

Management of Obese Type1 Diabetes Mellitus (Double Diabetes) Through Telemedicine during COVID 19 Pandemic Lockdown

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ABSTRACT

Introduction: Prevalence of obesity in type 1DM (T1DM), with features of type 2DM (double diabetes) is increasing, which is an independent risk factor for vasculopathy. Achieving glycaemic control, avoiding insulin-related weight gain and preventing hypoglycemia is challenging in such cases during pandemic. Telemedicine may be effectively used for therapeutic diabetes education.

Aim: To manage a case of morbidly obese uncontrolled T1DM, through intensive online lifestyle modification (LSM), during COVID19 lockdown.

Case Details: A 33year old morbidly obese female (BMI: 30.1Kg/m²) with T1DM of 24 years duration, having sedentary lifestyle, presented with uncontrolled diabetes (HbA1c-8.7%), despite high total daily dose (TDD) of insulin (140U/Day), limitation of movements, easy fatigue and emotional instability. She had polycystic ovarian syndrome with hypertension and was on metformin, voglibose & telmisartan. First teleconsultation was done in September 2020.

Methodology: Teleconsultation for medical nutrition therapy (MNT), exercise, insulin dose adjustments through self-monitoring of blood glucose was done by nutritionist, diabetes educator (DE) and clinician. Modification in total calories intake (reduced by 500-600Kcals/day), food frequency and macronutrient content were done. Regular brisk walk/jogging (45-50mins/day) was advised. Depression was assessed by using PHQ9 questionnaire. Compliance was assessed weekly by DE.

Results: At 16 weeks post-intervention, she lost 11.5% of weight. HbA1c reduced by 1% from baseline and TDD of insulin reduced by 57.14%, with no episode of hypoglycemia or ketosis. PHQ9 questionnaire score reduced from 6 to 2.

Conclusion: Implementing diabetes education through telemedicine can help to reduce obesity, glycosylated HbA1c, insulin doses and risk of depression in a person with double diabetes.

Key words: Glycaemic, Telemedicine, Therapeutic diabetes

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INTRODUCTION

Traditionally, a person with type 1 diabetes mellitus (T1DM) is being described as lean and insulin-sensitive, where insulin deficiency rather than insulin resistance is the main pathophysiological mechanism. The global

increase in overweight and obesity, the so-called obesity epidemic [1] is associated with metabolic disturbances like insulin resistance, Hyperinsulinemia, dyslipidemia and subclinical inflammation, which may result in the development of micro and macrovascular diseases [2]. Obesity also affects large number of people with T1DM across their lifetime with an increasing prevalence in recent decades, and with rates ranging from 2.8% to 37.1% [3] which is termed as "double diabetes" [4]. Insulin resistance and tight glycaemic control also increases weight, insulin demand and the risk of hypoglycemia [5]. Sedentary lifestyle, lack of exercise, high fat diet and low fibre diet in T1DM also contribute to weight gain and poor metabolic control of the disease and psychomotor disorder [6]. Metabolic syndrome in

T1DM has shown to be an independent risk factor for macrovascular and microvascular complications [7]. It is tough for a person with double diabetes to achieve good glycaemic control, to avoid insulin related weight gain and prevent hypoglycemia, especially in view of lockdown of pandemic.

Objective

Management of uncontrolled type 1 DM (T1DM) on high dose of insulin with associated morbid obesity is a challenging task, especially during lockdown. Lifestyle modification through telemedicine can play a vital role in such cases, which, if effectively implemented can give rewarding results.

CASE HISTORY

A 33years old female, homemaker, vegetarian, known case of T1DM for 24 years, presently staying at Hyderabad, Telangana, presented with uncontrolled diabetes, despite high doses of insulin, increasing weight, limitation of movements, tiredness, exhaustion and emotional instability with negative thoughts due to hyperglycemia and obesity. She was on subcutaneous insulin basal-bolus therapy and had sedentary lifestyle due to lockdown. She has PCOS (polycystic ovarian syndrome), had pre-gestational DM 9 years ago and delivered a normal baby through LSCS, without significant perinatal complications. She is a known case of hypertension for 4 years, which is well controlled on Telmisartan 20 mg once a day. She has mild non-proliferative diabetic retinopathy. No other significant past, family and personal history. She was on basal-bolus insulin therapy, 140 units/day in divided doses. She was also on Metformin for PCOD and on Voglibose for postprandial hyperglycaemia. She has a sedentary lifestyle with minimal activity since lockdown of March 2020.

She consulted at Sunil's Diabetes Care n' Research Centre Pvt. Ltd. after a gap of 7 years in September 2020 via Teleconsultation from Hyderabad. Her height, weight, BMI, waist circumference and HbA1c were 150 cm, 67.8 kg, 30.1kg/m² 101 cms & 8.7% respectively. Other biochemical parameters were within physiological limits.

She was on the following treatment before intervention:

Inj. Human Regular (Actrapid) Insulin: 34U-33U-33U (BBF, BL & BD)

Inj. Human NPH (Insulatard) Insulin: 20U-00-20U (at 9am & 9pm)

Total daily dose (TDD) of insulin: 140units/day

Tab. Metformin 1000mg 1-0-1 (for PCOS)

Tab. Voglibose 0.3mg 1-0-1(For Postprandial Hyperglycaemia)

Tab. Telmisartan 20mg once a day at dinner (for hypertension).

METHODOLOGY

Her history was taken through telephonic and online consultations with the help of nutritionist and diabetes educator. PHQ9 questionnaire was used to assess the depression. The insulin doses and frequency were supervised by the treating clinician. Following details were reviewed online by nutritionist and diabetes educator:

Presenting complaints, history of presenting complained, Treatment history etc.

72 hours dietary recall with food frequency was taken

Physical activity profile was evaluated.

History of associated complications was taken.

Medical Nutrition Therapy (MNT) was given through online consultations. Past energy intake was 1700-1800 kcals/day (CHO- 259g, Protein 46g, Fat 54g). The food frequency questionnaire revealed that the fast/fried food and bakery food consumption were twice and 3-4times a week respectively, while nuts, fruits and green leafy vegetables were consumed once a week. Her total calories was reduced to 1200 kcals/day (CHO-195g, Protein 72g, Fat 36g), which included moderate carbohydrate, low fat, high fibre along with free foods. Subject was trained for carbohydrate counting and insulin dose adjustment by teaching her about Insulin to Carb Ratio i.e.ICR=450/Total Daily Dose (TDD) and Insulin Sensitivity Factor (ISF) 1700/ TDD.

Regular exercise of 45-60 mins (walking, jogging) in 2-3 spells was advised along with frequent SMBG (self-monitoring blood glucose). Post prandial blood glucose was high hence; carbs were replaced by a protein snack. Food order was changed as to eat protein & fibre first followed by carbs later. Diabetes educator played an important role of getting optimum diet, lifestyle changes, blood glucose monitoring compliance etc. through multiple telephonic calls, WhatsApp and frequent online meeting. The three tire system of medical expert, clinical dietitian and diabetes educator was applied. The timeline for the intervention was around 16 weeks or 120days. She was asked to examine her insulin injection sites by visual and palpatory methods for lipodystrophy. Once a week telephonic follow-up and counseling was done by diabetes educator nutritionist, while once a month online consultation was done by treating clinician.

RESULTS

After intervention, her weight, BMI and waist circumference was reduced by 11.1%, 10% and 14.85% respectively. The TDD of insulin was reduced by 56% while her HbA1c, fasting & post-meal blood glucose was reduced by 11.5%, 20% and 29% respectively from baseline (Table 1). Improvement in the lipid parameters and blood pressure were also seen. Except insulin dose, other medications remained unchanged.

The basal-bolus dose of insulin after intervention is as

Table 1: Changes in anthropometric measurements, biochemical Parameters and blood pressure.

	Sept 2020 (Baseline)	1/1/2021 (Post intervention)	Post intervention % Change
Weight (kgs)	67.8	61	10%
BMI (kg/m ²)	30.1	27.1	10%
Waist (cms)	101	86	14.85%
Insulin Total Daily Dose (units/day)	134	59	56%
FBG (mg/dl)	200	160	20%
PPBG (mg/dl)	240	170	29%
HbA1C (%)	8.7	7.7	11.50%
Cholesterol (mg/dl)	186	143	23.10%
Triglyceride (mg/dl)	156	120	23%
LDL-Cholesterol(mg/dl)	116	77	33.60%
HDL- Cholesterol (mg/dl)	38.8	42	8.30%
Sr. Creatinine (mg/dl)	0.5	0.5	NIL
eGFR	123	123	NIL
SGPT (mg/dl)	22	23	NIL
SGOT (mg/dl)	21	22	NIL
Uric Acid (mg/dl)	3.45	3.5	Nil
Systolic Blood pressure (mm of Hg)	140	130	7.10%
Diastolic Blood pressure (mm of Hg)	90	82	8.90%

below.

Inj. Human Actrapid (Regular) Insulin: 06U-18U-14U (BBF, BL & BD)

Inj. Human Insulatard (NPH) Insulin: 06U-00-15U (at 9am & 9pm)

Total daily dose (TDD) of insulin: 59 units/day.

Tab. Metformin 1000 1-0-1 (for PCOS)

Tab. Voglibose 0.3 1-0-1(For Postprandial Hyperglycemia)

Tab. Telmisartan 20mg once a day at dinner

DISCUSSION

The prevalence of obesity is increasing globally, which not only increases the risk of type2DM, but is also affecting people with type 1DM, primarily due to changing dietary habits and poor exercise compliance. Management of such cases of double diabetes is challenging. On the evening of 24 March 2020, the Government of India ordered a nationwide lockdown for limiting movement of the entire 1.38 billion (138 crore) population of India as a preventive measure against the COVID-19 pandemic in India [8]. People with uncontrolled diabetes are believed to have higher risk of developing complications, their severity and death. Studies have shown the potential benefits of remote telemedicine in diabetes care and its use is rapidly increasing due to the pandemic [9-11]. In a systematic review of 29 studies in the field of paediatric diabetes care, 12 it was concluded that telemedicine has the potential to facilitate patient monitoring and can improve short-term glycaemic control in some contexts. Our case study has shown that the use of telemedicine through structured virtual/telephonic connect for lifestyle modification under clinician's guidance via diabetes educator and nutritionist can adequately reduce generalized and central obesity, reduce blood

pressure, achieve better glycaemic control on lesser insulin doses, improve lipid parameters, and offer better quality of life by reducing risk of depression in a difficult case of double diabetes (obese T1DM) during the time of pandemic, when in-person consultation is challenging [12-17].

CONCLUSION

Through holistic approach, implementing diabetes education via telemedicine can help to achieve best possible compliance for strict diet adherence, regular exercise and monitoring, which does reduce obesity, glycosylated HbA1c, insulin doses and risk of depression in a person with double diabetes.

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