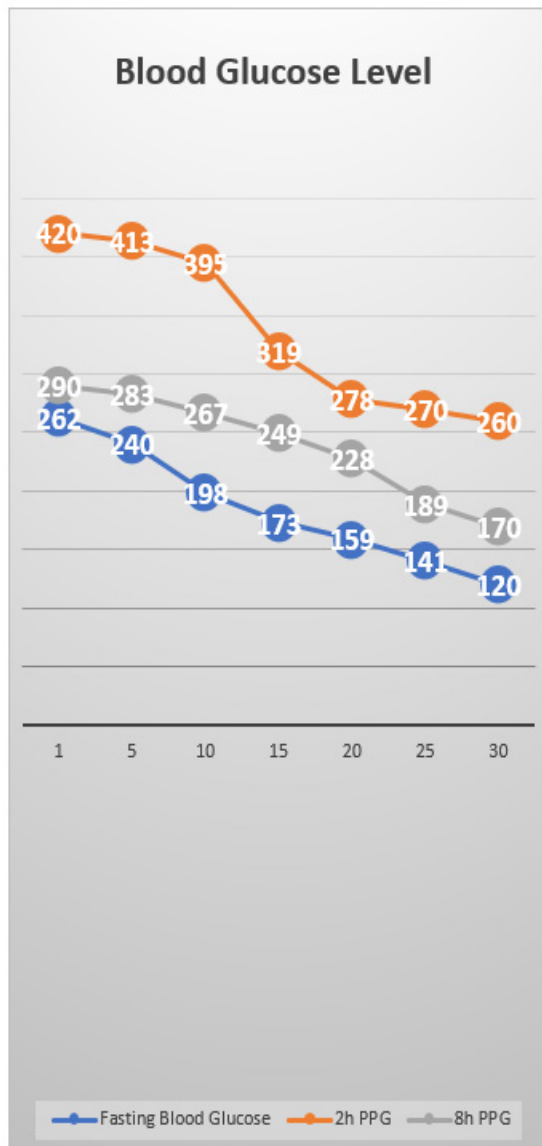
2. Body Mass Index (BMI): Decreased from 30.12 kg/m^2 to 27.3 kg/m^2 .

Figure 2: Graph illustrates the progressive decline in BMI over the month.



3. Fasting Blood Glucose: The mean level decreased from 262 mg/dL to 120 mg/dL (an improvement of approximately 142 mg/dL). Postprandial values also improved significantly: from 420 mg/dL to 260 mg/dL (2 hours post-meal), and from 290 mg/dL to 170 mg/dL (8 hours post-meal).

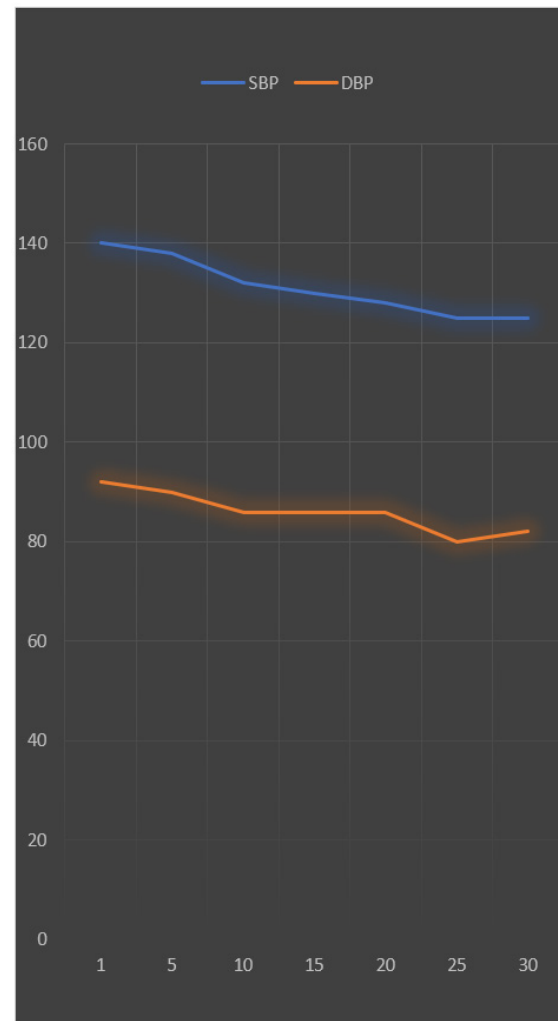
Figure 3: Graph illustrates the gradual reduction in fasting and postprandial blood glucose levels over the month.



Source: Researchers

4. Blood Pressure: Decreased from 140/90 mmHg to 125/80 mmHg.

Figure 4: Graph illustrates the progressive improvement in blood pressure readings.



Source: Researchers

5. Clinical Observations: The participant reported better sleep quality, reduced postprandial fatigue, and increased overall activity levels. HbA1c improved from 13.4% to 8.7%, representing a substantial reduction compared to baseline. Fasting insulin increased from 2.8 μ IU/mL to 6.7 μ IU/mL, indicating a reversal of insulin resistance and restoration toward normal physiological response.

Discussion of Results in Light of the Hypotheses

Sub-Hypothesis 1: Daily walking has a positive effect on improving glycemic balance indicators.

The results show that the participant recorded a significant decrease in fasting blood glucose. This is consistent with previous studies (e.g., Colberg et al., 2016), which demonstrated that regular physical activity improves insulin sensitivity and contributes

to lowering glucose levels.

It can be stated that walking after each meal played a key role in stimulating glucose uptake by the muscles and enhancing insulin efficiency.

Sub-Hypothesis 2: Intermittent fasting (16/8) has an effect on weight reduction and improving insulin sensitivity.

The observed weight loss (7 kg within one month) reflects the effectiveness of sugar-free intermittent fasting in reducing caloric intake and improving energy balance. This finding is in line with Varady (2011), who confirmed that intermittent fasting contributes to significant weight loss while improving metabolic markers. Moreover, the decrease in appetite reported by the participant supports the hypothesis that intermittent fasting helps reset hunger and satiety signals.

Sub-Hypothesis 3: Combining post-meal walking with sugar-free intermittent fasting leads to greater improvements in health indicators compared to relying on either intervention alone.

Field observations revealed that the integrative effect was more evident: weight reduction was not solely a result of dietary intervention, but also facilitated by the increased energy expenditure through walking. Likewise, the reduction in blood glucose resulted from the synergy between muscular glucose uptake (via walking) and enhanced insulin sensitivity (via intermittent fasting).

This agrees with Patterson & Sears (2017), who indicated that the combination of exercise and fasting produces a synergistic effect.

5. Conclusion

This case study demonstrated that adherence to a regular daily routine of post-meal walking (30–45 minutes) combined with sugar-free intermittent fasting (16/8 protocol) for a full month resulted in notable improvements in multiple health indicators for a female patient with type 2 diabetes. Her weight decreased by 7 kg, her BMI dropped from 30.12 kg/m² to 27.3 kg/m², fasting blood glucose levels declined from 262 mg/dl to 120 mg/dl, and blood

pressure improved. These physiological changes were accompanied by subjective improvements, including enhanced well-being, increased daily activity, and better sleep quality.

The findings validate the partial hypotheses and the general hypothesis of the study, indicating that the combination of moderate physical activity (post-meal walking) and sugar-free intermittent fasting constitutes an effective, simple, and low-cost strategy to improve type 2 diabetes control. Moreover, both approaches are safe and can be integrated alongside pharmacological treatment.

Despite the limitations of the study—namely, the small sample size (a single participant) and the short intervention duration (one month)—the results provide a practical model upon which future, larger-scale, and longer-term research can build, in order to strengthen scientific evidence regarding the impact of non-pharmacological interventions on the lives of individuals with diabetes.

6. Recommendations

Based on the findings of this study, the following recommendations can be made:

For patients with type 2 diabetes:

Adopt regular post-meal walking for at least 30 minutes at a moderate pace, as it represents a simple and safe form of physical activity.

Implement a sugar-free intermittent fasting regimen (16/8) after consulting with a physician, while focusing on consuming balanced meals rich in vegetables and lean proteins, and limiting simple sugars.

Monitor blood glucose levels regularly to ensure proper physiological response and to prevent severe hypoglycemia.

For physicians and health professionals:

Encourage patients to integrate healthy lifestyle practices (exercise + diet) as a complementary approach that may reduce reliance on pharmacological treatment.

Develop individualized programs tailored to each patient's health status, age, and physical fitness level.

Conduct regular follow-ups of blood glucose levels and body weight to ensure the effectiveness and safety of the intervention.

For researchers:

Expand research to include larger samples and longer intervention periods, to validate and generalize the findings.

Investigate the combined effects of physical activity and sugar-free intermittent fasting across different populations (men, women, various age groups).

Compare the effectiveness of different types of exercise (post-meal walking, swimming, resistance training) combined with various intermittent fasting protocols.

For health policymakers:

Integrate education on physical activity and healthy fasting practices into national diabetes prevention programs.

Promote community-based initiatives (e.g., health clubs, awareness campaigns) to simplify and facilitate the adoption of healthy practices among patients.

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