

**Case Study****REVERSAL OF METABOLIC SYNDROME WITH PLANT BASED DIET AND EXERCISE****Pramod Tripathi<sup>1\*</sup>, Mamata Hiremath<sup>2</sup>, Anagha Vyawahare<sup>3</sup>**<sup>1</sup>Founder, <sup>2</sup>Research Department Manager, <sup>3</sup>Senior Research Associate, Freedom From Diabetes Research Foundation, Pune, Maharashtra, India.**KEYWORDS:** Metabolic Syndrome Reversal, Diabetes, GTT clearance, Fatty liver.**ABSTRACT**

This study aimed to investigate the effectiveness of a specified diet pattern and exercise like lymphatic and strength-building exercises (FFD protocol) to enhance weight and fat loss. A 45-year-old male with a history of obesity and diabetes mellitus (DM) enrolled in the study. The patient followed a specified diet along with lymphatic and strength-building exercises. Follow up was done for 6 months where, baseline characteristics, anthropometric measurements and biochemical parameters were measured in visit 1 and visit 2. The patient was off DM medication in 10 days. In first follow up (3 months) weight, BMI, waist circumference and body fat was significantly reduced. Whereas skeletal muscle mass was increased. A drop in HbA1C, fasting insulin, fasting blood sugar level and postprandial blood sugar levels were observed. In comparison to first follow up the second follow up after 6 months, shows substantial changes in the basal parameters. A drastic decline in HbA1c was reported from 6.1% to 5.5%. The FFD program comprehensively targets diabetes, ultimately clearing GTT the harbinger of the defeat of diabetes and visceral obesity, thereby successfully reversing the cluster of components of this morbid syndrome.

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Email:

[drpramod@freedomfromdiabetes.org](mailto:drpramod@freedomfromdiabetes.org)**INTRODUCTION**

Metabolic syndrome is an array of chronic degenerative diseases.<sup>[1]</sup> The medical cost of management of associated cluster of morbidities and complications of this syndrome are staggering. The prevalence of the morbidities, especially obesity, diabetes and hypertension in the world has increased dramatically and is associated with high mortality rate.<sup>[1, 2]</sup>

**Case**

It includes a brief but thorough description of the clinical case (eg., patient profile, presenting symptoms, relevant past medical/surgical history, hospital or treatment course, laboratory results, tests or procedures) with utilization of the Nutrition Care Process.<sup>[3]</sup> A 45 year old male with history of obesity and diabetes mellitus (DM) was seeking treatment, for weight loss and drug free management of multiple health problems. The patient self diagnosed with DM in 2004 due to presence of sugar in urine. The patient was started metformin 250 mg in 2004. The patient started with

Freedom From Diabetes (FFD) diet in 2016 which was a whole food plant based diet. Patient was monitored under the FFD intensive program for a period of 12 weeks on a daily basis for his sugar levels. A written signed informed consent form was obtained from him. Following enrolment in the 12 weeks intensive program the patient approved and signed the consent form. Detailed family, medical history and clinical profile of the patient were recorded. Family history revealed that patient's mother was diagnosed with DM at the age of 67 years and maternal uncle was similarly diagnosed with DM at the age of 61 years. The patient gave no other history of habits like alcohol, tobacco, and smoking. The patient presented with other gastric symptoms like pain in abdomen, gastro-esophageal reflux (GERD) and constipation. The patient was on oral hypoglycemic agent metformin 1500mg/day when he started with the FFD diet. Since 2006 the patient was also on daily dose of ecosprin 75mg. The patient also had an episode of hypertension

(HTN) (160/100 mm/Hg) and was asked to start treatment for HTN but it was not started with. USG examination showed fatty liver grade III. The anthropometric data was recorded on the prescribed form followed by laboratory investigations.

The patient joined the intensive program, a 12 week program, which includes

- Self monitoring of blood glucose – SMBG
- Daily reporting of blood sugar levels to the assigned doctor through the mobile FFD application.
- Diet counselling through telephonic and/or personal appointment.
- Group chat of all co-participants of intensive batch.
- Three group sessions were conducted which concentrated on the diet, exercise and self transformation.

**Informed Consent:** Informed consent was obtained in writing from patient.

**Freedom from Diabetes dietary Protocol Followed by the Patient**

The patient followed a diet consisting of plant based foods designed to meet the daily macro and micronutrients requirements. Diet counselling was done through telephonic and/or personal appointment. The dietary intervention was carried out in 3 phases along with the exercises.

**Phase 1: Adjustment phase**

It lasted for 4 week. The green smoothie was recommended twice or thrice in a day (500ml), first to be consumed on empty stomach. This smoothie recipe was inspired by Victoria Boutenko’s Green smoothie revolution book.<sup>[4]</sup> However, it was modified according to the patient health condition.

**Green smoothie recipe:** Locally available fresh green leafy vegetables (except spinach for hypothyroid participants), one fruit (apple, pear, guava, banana and papaya) and any two herbs (curry leaves, betel leaf, *Tulsi*/basil leaves or mint leaves), a pinch of black pepper powder, cinnamon powder, turmeric powder, rock salt and juice of half a lemon. This was blended with 250-300 ml water to get around 500ml of green smoothie.

- a) The patient was asked to strictly avoid milk, milk products and non vegetarian food.
- b) The breakfast was a mix of 50% of raw foods (salads and sprouts) and 50% cooked food made from either pulses/lentils.
- c) To avoid cereals in breakfast and should consist a mix of 50% of raw foods (salads and sprouts)

and 50% cooked food made from either pulses/lentils.

- d) Lunch and dinner consisted of one grain in a meal with an equal proportion i.e. 25% of grain, cooked vegetable and a raw salad respectively, with one serving of pulse/lentil preparation.
- e) Intake of nuts and seeds were regularized (either 2 tablespoon mix seeds like sunflower, pumpkin, watermelon, sesame, flaxseed and 5-6 soaked almonds and 4 half walnuts).
- f) Whole and sprouted legumes, raw vegetables should be in the form of salads.

**Phase 2: Acceleration or aggressive phase**

- a. This includes juice feasting which was allowed once in a week
- b. Low glycemic fresh vegetable strained juices every 2-3 hourly on the day of juice feasting is advised by avoiding any form of cooked food. Red juice in the morning, green juice (1 & 2) in the afternoon and white juice in the evening. Smoothie (500ml) was consumed in the morning before red juice and in the evening after green juice.
- c. Patient was allowed to have 1000ml smoothie along with 8-10 nuts and/or a bowl of salad (if felt hungry).

**Juice recipes**

Red juice	800gm tomato, 250gm carrot, 1 red capsicum, 1 yellow capsicum (500ml)
Green juice 1	500gm Ash gourd, half apple, 4 big capsicums, 1 ridge gourd, half lemon juice (500ml)
Green juice 2	700gm bottle gourd, 2 cups green sorrel/Chenopodium, 1 cup coriander, half lemon juice (500ml)
White juice	500gm bottle gourd, 500gm cucumber, half lemon juice (500ml)

**Phase 3: Inner transformation phase**

This was directed towards the release of stress at an emotional level; improve awareness and healing from within. This inner transformation is majorly complimented with exercise therapy. It lasts for 4 weeks in which a maintenance diet (similar to phase 1) was given to the participants. Some flexibility was permitted for fruits, white rice or non-dairy sweets according to participant’s glucose levels and medications.

**Physical Activity/Exercise Followed by the Patient**

**Phase 1:** On starting with FFD program he started with 1 hour of exercise it includes moving the stagnant lymphatic circulation in the initial phase through World's Best Warm-Up exercise as a

morning routine. Anti-gravity exercise includes ascending and descending of the staircase (post 1 hour 45 minutes of breakfast, lunch and dinner).

**Phase 2:** Yoga-based cleansing exercises like whole system breathing, *Dhautikriyas* (specific cleansing processes for the oral cavity and head region), *Kapalbhati* (forceful exhalations with minimal inhalation done rhythmically 1 per second for 150-300 times only) were introduced.

Mild strength building exercise for 10 minutes which includes lightweight training and/or resistance band (upper body focused) exercises 15 repetitions each, 3 times a week.

**Phase 3:** A weekly proportion of 4 hours of resistance, 3 hours of cardiovascular and 2 hours of flexibility training was recommended. As part of the resistance, training he was asked to work with dumbbells/ resistance bands or join a gym. For stamina, jogging, cycling or swimming for a longer duration as per individual preference was advised.

### Results

The Patient was off medication for DM in 10 days after starting the FFD program with regular recording of the blood sugars and reporting to the doctors. In the first follow up after 12 weeks of intensive program there were changes in the basal parameter values. Weight reduced from 86.1kg to 76.1kg with a decline in the BMI from 30.3 to 26.8 and decrease in the waist circumference from 101cms to 92.5cms (Graph 1). Body fat percentage decreased from 31.7 to 26.5 i.e. from 18% to 13%,

and the muscle mass increased from 27.9% to 29.9% (Graph 2). A drop in HbA1C from 6.9% to 6.1% (Graph 3), fasting BSL decreased from 102 to 90mg/dl and postprandial blood sugar levels decreased to 120mg/dl from 139mg/dl (Graph 4). The patient was asked to stop statins during the first visit, following which the cholesterol values increased from 149 to 171mg/dl, LDL increased from 97 to 126mg/dl. A decrease in HDL 33 to 30mg/dl, VLDL 24.64 to 22mg/dl was observed. No gastritis was reported starting the FFD diet. Also a drastic decrease is observed in fasting insulin from 18.76 µU/ml to 4.34 µU/ml. The overall trend of the parameters was favourable without medications, indicating a frank reversal. Further follow up was encouraging and the various parameters showed favourable results.

In comparison to the second follow up after 6 months to the first follow up, substantial changes in the basal parameters were observed. Weight reduced from 76.1kg to 69.4kg, with a decline in the BMI from 26.83 to 24.4. Waist circumference decreased from 92.5 to 83cms with a decline in fat to 23.8 from 26.5. Muscle mass increased from 29.9% to 30.9%. A drastic decline in HbA1c was reported from 6.1% to 5.5%.

The patient voluntarily shared his experience that after FFD program his energy levels and health related quality of life have significantly improved. Tiredness, anger, irritability, intense hunger drastically reduced (Table 4).

**Table 1: Ultrasonography Reports**

Organ	Before FFD (28/02/2015)	After FFD (24/10/2016)
Liver	Normal sized liver with Grade II-III fatty change. No lesions seen.	Normal sized Liver. No focal lesions seen. The fatty liver has reversed to normal.

**Table 2: Report of Glucose Tolerance Test**

Fasting ( mg/dl)	1 hour (mg/dl)	2 hour(mg/dl)	Remarks
97	207	124	cleared

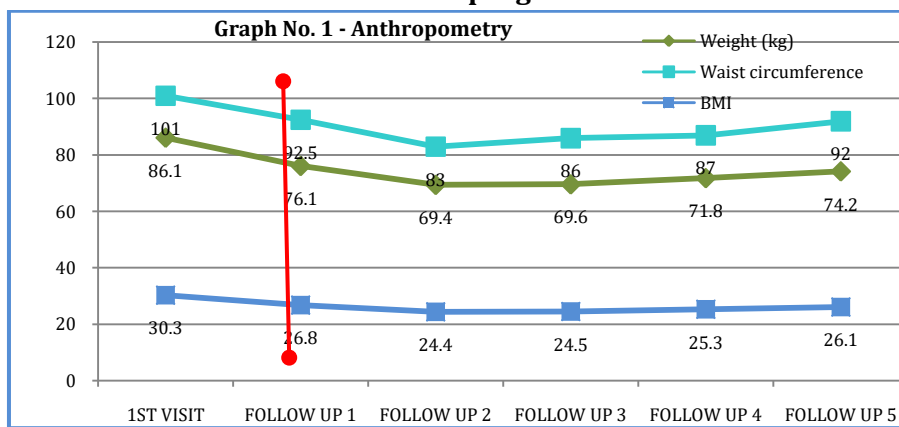
**Table 3: Change in Physical and Psychological Parameters after FFD Program**

Parameters	Before FFD	After FFD
Improvement in athletic performance	Could walk only ½ km. and experienced giddiness sometimes	Can walk up to 6 km without experiencing giddiness
Concentration	Lack of Focus on job	Concentration good
Gastritis	Present	Absent
GERD	Present	Absent
NAFLD	Present	Absent
Visual acuity	Used spectacles	Improved visual acuity and does not need spectacles.
Mindful eating	Had a vague idea	Clear concept
Significance of diet protocol	Not clear	Could study cause and effect of diet schedule by self monitoring of blood glucose(SMBG)

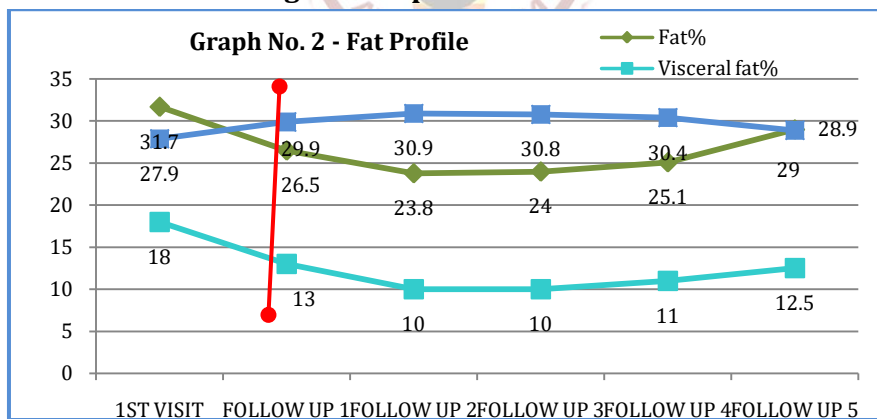
**Table 4: Experience Reported by Patient Voluntarily:**

Parameters	After FFD
1. Energy level	Significantly Improved
2. Health related quality of life (HRQOL)	Improved
• Quality of sleep	Good
• Confidence in blood sugar level	Good
• Outlook on life	Positive
• Tiredness	Significantly Diminished
• Irritability, anxiety and mood swings	Reduced
• Anger	Drastically reduced
• Intense hunger	Reduced
3. Overall quality of life	Improved considerably

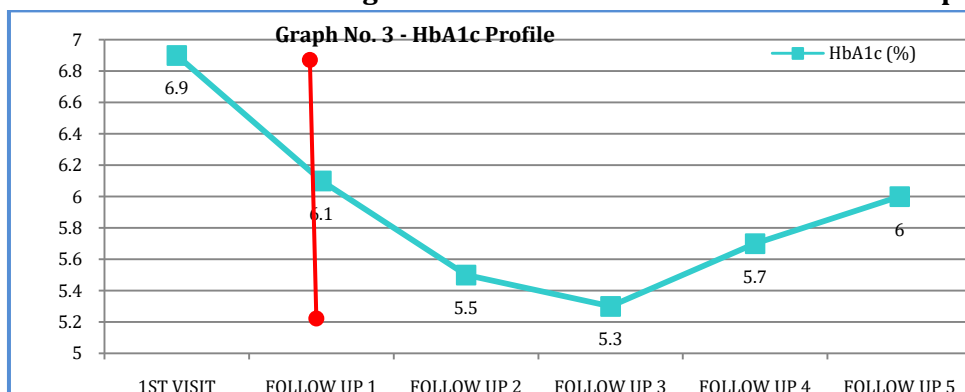
**Graph 1** ●—● indicates the changes in anthropometry measurements after 12 weeks of FFD Intensive program

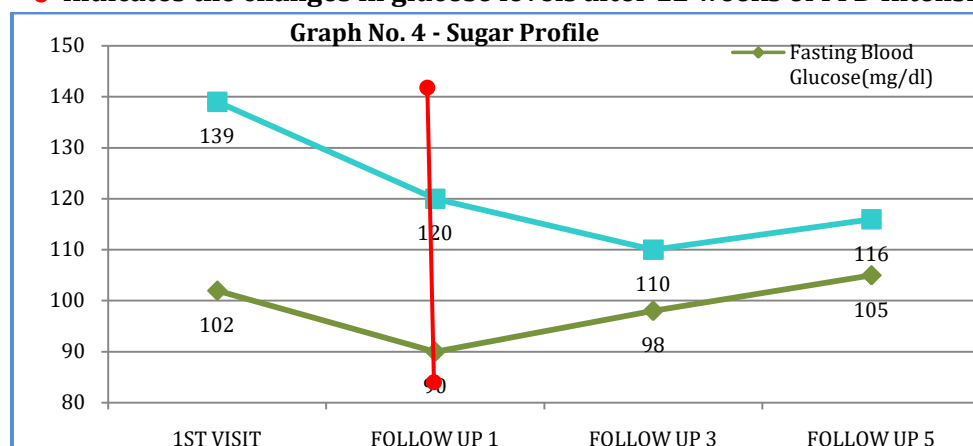


**Graph 2** ●—● indicates the changes in fat profile after 12 weeks of FFD Intensive program



**Graph 3** ●—● indicates the changes in HbA1c after 12 weeks FFD Intensive program



**Graph 4** indicates the changes in glucose levels after 12 weeks of FFD Intensive program

## DISCUSSION

Before following the FFD protocol, BSLs were uncontrolled with diet and medications. Weight and anti-diabetic medication dosage was increasing associated with a decrease in working capacity. The present study not only focused on a specifically adapted plant-based diet but also on complete muscle activation, lymphatic, antigravity, cleansing and strength/ stamina building exercises in a phase-wise manner for improving their health. Avoiding milk and milk products from diet played an important role in significantly reducing insulin resistance. In the first phase, increased intake of cooked vegetables and raw salad in lunch and dinner helped in reducing portion size due to early satiety. While in the second phase, juice feasting helped in removing all the toxins from the body; improve cardiovascular health and help in weight reduction. The juices are rich sources of several biologically active components like phenolic compounds that exert a variety of physiological effects in vitro including antioxidative, immunomodulatory and antimicrobial activities.<sup>[4]</sup> Different coloured juices were based on 'Rainbow diet', from Spiritual Nutrition Book.<sup>[5]</sup> It was specific for energizing, balancing and healing their corresponding colour related chakras.<sup>[5,6]</sup> Like red colour for root chakra (base of the spine), green colour for heart chakra (heart) and white colour for crown chakras (Head).<sup>[5,6]</sup> Incorporation of smoothie in both phases caused an increased sensation of fullness (satiety) due to high dietary fibre content, which reduces the frequency of undesirable dietary habits lead to weight reduction.<sup>[7]</sup> Smoothie is rich in fibre, phytonutrients and antioxidants help in reducing blood glucose levels, inflammation and blood cholesterol levels.<sup>[3, 7]</sup> On following the FFD diet for 12 weeks, weight lost was 17kg and an improvement in his anthropometric measurements and HbA1C were noted. The patient could also clear

the glucose tolerance test (GTT). Reversal of fatty liver was also observed. Thus, an overall improvement in the co morbidities of metabolic syndrome was evident. The quality of life, wellness quotient, feeling of well being, activity level and visual acuity improved.

A plant-based diet pattern is associated with a reduced risk of developing diabetes.<sup>[8]</sup> It excludes key animal-protein and fat that tends to promote insulin resistance.<sup>[8, 9]</sup> Saturated fat found primarily in animal-based foods, contributes to lipotoxicity, in which toxic fat metabolites accumulate in hepatic and skeletal muscle cells, impairing insulin signalling, therefore reducing the glucose uptake.<sup>[9]</sup> A plant-based diet has been shown to reduce visceral fat and improve markers of oxidative stress more than a conventional diet in individuals with type-2 diabetes.<sup>[8,9]</sup>

Weight reducing effect of the vegan diet and exercise is responsible for a substantial reduction in HbA1C.<sup>[8-10]</sup> Insulin resistance is related to the lipid accumulation within muscle cells (intracellular lipid) apparently due to a genetically based reduction in the mitochondrial activity identifiable many years before diabetes manifests.<sup>[11]</sup> High-fat diets appear to down-regulate the genes required for mitochondrial oxidative phosphorylation in skeletal muscle.<sup>[11]</sup>

It is possible to successfully treat obesity and return a patient to normal body fat percentage i.e. reverses the cluster of morbidities of metabolic syndrome with adherence to the combination of a specified dietary pattern, a designed diet composition and a weight loss behavioural program of investing in specific exercises. A study has confirmed that physical exercise training, of moderate intensity, has numerous beneficial effects including reduction of weight and improvement of insulin sensitivity and hyperglycaemia which can prevent the development of DM.<sup>[12,13]</sup> A well-

formulated program of FFD with regular follow up by dietician and doctors was highly effective for treating obesity and the spectrum of illnesses under the umbrella of metabolic syndrome including DM, clearance of GTT and reversal of fatty liver. This led to reversal of DM and metabolic syndrome, other related health conditions and overall quality of life. The diet is satisfying and sustainable as seen in the present case study. Special medical considerations and uniqueness for presenting it as a case report are acute weight loss of 10kg in 3 months and 17kg in 6 months; fatty liver reversal from grade 3 to non-fatty state and clearing the GTT three times consecutively.

### CONCLUSION

The voluntary adherence to FFD protocol is a sustainable, compelling and a rapid method of reversal of metabolic syndrome. The present case study highlights the effect of the FFD program- a polyvalent attack comprising of assorted exercises and lifestyle modification schedule. This comprehensively targets, diabetes, ultimately clearing GTT the harbinger of defeat of diabetes and visceral obesity, thereby successfully reversing the cluster of components of this morbid syndrome.

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