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## Diabetes Treatment And Control Using Lifestyle Intervention In Outpatient Setting: Case Series And Update

Amin Amilcar Valencia Leal

*Unidad de Diabetes y centro de Vida Sana La Carlota, Universidad de Montemorelos. Nuevo León, México,*  
1140271@alumno.um.edu.mx

Lujhon Guillermo Flórez Gutiérrez

Evy Nohemi Perez

Ana Vanessa Valencia Leal

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# DIABETES TREATMENT AND CONTROL USING LIFESTYLE INTERVENTION IN OUTPATIENT SETTING: CASE SERIES AND UPDATE

TRATAMIENTO Y CONTROL DE LA DIABETES CON INTERVENCIÓN DE ESTILO DE VIDA EN PACIENTES AMBULATORIOS: SERIE DE CASOS Y ACTUALIZACIÓN

Amin Amilcar Valencia Leal<sup>1,2a</sup>, Lujhon Guillermo Flórez Gutiérrez<sup>1,2b</sup>, Evy Nohemi Perez<sup>3a</sup>, Ana Vanessa Valencia Leal<sup>3c</sup>

## ABSTRACT

**Introduction:** The prevalence of diabetes demands the identification of more efficient long-term methods to achieve good patient control. **Clinical Case:** This paper reports the progress of 4 patients diagnosed with previously poorly controlled type 2 diabetes and prediabetes with comorbidities that were attended in an outpatient clinic, they received orientation regarding lifestyle change and were instructed to increase consumption of dietary fiber and physical activity. Body composition and biochemical markers were followed, and changes were reported. **Conclusion:** In a 5-month period Patient 1 achieved criterion to be classified as controlled diabetes and was able to suspend oral hypoglycemic agents, reducing his body weight by 10%. Within an 8-week period Patient 2 experienced a 50% decrease of HOMA IR and was able to achieve criteria of controlled diabetes. Furthermore a 3 kg increase in lean body mass and a 4 kg body weight decrease were documented. These findings were accompanied by a 23% and 38% decrease in total cholesterol and triglycerides respectively. Patient 3 achieved criteria for type 2 diabetes remission within a 18 month time span (Inicial HBA1C 11.4% Final HBA1C 5.3). Patient 4 progressed to remission of prediabetes and a decrease of 5.9% in total body weight in a 3-month period.

**Keywords:** Type 2 Diabetes Mellitus, Plant-Based Diet, Healthy Lifestyle, Remission. (Source: Mesh – NLM)

## RESUMEN

**Introducción:** Las cifras de prevalencia de la diabetes nos obligan a identificar métodos más eficientes a largo plazo para lograr el buen control de los pacientes. **Caso Clínico:** En este trabajo se reporta el curso clínico de 4 pacientes con diagnóstico de diabetes mellitus tipo 2 y prediabetes quienes fueron atendidos en la consulta externa y recibieron asistencia no intensiva para cambio de comportamiento en salud, orientada a aumentar consumo de fibra alimentaria y a aumentar sus niveles de actividad física. Se reportan cambios en indicadores bioquímicos y antropométricos. **Conclusión:** El paciente 1 en 5 meses logró suspender hipoglucemiantes orales, disminuyendo un 10% de su peso corporal y logrando criterios de prediabetes (remisión parcial). El paciente 2 en un período de 8 semanas logró alcanzar criterios de diabetes controlada, disminuyendo en 50% el índice HOMA IR. Además, se documentó pérdida de 4 kg de masa grasa corporal con ganancia de 3 kg de masa magra. Lo anterior se acompañó de una disminución del 23% del colesterol total y 38% de triglicéridos. La paciente 3 alcanzó criterios de remisión de DM2 durante un seguimiento de 18 meses (HBA1C 11.4% inicial y 5.3% final). La paciente 4 evolucionó a remisión de prediabetes y disminución de 5.9% de peso corporal total en un periodo de 3 meses.

**Palabras claves:** Diabetes Mellitus tipo 2, dieta basada en plantas, estilo de vida saludable, remisión (Fuente: Decs – BIREME).

<sup>1</sup> Unidad de Diabetes y centro de Vida Sana La Carlota, Universidad de Montemorelos. Nuevo León, México.

<sup>2</sup> Colegio Mexicano de Medicina del Estilo de Vida. Latín American Lifestyle Medicine. Nuevo León, México.

<sup>3</sup> Universidad de Montemorelos. Nuevo León, México.

<sup>a</sup> Médico cirujano

<sup>b</sup> Especialista en Medicina Interna y Diabetes

<sup>c</sup> Estudiante de medicina

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## INTRODUCTION

The pandemic caused by the SARS-COV 2 virus has surprised the world population that was already fighting against another pandemic caused by a group of conditions that share a common origin in metabolic disorders underlying insulin resistance (Metabolic Syndrome), these include obesity, coronary heart disease, different types of cancer, type 2 diabetes mellitus and its complications. It has been established that type 2 diabetes mellitus is a disease mostly caused by habits out of alignment with a healthy lifestyle, <sup>(1)</sup> currently occupying first place in mortality in Mexico, surpassing even coronary heart disease <sup>(2)</sup>. The worldwide prevalence continues to increase at an alarming rate, currently standing at around 415 million people <sup>(3)</sup>.

Worldwide figures for DM2 establish that every 6 seconds a person dies as a result of DM2, it is the leading cause of permanent blindness, non-traumatic amputations and end-stage renal failure <sup>(4,5)</sup>. DM2 care programs are estimated to consume about 12% of the world's health expenditure <sup>(3)</sup>, unfortunately with poor results as shown by the fact that in most Latin American countries, taking into account HbA1c <7% as a criterion of good control, less than 25% of patients can be considered controlled and this figure falls below 5% if other factors such as control of HT, hyperlipidemia and adequate treatment of antiplatelet aggregation are considered <sup>(5)</sup>.

The above facts clearly place us in the worrying situation in which we find ourselves. As a response to the current health crisis it is crucial that we health professionals are prepared to employ an effective tool currently underutilized, such as Lifestyle Medicine, which has a growing body of robust scientific evidence on its efficacy for the prevention, control and even reversal of DM2 <sup>(6)</sup>. From our corner we want to make a contribution by sharing real life experiences around the role of Lifestyle Medicine in the treatment of prediabetes and DM2 individuals.

## CASE REPORT

### Case 1

Patient identification: 59-year-old female.  
Reason for consultation: Referred by family physician.  
Heredofamilial history: DM2 4/10 siblings.  
Personal Pathologic History: 2018 osteoporosis, mixed

hyperlipidemia.

Medications: Zoledronic acid 4mg per year, Bezafibrate 200 mg per day, Atorvastatin 20 mg per day, Metformin 500 mg every 24 hours.

Physical examination: Monofilament test (-), pedal pulse +++/++++.

### Lifestyle vital signs

Sleep: Chronodisruption related to his status as a caregiver of person with special needs.

Physical activity: Walking and jogging 150 min/week.

Dietary pattern: 3 meals a day, no set schedule; omnivorous. Diet low in fiber, hypercaloric, high in ultra-processed, sweetened beverages and fats.

### Treatment and evolution:

A 59-year-old woman presented to the outpatient clinic where a diagnosis of type 2 diabetes mellitus, mixed hyperlipidemia and overweight (BMI 27) was established. Pharmacotherapy was started with bezafibrate 200 mg per day, atorvastatin 20 mg per day and she was referred to diabetology consultation where plant-based diet therapy was advised with caloric restriction <1500 kcal, 40 g of dietary fiber per day and restriction of saturated and ultra-processed fats. Aerobic or muscle strengthening exercise at tolerance for more than 150 minutes per week. Abundant intake of pure water and establishment of meal and sleep schedules and healthy stress management.

At the control visit 2 months later, a weight loss of 2.9 kg was documented, at 4 months 5.2 kg with HBAIC of 6% and basal glucose of 99 mg/dl, at 5 months a cumulative loss of 7.7 kg (BMI 24.1) of body weight was calculated and blood glucose levels were found to be 100% within normality. It was decided to maintain the pharmacological treatment (dapagliflozin/metformin) for a couple of more months until the patient felt more confident and accustomed to her new habits.

### CASE 2

Patient identification: 62-year-old male.  
Reason for consultation: Dysglycemia.  
Heredofamilial history: Mother DM2, DM2 5/11 siblings.  
Pathological Personal History: uncontrolled DM2 20 years of evolution, systemic arterial hypertension, hyperlipidemia and venous insufficiency.  
Medications: Metformin/glipizide 1000/10 mg every 12 hours, Fenofibrate 100 mg/day, Amlodipine/Valsartan 320/10/35 mg/day.

### Lifestyle Vital Signs

Sleep: Chronodisruption: Irregular schedule for meals





and sleep. Sleep less than 6 hours per circadian cycle.  
Physical activity: Sedentary secondary to lumbosciatica.

Dietary pattern: Omnivorous, 2 main meals per day. Food without established schedule, hypercaloric, high in saturated fat and low in fiber.

### Treatment and evolution

A 62-year-old man with a history of DM2, systemic arterial hypertension, stage 3 CKD, hyperlipidemia and class 1 obesity (BMI 32.7) registering 26% body fat and 16.6 visceral fat was presented for consultation. Pharmacotherapy was started with metformin/vildagliptin 50/1000 mg and lifestyle intervention was advised with plant-based diet therapy with caloric restriction 1700 kcal, low glycemic load, with at least 40 gm of dietary fiber per day and restriction of saturated and ultra-processed fats. Aerobic or muscle strengthening exercise at tolerance for at least 300 minutes per week. Abundant intake of pure water and establishment of eating and sleeping schedules and healthy stress management.

During the follow-up, 3 months later, the patient presented blood glucose levels 100% within normal range, reduction of 4 kg of body fat mass, 1.1 in the visceral fat indicator and increase of 3 kg of fat free mass. At 5 months the patient presented 100% glucometry in normal range, HBA1C of 6.1%, reduction of 182 mg/dl of triglycerides and reduction of 1.8% of visceral fat. The patient was reclassified as controlled type 2 diabetes mellitus and obesity grade 1. The management previously established was followed.

### CASE 3

Patient identification: 39-year-old female homemaker.  
Reason for consultation: Hyperglycemia, blurred vision and involuntary weight loss.  
Heredofamilial history: None of importance.  
Personal Pathologic History: Hyperthyroidism.  
Medications: Denied.

### Lifestyle Vital Signs

Physical activity: Sedentary.  
Dietary Pattern: Hypercaloric diet high in fat, low in fiber.

### Treatment and evolution

A 39-year-old female homemaker who came to the outpatient clinic for elevated blood glucose levels and

unintentional weight loss of approximately 7 kg, with a BMI of 25.9. Her laboratory tests reported HBA1C 11.7%, basal glucose of 278 mg/dl, ketonuria and glycosuria. Type 2 diabetes mellitus was diagnosed and she was started on insulin glargine 16 IU and Metformin/Vildagliptin 2-tab 850 mg per day. A plant-based, low glycemic load diet with at least 40 grams of fiber and restriction of saturated and ultra-processed fats was advised. Aerobic or muscle-strengthening exercise at tolerance for more than 150 minutes per week. Abundant intake of pure water and establishment of eating and sleeping schedules and healthy stress management.

In follow-up consultation, 18 months later, there is evidence of normalization of her basal glycemia to 98 mg/dl, HbA1c 5.3%, total cholesterol of 150 mg/dl, triglycerides of 200 mg/dl and LDL within normal ranges. She is reclassified as controlled DM2, with high probability of reversion and the process of dismantling the pharmacological therapy is completed.

### CASE 4

Patient identification: Female 50 years old  
Reason for consultation: Recent diagnosis of prediabetes.  
Heredofamilial history: N/A.  
Personal Pathologic History: Prediabetes, fibrocystic breast condition.  
Medications: metformin 425 mg every 12 hours.

### Lifestyle Vital Signs

Sleep: Circadian cycle interrupted 2 times per night.  
Physical activity: 30-minute walks 2 times per week  
Dietary pattern: hypercaloric, carnivorous and low in fiber.

### Treatment and evolution

A 50-year-old female patient presented to outpatient clinic reporting HBA1C of 6.2% and BMI of 24.6. A 30-minute walk daily and plant-based dietary plan with low glycemic load, caloric restriction of 1500 Kcal/day, with at least 40 gm of fiber per day and restriction of saturated and ultra-processed fats were recommended. Pharmacotherapy was started with metformin 425 mg twice a day under diagnosis of prediabetes.

During follow-up, 3 months later, a loss of 10 kg (BMI 23.3) of total body weight, HBA1C of 5.6%, oral glucose tolerance test and blood glucose in normal range were documented, so metformin was discontinued. Pre-





diabetes remission is considered and she continues to be monitored for maintenance of the changes made.

## DISCUSSION

The previously accepted paradigm that defined DM2 as an inexorable and irreversibly progressive disease has been challenged by evidence from studies in patients undergoing both bariatric surgery and severe caloric restriction<sup>(7)</sup>. Subsequently, Dr. Lingvay's group presented a paper postulating that the reversal of diabetes in patients with bariatric surgery was secondary to significant weight loss and not to the surgical intervention<sup>(8)</sup>. The causal mechanism of this phenomenon can be explained by the twin-cycle hypothesis<sup>(9)</sup>. The causal mechanism of this phenomenon can be explained with the twin-cycle hypothesis<sup>(9)</sup>. This suggests that chronic exposure to a positive caloric balance diet initiates the accumulation of peripheral and central fat including perihepatic visceral fat.

This initiates the non-alcoholic liver disease process and has negative metabolic effects such as decreased central insulin sensitivity and increased triglyceride-VLDL production causing accumulation of ectopic fat stores in the pancreas. At the pancreatic level, lipotoxicity is induced by increased metabolic stress decreasing beta cell function and promoting their dedifferentiation towards progenitor and/or alpha cells causing an eventual failure of the beta cell mass<sup>(9)</sup>.

This pathophysiological process can be reversed by a negative caloric balance, taking into account important factors such as age, years of disease duration and magnitude of weight loss. A randomized clinical trial in the United Kingdom documented a statistically significant reduction in pancreatic steatosis and an increase in beta-cell functionality directly associated with a reduction in body fat mass<sup>(10)</sup>. As a consequence of the growing evidence in this field, the ADA published in 2009 a consensus on the criteria for assessing remission in DM2<sup>(11)</sup>.

During the last decade Dr. Taylor's group in the United Kingdom has published multiple studies, such as

Counterpoint applying a very restrictive diet (600 Kcal per day) for 8 weeks, achieving a weight loss of 15.3 kg on average, achieving normalization of hepatic sensitivity to insulin and the phase 1 response of pancreatic beta cells, demonstrating that the two main pathophysiological features of DM2 are reversible<sup>(12)</sup>. In the DIRECT study, only 14% of those who lost 15 kg or more failed to achieve remission of their DM2<sup>(13,14)</sup>. These results manage to inspire and motivate a large number of patients and treating physicians to consider remission as one of the goals of DM2 treatment. Although this is an excellent advance on the road to a better therapeutic approach to DM2, it is possible that an approach in which the adoption of such a severely restrictive diet is not necessary would be much more acceptable and more adherent.

The answer to this dilemma may lie in the conscious, long-term utilization of a nutritionally balanced diet with low caloric density, low glycemic load, high nutritional fiber, and high satiety indices. Plant-based nutritional patterns comply with these precepts and have been tested in the context of DM2 reversal, with good results<sup>(15)</sup>. The patients reported here participated in an intervention based on the modification of lifestyle factors that facilitate the development of DM2, proposing a plant-based dietary pattern emphasizing increased dietary fiber, increased physical activity, circadian alignment, stress and toxic habit management<sup>(16,18)</sup>. Participating in an uncontrolled daily environment with a plant-based diet and increased physical activity, disease control was achieved in 3 patients and remission of prediabetes in 1 patient requiring an average of 4 consultations.

## CONCLUSION

Lifestyle interventions such as the adoption of a plant-based dietary pattern and increased physical activity are feasible and effective tools for the prevention and treatment of patients with type 2 diabetes mellitus.







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**Correspondence:** Amin Amilcar Valencia Leal

**Address:** Av. Libertad 1300 Pte, Matamoros, 67515 Montemorelos, N.L.

**Telephone number:** 8261299435

**E-mail:** 1140271@alumno.um.edu.mx

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