Original Article

Video Consultation Versus In-Person Clinic Visit for Glycemic Control in Type 2 Diabetes during COVID-19 Pandemic (VIP-CD Study)

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Abstract

Objectives: To compare the efficacy of video consultation (VC) for prospective glycemic control against that of in-person clinic visit (IPV) in individuals with type 2 diabetes. **Materials and Methods:** This is a retrospective, cohort study of 96 individuals with type 2 diabetes followed up for a period of ≤6 months. The cohort was divided into two groups depending on the mode of consultation, namely IPV ($n = 48$) and VC ($n = 48$). Baseline and follow-up characteristics including glycemic profile and lipid profile were compared. **Results:** The cohort had a mean age of 55.4 ± 13.8 years, median diabetes duration of 8 (0.3-70) years, a mean body mass index (BMI) of 28.8 ± 5.8 kg/m^2, 44 (46.3%) females, and uncontrolled hyperglycemia (HbA1c 8.7% ± 1.9%). Both groups were adequately matched at baseline. At the time of first visit, cessation of previous medications was more frequent in the IPV group (37.5% vs 8.3%; $P = 0.001$) than in the VC group. Follow-up was earlier in the VC group as compared to the IPV group (43.2 vs 87.9 days; $P = 0.000$). During the follow-up period, both groups had similar and adequate glycemic (mean HbA1c 7% ± 1%) and lipid profile control. Cox regression model showed that the VC group achieved glycemic control quicker as compared to the IPV group. **Conclusions:** Telemedicine is an effective mode of consultation for attaining glycemic control during COVID-19 pandemic, possibly owing to the quicker follow-up without the risk of potential in-clinic/hospital exposure to COVID-19.

Keywords: COVID-19, telemedicine, type 2 diabetes, video consultation

Introduction

Outpatient clinic absenteeism and lack of follow-up for diabetes care have been the common problems plaguing the physicians and endocrinologists in India during the ongoing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-induced coronavirus disease-19 (COVID-19) pandemic. Frequent lockdowns, administrative orders calling for closure of clinics, fear of contracting infection from health-care facilities or patient(s) (in case of doctors), steroid use, dearth of self- or lab-based monitoring, shortage of medications, and unavailability of health-care professionals have all contributed to impaired delivery of adequate and timely medical care for diabetic individuals. Providing diabetes care during the pandemic has assumed great importance as individuals with diabetes have been found to have severe COVID-19 and higher mortality.[1] Faced with these challenges, doctors have used telemedicine (video, telephone, or email consultation) to connect with and impart medical advice to diabetic individuals.[2] The use of telemedicine in the field of outpatient diabetes care is not new. Many studies and meta-analyses have unequivocally established telemedicine as a suitable alternative to manage noncritical diabetes.[3-11] Some studies have been performed during COVID-19 pandemic,[10,12,13] and their results pertaining to patient care, satisfaction, and adverse events are encouraging. Telemedicine-driven studies concerning diabetes have been conducted in India during the COVID-19 pandemic.[13,14] However, previous studies have not examined the efficiency of glycemic control in individuals

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treated through telemedicine. In this study, we assessed the efficacy of prospective glycemic control via telemedicine versus in-person clinic visit (IPV) in individuals with diabetes seen at a tertiary care center during the COVID-19 pandemic.

Materials and Methods

Study design

This is a retrospective, single-center, cohort study carried out at a tertiary care, designated COVID-19 treatment center in New Delhi, India. The study was conducted during COVID-19 pandemic from July 01, 2020, till October 31, 2020. The study was approved by the Max Healthcare Ethics Committee, New Delhi, India. A waiver of consent was sought because retrospective patient data was used and the study protocol did not affect the treatment protocol or patient identity in any way.

Participants

A total of 2186 consecutive outpatient clinic attendees with type 2 diabetes (T2D; new and follow-up) were met in the aforementioned period. These included individuals in two modes of consults, namely, IPV (n = 1205, 55.1%) and video consultation (VC; n = 981, 44.9%). Out of these, 486 (22.2%) individuals consulted for the first time. Ninety-six (4.4%) individuals who followed within 6-month period (for the second consult) were included for the study. People with type 1 diabetes and individuals hospitalized/testing positive for COVID-19 or receiving steroid for any other reason were excluded. VCs were performed in line with the Government of India guidelines[15] through a virtual consulting software (MyHealthcare; https://www.myhealthcare.co). Each VC was preceded and followed by a phone call (by a physician) to record anthropometry, history pertaining to diabetes and comorbidities, current medications, investigations (including self-monitored glucose, laboratory tests), and patient concerns and to describe any change(s) in medications and lifestyle. IPV consult was also given based on the aforementioned principles.

Measurements

Clinical data were collected from the electronic medical records (EMR), including self-reported age, sex, duration of diabetes, anthropometry, blood pressure (BP), current smoking, lifestyle interventions, baseline and post-consult medications, changes in medications (new drugs, dose change, or cessation of previous drug), baseline and follow-up glycemic (HbA1c, fasting plasma glucose [FPG] and postprandial plasma glucose [PPPG]) and lipid parameters (high-density lipoprotein cholesterol [HDLC], low-density lipoprotein cholesterol [LDLC] and triglycerides [TG]), and hypoglycemic events during the follow-up period. Individuals achieving any two out of the three glycemic targets (FPG 80-130 mg/dL, PPPG <180 mg/dL, and HbA1c <7.0%) laid down by the American Diabetes Association (ADA)[16] were considered to have adequate glycemic control at follow-up consult.

Objectives

The primary objective was to ascertain the efficacy of prospective glycemic control with VC as compared to IPV during COVID-19 pandemic. The secondary objective was to assess whether the change in glycemic control in both groups differed as a function of the period of follow-up.

Statistical analysis

Statistical analysis was performed using IBM SPSS statistics software version 26.0 (IBM Corp, Armonk, NY, USA). Normality of continuous variables was analyzed using Kolmogorov–Smirnov test. Categorical variables were presented as frequency and percentage, whereas continuous variables were presented as mean/standard deviation (SD) or median/range. Chi-square test was used to compare differences between categorical variables, and independent paired t-test/Mann–Whitney U test was used to compare continuous variables. A Cox regression analysis was performed (period of follow-up as the time-dependent variable) to derive the hazard ratio (HR) for the effect of the mode of consultation on the (prespecified) event of glycemic control. A P value of <0.05 was considered statistically significant.

Results

Baseline characteristics

The cohort had 96 individuals with a mean age of 55.4 ± 13.8 years, median diabetes duration of 8 (0.3-70) years, and 44 females (46.3%). The mean body mass index (BMI) of the cohort (28.8 ± 5.8 kg/m^2) was in the obese range. Lifestyle management was reported by 11.6% (moderate exercise) and 12.6% (medical nutrition therapy) individuals. Prior medications for diabetes included: metformin (70.2%), dipeptidyl peptidase-4 inhibitors (DPP4i; 43.8%), sulfonylureas (41.5%), insulin (25%), sodium–glucose cotransport-2 inhibitors (SGLT2i; 8.3%), and glucagon-like peptide 1 receptor agonist (GLP1a; 4.2%). At the time of the first consult, glycemic profile of the cohort was deranged: FPG 184.5 ± 70.7 mg/dL, PPPG 265.9 ± 94.8 mg/dL and HbA1c 8.7% ± 1.9%. Sixty-seven (69.8%) individuals had HbA1c >7%. Baseline lipid profile was as follows: HDLC 44.1 ± 11.8 mg/dL, LDLC 101.2 ± 38.4 mg/dL, and TG 177.8 ± 94.7 mg/dL. The cohort was divided into two groups (VC and IPV) comprising 48 individuals each. At baseline, the study populations in both groups were similar with respect to age, gender, height, weight, BMI, systolic BP, and current smoking [Table 1]. Although the duration of diabetes was longer in the VC group (10 vs 7 years), it was not statistically significant. Baseline medications for treating diabetes were similar between the two groups [Table 1]. PPPG was higher in the IPV group (289.8 vs 244.2 mg/dL; P = 0.049), while FPG, HbA1c, and lipid profile were similar between the two groups [Table 1].

First-visit characteristics

After the first consult, use of all classes of medications increased: metformin (86%), DPP4i (68.8%), sulfonylureas (46.2%), insulin (28.1%), SGLT2i (25%), and GLP1a (5.2%).

Dose change and addition of new medication were done for 57 (59.4%) and 63 (65%) individuals, respectively. However, no inter-group difference was noted in either parameter [Table 2]. Cessation of previous medications was seen more frequently in the IPV group (37.5% vs 8.3%; $P = 0.001$) than the VC group. Despite the addition and cessation of drugs, post-consult medications were similar across the groups [Table 2].

Follow-up characteristics

Mean period of follow-up in this study was 65.7 ± 39.4 days. The VC group followed up earlier as compared to the IPV group (43.2 vs 87.9 days) [Table 3]. Glycemic control improved at the follow-up visit: FPG 119.7 ± 24.8 mg/dL, PPPG 162.8 ± 43.7 mg/dL, and HbA1c 7% ± 1%. However, no differences in glycemic profile achieved could be found between the two groups [Table 3]. The median weight change (loss) of 1.6 kg (−8.7 to 7.5) was recorded in 53 individuals at follow-up visit. Seven individuals in the IPV group gained weight (1-8.7 kg), while none in the VC group gained weight ($P = 0.076$). Lipid profile improved on follow-up visit: LDLC 84.1 ± 26.5 mg/dL and TG 140.1 ± 39.5 mg/dL. Fifty-two (65%) individuals achieved adequate glycemic control (prespecified criteria) with similar figures across the two groups (65.1% vs 64.9%).

Glycemic control as a function of the period of follow-up

In the Cox regression analysis model, we studied the effect of mode of consultation on the (prespecified) event of glycemic control while adjusting for covariates (age, gender, duration of diabetes, BMI, baseline glycemic profile [HbA1c, FPG, PPPG], dose change, addition of new medication, and cessation of previous medication). The model was statistically significant ($P = 0.018$). BMI (HR 0.907, CI 0.823-1.001; $P = 0.052$) and the mode of consultation (HR 0.083, CI 0.023-0.300; $P = 0.000$) were found to predict adequate glycemic control during the period of follow-up [Table 4]. The hazard function plot [Figure 1] showed that the VC group achieved glycemic control quicker as compared to the IPV group. Hypoglycemia was numerically higher in the VC group.

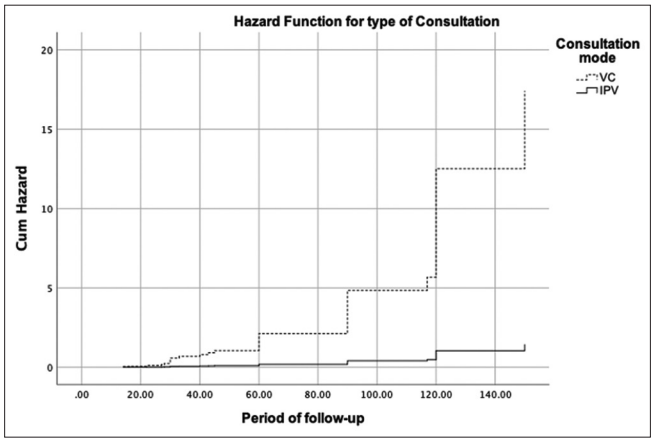

Figure 1: Hazard curve analysis

Table 1: Baseline characteristics of the two groups

Characteristic	VC ($n=48$)	IPV ($n=48$)	*P*
Age (years; $n=96$)	56.4±15.2	54.7±12.2	0.551
Gender (male/female) ($n=96$)	29/19	23/25	0.219
Duration of diabetes (years; $n=94$)	10 (0.4-70)	7 (0.4-45)	0.177
Height (cm; $n=80$)	166.1±10.3	162.8±10.1	0.154
Weight (kg; $n=87$)	81.1±19.5	74.6±16.5	0.097
BMI (kg/m^2; $n=80$)	29.2±6.6	28.4±5.2	0.551
Systolic BP (mmHg; $n=76$)	129.6±17.6	128.7±16.1	0.82
Diastolic BP (mmHg; $n=76$)	80.7±10.8	74.6±8.8	0.009
Current smoking ($n=95$)	8 (16.7%)	0	0.003
Exercise ($n=95$)	8 (16.7%)	3 (6.4%)	0.117
Medical nutrition therapy ($n=95$)	6 (12.5%)	4 (8.5%)	0.526
Baseline medication			
Metformin ($n=94$)	33 (68.8%)	30 (65.2%)	0.716
Sulfonylurea ($n=94$)	18 (37.5%)	21 (45.7%)	0.423
DPP4i ($n=96$)	18 (37.5%)	24 (50%)	0.217
SGLT2i ($n=96$)	4 (8.3%)	4 (8.3%)	1.000
GLP1a ($n=96$)	2 (4.2%)	0	0.153
Insulin ($n=96$)	15 (31.3%)	9 (18.8%)	0.157
Baseline HbA1c (%; $n=90$)	8.7±1.8	8.6±2.1	0.771
Baseline FPG (mg/dL, $n=84$)	184.1±69	184.9±73.1	0.962
Baseline PPPG (mg/dL; $n=67$)	244.2±70.2	289.8±112.3	0.049
Baseline HDLC (mg/dL; $n=56$)	42.5±12.7	45.8±11.1	0.312
Baseline LDLC (mg/dL; $n=64$)	95.3±35.6	104.6±39.7	0.342
Baseline TG (mg/dL; $n=59$)	196±111.4	151.7±58.1	0.062

Table 2: First-visit characteristics

Characteristic	VC ($n=48$)	IPV ($n=48$)	*P*
Dose change ($n=96$)	26 (54.2%)	31 (64.6%)	0.299
New medicine ($n=96$)	31 (64.6%)	32 (66.7%)	0.830
Cessation of previous medicine ($n=96$)	4 (8.3%)	18 (37.5%)	0.001
Medication after consult			
Metformin ($n=93$)	42 (87.5%)	38 (84.4%)	0.671
Sulfonylurea ($n=93$)	18 (37.5%)	25 (55.6%)	0.081
DPP4i ($n=93$)	32 (68.1%)	32 (71.1%)	0.753
SGLT2i ($n=96$)	12 (25%)	12 (25%)	1.000
GLP1a ($n=96$)	3 (6.3%)	2 (4.2%)	0.646
Insulin ($n=96$)	16 (33.3%)	11 (22.9%)	0.256

Table 3: Follow-up characteristics

Characteristic	VC ($n=48$)	IPV ($n=48$)	*P*
Period of follow-up (days)	43.2±29.3	87.9±35.8	0.000
Weight at follow-up (kg; $n=53$)	82.6±18.3	76.2±14.7	0.155
Weight change (kg, $n=53$)	2.0 (0-6)	1 (−8.7-7.5)	0.076
Follow-up HbA1c (%; $n=48$)	6.9±1.1	7±1	0.882
Follow-up FPG (mg/dL; $n=80$)	120.3±20.8	118.6±29.3	0.761
Follow-up PPPG (mg/dL; $n=70$)	155.1±30.3	172.3±55.3	0.104
DM control ($n=80$)	28 (65.1%)	24 (64.9%)	0.981
Follow-up HDLC (mg/dL; $n=19$)	41.1±11.5	34±9.8	0.19
Follow-up LDLC (mg/dL; $n=24$)	88.7±33.7	77.3±14.8	0.31
Follow-up TG (mg/dL; $n=20$)	151.2±41.1	117.4±30.6	0.074
Hypoglycemia ($n=94$)	5 (10.6%)	1 (2.1%)	0.091

Table 4: Cox regression analysis

Covariates	*B*	Sig.	Exp (*B*)	95.0% CI for Exp (*B*)	
				Lower	Upper
Age	0.036	0.116	1.036	0.991	1.083
Duration of diabetes	−0.017	0.286	0.983	0.953	1.014
HbA1c	0.172	0.378	1.188	0.810	1.742
FPG	−0.008	0.066	0.992	0.983	1.001
PPPG	0.004	0.240	1.004	0.997	1.012
Gender	−0.051	0.902	0.950	0.419	2.154
Consultation mode	−2.492	0.000	0.083	0.023	0.300
BMI	−0.097	0.052	0.907	0.823	1.001
Dose change	−0.128	0.791	0.880	0.342	2.265
New medication	0.434	0.333	1.543	0.642	3.710
Cessation of previous medication	−0.824	0.178	0.438	0.132	1.455

Discussion

In this retrospective cohort study, we demonstrated that use of telemedicine (in the form of VC) was an equally effective modality for prospective glycemic control when compared to the traditional IPV during the peak of COVID-19 pandemic. While both the groups achieved adequate glycemic control, Individuals in the VC group were able to achieve glycemic control earlier as compared to those in IPV group.

Telemedicine application for delivering diabetes care is a well-recognized strategy, even though it is underutilized and underpromoted. COVID-19 pandemic has laid to rest the insecurities surrounding telemedicine use, and doctors at all levels have embraced this practical mode of consultation with vigor. Not only has it helped us to stay connected and impart medical care to the patient, it has also delivered reassurance and the message of vaccination to the patient. Previous studies have shown the efficacy of telemedicine in improving glycemic control,[4,8,10-12] weight reduction,[7] dyslipidemia,[5] diabetic foot care,[14] and patient satisfaction.[6,13]

In this study, all glycemic parameters, that is, FPG (120.3 vs 118.6 mg/dL), PPPG (155.1 vs 172.3 mg/dL), and HbA1c (6.9% vs 7%), were comparably controlled by both modes of consultation (VC and IPV, respectively) during the period of follow-up. Both groups of patients also saw a similar reduction in lipid parameters. However, the results of the Cox regression analysis model showed that the individuals opting for VC (HR 0.083) and those with lower BMI (HR 0.907) were likely to achieve glycemic control earlier. The former could be attributed to the ease of doing VC from one's residence and the hesitancy to come for IPV during peak COVID-19 pandemic and/or lockdown. The cohort had a median weight loss of 1.6 kg; however, seven individuals in the IPV group gained weight (1-8.7 kg). The reason for weight gain could be numerically higher use of sulfonylureas ($P = 0.081$) [Table 2] in the IPV group.

The study also threw light the aspect of medication-prescribing behavior. There was a tendency to write euglycemic drugs (metformin and DDP4i) more than hypoglycemic drugs (sulfonylurea, insulin). Thiazolidinediones were not prescribed to any individual. IPV group had greater cessation of previous medication (37.5% vs 8.3%), a finding that may be either construed as chance or physician reluctance to stop pre-existing prescription on VC.

The strengths of this study include presence of homogeneous baseline groups, robust anthropometric and laboratory data, prospective follow-up, and the fact that it is the first such study from India. The limitations include lack of medical record of comorbidities, lipid profile, dosage of drugs, and loss to follow-up.

Conclusions

Telemedicine imparted via VC is a viable and an effective mode of consultation for achieving glycemic control during COVID-19 lockdown. It allows for remote, frequent, and flexible approach to glycemic and lipid management in individuals with T2D. In addition, individuals opting for VC are likely to achieve glycemic control earlier compared to those opting for IPV.

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Conflicts of interest

There are no conflicts of interest.

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