

# Telemedicine for the Initial Management of Newly Diagnosed Gestational Diabetes in the Pandemic Period: A Report of Three Case Studies

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## Abstract

Amidst the coronavirus disease of 2019 (COVID-19) pandemic and the subsequent guidance regarding movement restrictions, people may not be able to or willing to visit hospitals for a diabetes consultation. This especially applies to women with gestational diabetes mellitus (GDM) who are worried about getting infected during their visit to hospital. National telemedicine guidelines have now paved the way for using telemedicine for clinical care in India. We describe a series of three cases, where telemedicine aided the management of GDM. Aided by the use of digital technology, along with glucometers which synchronize with mobile phones and store data in the cloud for clinicians to access, we suggest that telemedicine could be considered in management of hyperglycemia in pregnancy in the current scenario.

**Keywords:** Coronavirus, diabetes mellitus, pandemic, pregnancy, telehealth

## INTRODUCTION

Diabetes in pregnancy involves the management of two important conditions—diabetes and pregnancy. According to the latest global diabetes data, the prevalence of gestational diabetes mellitus (GDM) is about 14.4%.<sup>[1]</sup> The present pandemic of coronavirus disease of 2019 (COVID-19) poses a difficulty for pregnant patients with diabetes to visit hospitals for medical care. The complications of hyperglycemia in pregnant females include increased risk of preeclampsia, gestational hypertension, and cesarean delivery.<sup>[2]</sup> In the fetus, there is increased risk of spontaneous abortion, fetal anomalies, fetal demise, macrosomia, shoulder dystocia, neonatal hypoglycemia, hyperbilirubinemia, neonatal respiratory distress syndrome and may also increase the risk of obesity, hypertension, and type 2 diabetes in the offspring later in life.<sup>[2,3]</sup> Hence, it is important to maintain tight glucose control during pregnancy to prevent these complications. In the scenario of the restrictions imposed due to the COVID-19 pandemic, a simulation model has shown that the duration

of restriction could be directly proportional to the worsening of glycaemic control and diabetes-related complications.<sup>[4]</sup> Considering all these factors, measures are being tried everywhere to allow appropriate management for patients. An example of this is endorsement of telemedicine as a legitimate tool for health care.<sup>[5]</sup> We present three cases who presented to us at Chellaram Diabetes Institute, Pune, India, where telemedicine helped management of newly diagnosed GDM.

## CASE 1

A 33-year-old lady presented with hyperglycemia detected during pregnancy at 25 weeks of gestation. This was her first successful gestation after previously undergoing five cycles of intrauterine insemination and six cycles of

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**Received:** 11-June-2020, **Revised:** 16-July-2020, **Accepted:** 17-July-2020, **Published:** 01-September-2020

### Access this article online

#### Quick Response Code:



**Website:**  
[www.journalofdiabetology.org](http://www.journalofdiabetology.org)

**DOI:**  
10.4103/jod.jod\_44\_20

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**How to cite this article:** Simon MR, Sarkar N, Kumaran S, Chittake A, Purandare V, Unnikrishnan AG. Telemedicine for the initial management of newly diagnosed gestational diabetes in the pandemic period: A report of three case studies. *J Diabetol* 2020;11:144-7.

in-vitro fertilization. Her father had diabetes. She had now been diagnosed with GDM at 25 weeks of gestation; her blood glucose levels were high with fasting plasma glucose (FPG)—93 mg/dL and postprandial plasma glucose (PPPG)—225 mg/dL. In view of precious pregnancy and high blood glucose levels she was referred to us for further management. Due to COVID-19 lockdown, she was unable to commute to our hospital and hence she approached our diabetes care team via a video consultation for further management of blood glucose.

The management began with counseling related to healthy balanced diet, exercise (brisk walking as tolerated, non-abdominal wall stretching exercises), and maintenance of tight glucose control for the best outcome of pregnancy and healthy baby. She was advised to obtain a glucometer, which could synchronize her blood glucose values to her mobile and via the cloud to a web database for easy and accessible reference. She was asked to check her blood glucose levels six times a day, every pre-meal and 1 h post each of the three major meals. She was introduced to our diabetes educator who guided her with medical nutritional therapy (MNT) and also empowered her to monitor her blood glucose levels regularly. The diagnosis and recommended goals of blood glucose levels were explained to her as per the guidelines.<sup>[3,6]</sup>

The 1 week follow up showed that her post-meal glucose values were high, highest value being 189 mg/dL despite following healthy diet and exercise, whereas most of her pre-meal values were within target level. Hence after a week, in the video-consultation, tablet metformin 250 mg twice a day was added to her treatment. Her post-meal blood glucose levels started to improve, to a highest value being 159 mg/dL. In the video consultations following this, her treatment was gradually escalated further to tablet metformin 500 mg twice a day with continued counseling on diet and walking. In accordance with her wishes, the frequency of self-monitoring of blood glucose (SMBG) was reduced. She eventually has delivered a baby girl via cesarean section as she had abruption placentae at 35 weeks gestation. The baby is healthy and discharged after hospital stay of few days and this lady's blood glucose levels post-delivery returned within

normal limits with FPG—76 mg/dL and PPPG—120 mg/dL. Her glucose profiles over 9 weeks follow-up are shown in Table 1 and Figure 1.

## CASE 2

A 30-year-old primi lady underwent *in vitro* fertilization and presented at 18 weeks gestation. Her fasting blood glucose level was 84 mg/dL and post 75gms oral glucose tolerance test was 204 mg/dL at the time of referral to our hospital. She followed a healthy diet but did not exercise regularly. Family history included diabetes in her father and grandmother. In view of high glucose level, she wished to approach us for further management. With the occurrence of COVID-19 imposed restrictions, she did not want to make a clinic visit and chose a video consultation with us.

After noting the history, she was counseled in detail about the management for a successful pregnancy outcome. This counseling included patient education on complications in pregnancy due to uncontrolled blood glucose levels, importance of regular monitoring of glucose levels to avoid the complications, the target glycemic levels, an optimal diet and exercise regimen, and hypoglycemia awareness. She also obtained a digitally connected glucometer and was trained to use it appropriately with the help of the diabetes educator. She was given the choice of initial pharmacotherapy but she was reluctant and wished to try lifestyle modifications. Hence she was started with medical nutritional therapy and monitored. Her capillary blood glucose values measured in glucometer were recorded and she was asked to follow-up for video consultations, as well as telephonically with the diabetes care team.

In the video consultation during the third week, she reported that she had eaten calorie-dense food that was purchased from a local outlet on the days of hyperglycemia and hence this explained the high readings. She still wished to continue with MNT and not start on any medical treatment. She was counseled about the necessity for tight control of sugars and that if hyperglycemia continued, would require pharmacotherapy. In a subsequent consultation, due to continued post-meal hyperglycemia, she was initially started with tablet Metformin 500 mg

**Table 1: Case 1: Weekly mean SMBG levels monitored at different times of the day**

Week	Mean pre- breakfast (mg/dL)	Mean post-breakfast (mg/dL)	Mean pre-lunch (mg/dL)	Mean post-lunch (mg/dL)	Mean pre-dinner (mg/dL)	Mean post-dinner (mg/dL)
1	87	156	89	151	98	144
2	86	136	95	145	76	127
3	82	126	92	158	83	129
4	87	127	91	141	90	132
5	91	135	–	143	–	137
6	88	136	–	149	–	135
7	80	128	–	157	–	117
8	81	115	–	140	–	123
9	76	126	–	146	–	114

initially once a day and then increased to twice daily. As she relocated to her home district, the self-monitored blood glucose (SMBG) levels available are only up to 5 weeks. Her 5-week follow-up glucose profile is shown in Table 2 and Figure 1. She now continues to follow-up with her nearby gynecologist in her hometown.

### CASE 3

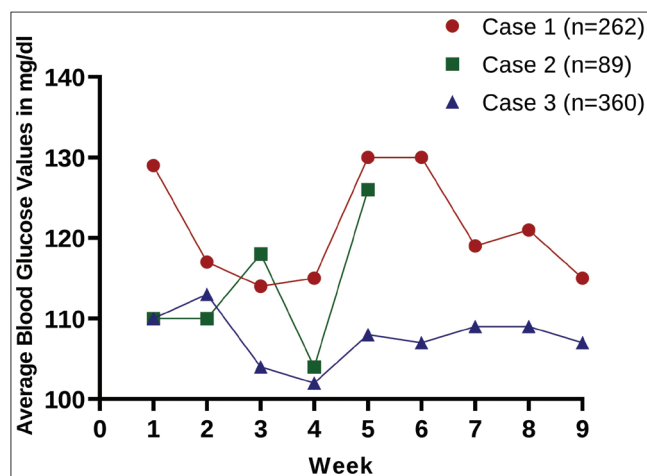
A 27-year-old lady had earlier undergone abortion of her first pregnancy at 7 months gestation secondary to congenital hepatic fibrosis in the fetus. This was her second pregnancy and presented at 6 months of gestation. She

took the oral glucose tolerance test during the 25th week of gestation and her fasting was 107mg/dL and 2h post 75gms glucose was 190mg/dL. With these values, she was diagnosed with GDM. Due to the situation of pandemic, she chose a video consultation with us for management of her GDM.

A similar approach of management with detailed counseling, a connected glucose meter, and introduction to our diabetes educator was carried out. Along with diet modification and physical activity regime a dose of metformin 250mg once in the morning was started. She was asked to review back with us via a video consultation for necessary further course of treatment. She monitored her SMBG values consistently at home and the blood glucose values profile during the follow-up period of 9 weeks is shown in Table 3 and Figure 1.

Her SMBG values on tablet metformin 250 mg (once a day) as seen in [Table 3] indicate post-meal hyperglycemia during the first 2 weeks particularly with post dinner. The post-dinner values ranged from 150mg/dL to the highest value being 207mg/dL. Notably pre-lunch and pre-dinner values were within the required range. Due to the initial hyperglycemia post-meal, in a later video consultation, the dose of metformin was increased to 500 mg twice a day.

After this increment of dose, her post-meal hyperglycemia improved in general. In her follow-up video consultations she showed better glucose control, however with few episodes of hyperglycemia. She continues to do strict monitoring consistently and she has also been explained that if her hyperglycemic episodes continue to repeat then she may require insulin treatment.



**Figure 1:** Graphical representation of weekly mean blood glucose values noted throughout the 9 weeks for Cases 1,2,3 (includes all pre-meal and post-meal values). Subject 2 does not have readings beyond 5 weeks, which was the last recorded value. Note that *n* refers to the total number of readings measured in the duration of follow-up

Week	Mean pre- breakfast (mg/dL)	Mean post- breakfast (mg/dL)	Mean pre- lunch (mg/dL)	Mean post-lunch (mg/dL)	Mean pre- dinner (mg/dL)	Mean post- dinner (mg/dL)
1	86	112	109	130	103	140
2	93	115	91	137	100	132
3	86	129	88	161	-	154
4	80	130	92	105	118	113
5	83	147	-	135	98	153

Week	Mean pre- breakfast (mg/dL)	Mean post- breakfast (mg/dL)	Mean pre- lunch (mg/dL)	Mean post-lunch (mg/dL)	Mean pre- dinner (mg/dL)	Mean post- dinner (mg/dL)
1	99	113	82	131	77	161
2	97	130	76	124	80	166
3	91	121	75	118	76	134
4	94	119	76	117	84	130
5	99	135	78	115	81	138
6	94	122	83	123	84	138
7	96	130	79	123	82	143
8	95	130	80	126	76	150
9	92	131	77	123	79	138

## DISCUSSION

Telemedicine is the use of electronic information and communications technologies to provide and support health care.<sup>[7]</sup> Telemedicine has always been a controversial topic. However during the COVID-19 pandemic, telemedicine has become useful for health-care delivery, also approved by regulatory authorities in countries like India.<sup>[5]</sup>

Telemedicine is uniquely suited for management of gestational diabetes in routine follow-up outpatient setting. Pregnant women are often reluctant for hospital/clinic visits during times of social distancing and other restrictions as they are concerned about contracting infections. Moreover, due to the pandemic scenario, commuting may be difficult. Finally, gestational diabetes responds very well to lifestyle changes, as well medications such as metformin and insulin.<sup>[8]</sup>

Three aspects of technology come together to help in the practice of gestational “tele-diabetology care.” First is the use of online appointment systems and electronic medical records. Second is the emergence of simple video conferencing tools. And finally, the use of connected glucose meters, which link seamlessly to the smartphone for patient convenience, and via the cloud to a website for access by health-care provider. We have deliberately refrained from using brand names of glucometers or videoconference apps, and we advise our readers to choose the highest quality and secure devices, as well as safe software for the purpose. We believe that a digitally connected glucose meter would reduce chances of transcription errors and is preferable to subjects manually entering the glucose readings in a diary or logbook.

Telemedicine for gestational diabetes care has several challenges. In addition to the absence of the “true” human touch, it may be difficult to clinically assess the subject. Also patient-related errors in measurement of blood pressure, weight, and blood glucose are possible. All these factors could deter the physician from aggressively escalating therapies to reach glycemic targets. Our patients were managed with lifestyle modifications and metformin, an initial strategy consistent with international guidelines.<sup>[8]</sup> Hence, in some ways telemedicine consultation requires more time and effort than a face to face consultation. Despite these limitations, teleconsultations are generally practicable in diabetes as shown by a recent report of telemedicine for initial management of type 1 diabetes during COVID-19 pandemic.<sup>[9]</sup> In view of the current pandemic, guidelines for care of GDM patients have been modified by various organizations such as the International Federation of Gynecology and Obstetrics (FIGO) to support teleconferencing for antenatal care, so that people with GDM have minimal exposure to the risk of contracting virus.<sup>[9-12]</sup> The American College of Obstetrics and Gynecology specifically advises the need to overcome challenges of hardware, software, and a secure internet.<sup>[12]</sup> This may be a problem in certain parts of India.

To summarize, the digital transformation of healthcare has evolved in recent times. Although it has its advantages and disadvantages, telemedicine for managing gestational diabetes may be a useful tool in selected situations where the patients are asymptomatic and hemodynamically as well as clinically stable. More research is needed to study the benefits, risks, and outcomes of gestational “tele-diabetology” care.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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