

Exploring the Impact of Lifestyle Modification, Medical Intervention, and Collaborative Healthcare in Diabetes Management: A Comprehensive Case Study

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Introduction

Type 2 Diabetes is one of the most common metabolic disorders which is characterized by elevated blood sugars, frequent urination, and weight loss associated with many life-threatening complications [1]. The prevalence of type 2 diabetes is drastically increasing among adolescents and young adults due to obesity, family history, and sedentary lifestyle. The onset of diabetes in young adults less than 40 years of age is associated with chronic complications due to long-term exposure to the disease. The global pandemic of overweight and obesity now affects 37% of men, and 38% of women (adults ≥ 20 years) [2]. Obesity is an important driver for the increasing prevalence of type 2 diabetes in young people and changes in lifestyle account for much of the increased prevalence of obesity and type 2 diabetes [3]. Increasing consumption of energy-dense foods and sugar-rich drinks, and reduced physical activity, are the main contributors to obesity among young people [4]. Approximately a decade post-diagnosis, around 50% of individuals find it necessary to undergo insulin therapy for effective blood glucose management. Given these

observations, it has become standard protocol to apprise individuals at the point of diagnosis that they are dealing with a lifelong condition [5].

Calorie excess over many years leads to accumulation of fat in the liver, leading to liver insulin resistance. As the liver consistently synthesizes glucose under the regulatory influence of insulin, the insulin resistance induced by fat in the liver results in a subtle elevation in fasting plasma glucose levels, prompting an escalation in insulin production. This heightened insulin secretion further encourages the liver's conversion of carbohydrates into fat, setting off a self-perpetuating cycle. Moreover, it is theorized that the surplus fat in the liver may lead to an augmented release of fat into the systemic circulation, potentially impacting various tissues, including the pancreatic β cells. Fat is known to decrease acute insulin production, eventually causing increased post-meal glucose levels. In turn, this process would result in higher insulin levels and a greater tendency to store excess carbohydrates as liver fat. The two cycles would continue until a point at which the β cells become unable to produce enough insulin to compensate for the insulin resistance, resulting in diabetes. Importantly, according to the hypothesis, the twin cycles can be reversed if the excess fat load is removed [6].

Lifestyle modifications are universally acknowledged to be the first-line treatment of T2D, it gives the patients the liberty to live without any intensified restrictions and transform their lifestyle into a healthy one [7]. Lifestyle intervention has repeatedly and conclusively been shown to prevent or postpone the development of type 2 diabetes among high-risk individuals [8]. Patients with diabetes who want to self-manage their condition should generally monitor their blood sugar levels and blood pressure daily and keep them within the target ranges, eat a healthy diet that emphasizes foods with a low glycemic index (GI), exercise regularly, reduce their weight if it is above the recommended range, and give up smoking. Although self-management programs can help manage diabetes, a survey of more than 100 diabetic patients revealed that a technologically based solution might help people manage their condition more effectively [9]. Current evidence from randomized intervention trials suggests that weight loss using a healthy diet with lower saturated fat intake, but rich in vegetables, fruit, and whole grain products is beneficial in the prevention of T2D, especially when combined with physical activity [10]. Change in food habits plays an important role in the Management of type 2 diabetes by modulating or restoring normal glucose levels, thereby decreasing or eliminating the need for medicine/insulin.

This case study highlights the inspiring journey of an individual who joined on a path to reverse diabetes by enrolling in the SugarFits Diabetes Reversal and Management Program (SDRMP). This holistic program seamlessly integrates daily personalized life coaching with expert medical guidance, all with the main objective of empowering patients to regain control of their health and providing them with the tools necessary to facilitate lasting behavioral changes. The study aimed to discover the person's lifestyle and dietary habits, and provide them with personalized, and effective clinical treatment along with empathetic coaching. It also sought to demonstrate the success of a complete program in achieving lasting recovery, metabolic improvement, and the reduction of complications linked to diabetes, which can harm various organs. Additionally, the study aimed to share experiences and knowledge with others in the field.

Case Presentation

This concerns the case of Mr. SG, a 30-year-old male recently diagnosed with type 2 diabetes, hyperlipidemia, and Vitamin B12 deficiency. He presented with an abrupt, unintentional weight loss of 10 kgs over six months, accompanied by severe headaches, fatigue, generalized weakness, and burning feet issues.

Upon learning about Sugrfit's Diabetes Reversal and Management Program, Mr. SG proactively enrolled in the program in September 2021, to reverse his diabetes. At the time of enrollment, his baseline vitals were recorded as follows: Weight: 75 kgs, Height: 183 cm, BMI: 22.4, Waist circumference: 96 cm, Waist to height ratio: 0.52. He did not report any food or environmental allergies but had a significant family history of type 2 diabetes, with his mother being diabetic. His lifestyle involved a sedentary desk job with 30 minutes of daily walking. His sleep and mindfulness recall did not indicate any concerns, and he had a stable 8-hour sleep routine, despite alternating between day and night shifts every other day.

Hailing from the southern part of India, Mr. SG's 24-hour dietary recall revealed carbohydrate-heavy meals with irregular food timings and notably low protein intake despite consuming non-vegetarian options occasionally. While he did not admit to indulging in outside eating or excessive consumption of high-fat and high-sugar foods, his continuous glucose monitor (CGM) displayed low tolerance to oats, khichdi, ragi porridge, and ragi ball, but exhibited excellent tolerance to chapati, beans, eggs, and sprouts.

Initially, Mr. SG, conscientious about his eating habits, had eliminated many foods he enjoyed. He expressed confusion about the optimal choices for food, activity, and general habits needed to reverse his diabetes successfully. Consequently, he was assigned a coach who, understanding his challenges and lifestyle choices, provided empathetic guidance toward healthier lifestyle choices.

After receiving the initial diagnostic test results, Mr. SG sought a consultation with Sugrfit's doctor. Upon confirming the diagnosis of hyperglycemia, the consultant prescribed oral medications (Table 1).

Medication	Dosage	Frequency\Day
JANUMET XR CP	100\1000	1-0-0
ROSUVASF	5	0-0-1
NUROKIND OD	1500	1-0-1

Table 1: Baseline medications

Management and Outcome

The client received a dietary recommendation based on a 1700 kcal balanced meal plate concept, comprising 50% total carbohydrate intake, 20% protein, and 30% fat. This was further personalised to match the changing requirements of the client depending on his energy levels, blood glucose levels and

micronutrient requirement. To address potential sugar level spikes, the plan strategically included foods through meal sequencing and emphasised higher protein content. Adjustments were made to food intervals, offering diverse and suitable food choices with an emphasis on incorporating protein and fibre into each meal.

Given elevated fasting blood sugar levels and morning lethargy, the addition of apple cider vinegar post-dinner was suggested to mitigate nocturnal glycemic variations and reduce fasting blood sugars. To enhance insulin sensitivity, the diet was enriched with potent herbs such as moringa leaves (drumstick leaves), cinnamon, turmeric, and noni (Indian mulberry).

Simultaneously, a focus was placed on fitness. Considering time constraints, short bouts of exercise tailored to the client's routine were recommended, including a 15-minute walk post-lunch and dinner. The regimen progressed to incorporating 5-minute Nitric oxide dump routines three times a day, gradually intensifying to include daily strength-based routines facilitated through the Sugarfit application.

Mindfulness practices were integrated into the plan, starting with deep breathing routines before bedtime and chamomile tea consumption, later progressing to morning yoga sessions for comprehensive well-being.

Within a three-month period, HbA1c decreased from 10.4 to 6.5, and Fasting Blood Sugar (FBS) dropped from 164.4 to 131.3. Despite this improvement, medications were continued until the following quarter. By March 2022, HbA1c further decreased to 5.7, and FBS reached 86.7. During this period, the medication JANUMET XR CP 100/1000MG TAB 1-0-0 was switched to Glycomet SR 1-0-0 [metformin]. In August, metformin was discontinued, yet HbA1c was maintained at 5.8 and 5.7 in the subsequent quarters.

In addition to observing changes in HbA1c and FBS levels, the client also noted shifts in various parameters: Weight loss, though not initially a concern, amounted to 2 kgs. The focus then shifted to reducing waist size to improve the waist-to-height ratio. Consequently, the waist measurement decreased from 96 to 84, resulting in a notable reduction in the waist-to-height ratio from 0.52 to 0.45.

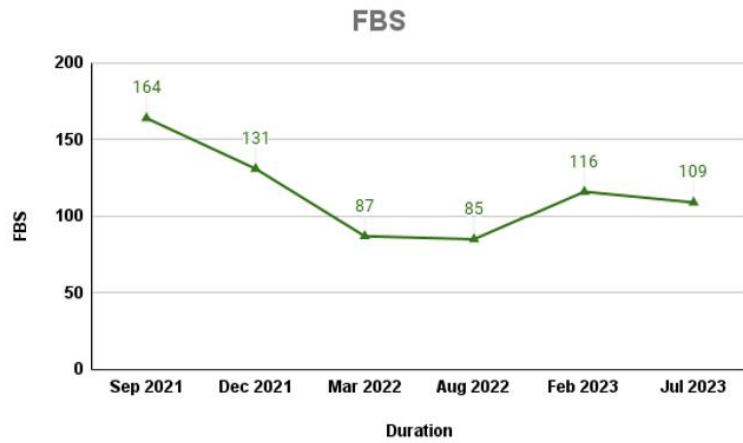


Figure 1: Fasting blood sugar levels for the duration of 22 months

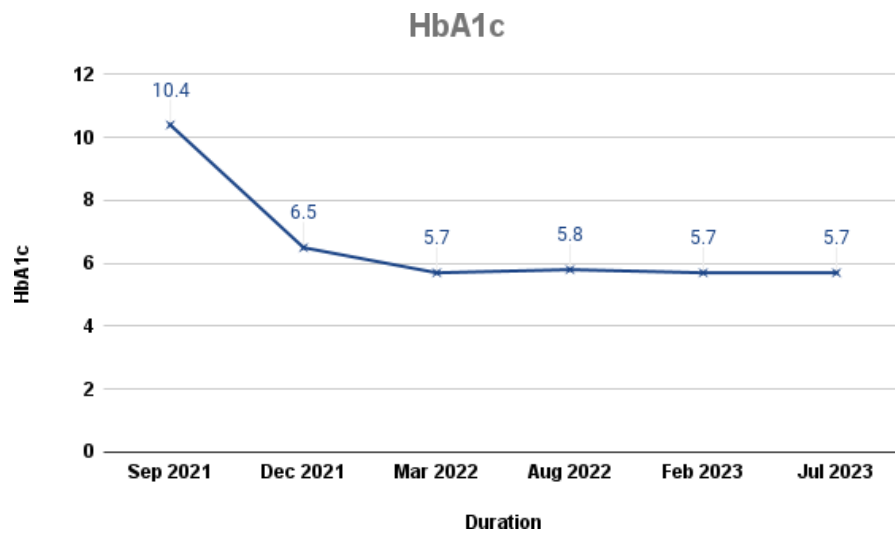


Figure 2: HbA1c for the duration of 22 months

In the lipid profile, Total Cholesterol maintained stability while the significant improvement was observed in Triglycerides, HDL and VLDL levels. However, LDL increased from baseline (Refer table 2).

Parameters	Baseline Values	Latest Values
Hba1c (%)	10.4	5.7
Average Glucose (mg/dl)	251.78	116.89
Glucose Fasting (mg/dl)	164.4	109
Total cholesterol (mg/dl)	150	197.62
Serum Triglycerides (mg/dl)	168	98.497
Serum HDL Cholesterol (mg/dl)	34.8	42
Serum LDL Cholesterol (mg/dl)	90.4	135.8
Serum VLDL Cholesterol (mg/dl)	33.7	19.7
Vitamin B12 (pg/ml)	123	364

Table 2: Baseline and latest plasma cholesterol, Blood sugar levels and Vit B12.

Symptoms such as headaches, fatigue, and generalised weakness, which were initially prevalent, showed significant improvement within the six months of the program. Additionally, the client experienced a substantial boost in energy levels. These observations underscore the comprehensive impact of the program on various health indicators beyond glycemic control.

In addition to the timely assistance provided by the healthcare professionals, and progress seen by the client, the quantitative involvement of Mr. SG in the program is noteworthy. During the course of the program, there were 7 doctor consultations, 57 coach consultations, 145 phone calls connected with the coach, over 600 text messages exchanged, and a high adherence to SMBG- self-monitoring of blood glucose with around 500 readings recorded. This data underscores the comprehensive and multidimensional nature of the support Mr. SG received.

Discussion

Mr. SG's remarkable journey towards improved health and glycemic control stands as a testament to his unwavering dedication and adherence to the comprehensive program offered by Sugrfit. His commitment to embracing lifestyle changes, as recommended by the program, played a pivotal role in achieving positive outcomes.

Throughout the process, Mr. SG's dedication to the dietary recommendations underscored his determination to make sustainable changes. His proactive approach, evident in enrolling in Sugrfit's Diabetes Reversal and Management Program, reflected a strong desire to actively participate in his health journey.

The integral role of the assigned coach cannot be overstated. The sustained and efficient guidance provided by the coach ensured that Mr. SG received personalised support tailored to his challenges and

lifestyle. The coach's ability to empathetically understand Mr. SG's concerns and guide him towards healthier choices fostered a trusting and supportive relationship.

Mr. SG's dedication to embracing a holistic approach, coupled with the sustained and efficient guidance provided by his coach, played a pivotal role in achieving and maintaining improved health outcomes. This case exemplifies the potential for success when clients actively engage in their health journey, supported by a dedicated and knowledgeable coaching team.

The success in managing and reversing diabetes can be attributed to a combination of factors: Mr. SG's commitment, the coach's guidance, and crucial support from the medical team, especially the consulting physician. The doctor's expertise in diagnosing and managing complex health conditions formed the basis of an effective treatment plan, leading to improvements in HbA1c and Fasting Blood Sugar levels. The collaboration between the doctor and lifestyle coach created a holistic approach, addressing both immediate medical needs and long-term lifestyle adjustments. The integrated strategy involved the doctor's pharmacological insights and the coach's expertise in lifestyle modifications, ensuring a well-rounded care plan. The doctor's comprehensive understanding of Mr. SG's health journey contributed to the decision to transition medications, highlighting the significance of a unified medical and lifestyle intervention strategy. The titration of medication from Janumet XR to no medication, with the maintenance of reversal, was the result of the collaborative effort between the life coach and the physician.

Research indicates that the most commonly prescribed class of drug for type 2 diabetes is Bigundes (for eg. Metformin), which are effective in enhancing insulin sensitivity and promotes weight loss [11]. However, a notable side effect of Metformin is its potential to reduce Vitamin B12 levels. Severe deficiency of Vitamin B12 may lead to macrocytic anaemia, peripheral neuropathy and sub-acute combined degeneration of the spinal cord [12]. Consequently, to counteract this deficiency, Mr. SG was initially prescribed an oral Vitamin B12 supplement which successfully restored his Vitamin B12 levels to within normal range.

In essence, the success story of Mr. SG highlights the pivotal role of a comprehensive healthcare team, where the doctor's expertise, the coach's sustained guidance, and the client's commitment worked harmoniously to achieve and maintain improved health outcomes. This synergetic and effective model serves as a testament to the power of an integrated healthcare approach in managing complex health conditions such as diabetes.

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