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Brief Report

The challenge of diabetes home control in COVID-19 times: Proof is in the pudding

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ABSTRACT

SARS-CoV-2 pandemic had changed self-care in diabetes. The aim of this work is to analyze the effect of lockdown on glycemic control in people with type 1 diabetes on multiple daily insulin injections using FGM. During lockdown no deleterious effect on glycemic control measured by FGM.

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1. Introduction

In late 2019 December, and unknown virus, SARS-CoV-2, caused pneumonia in Wuhan [1]. Till the date, 14,307,865 confirmed cases had been reported worldwide [2]. To control the spread of COVID-19, the lockdown was imposed in many countries.

In Spain, lockdown population was declared in March 14th, 2020 [3]. In April 26th, children under 14 years old, accompanied by an adult were authorized to go out. In May 2nd, all the Spanish population was allowed to go out, by age ranges for do sport or walking.

People with diabetes have a worse prognosis if they affected by COVID-19 [4]. Telehealth and remote monitoring systems have become essential for healthcare assistance in diabetes [5]. Flash glucose monitoring (FGM) use had demonstrated augmented time in range (TIR) in people living with type 1 diabetes (PLWD) [6–8].

The aim of this work is to analyze the effects of lockdown on glycemic control on ambulatory glucose metrics in PLWD, in a real-world setting.

2. Material and methods

The inclusion criteria were having type 1 diabetes mellitus on multiple daily insulin injections and using FGM. The exclusion criteria were developed COVID-19 or hospitalization for any cause. All the participants were attended in the Endocrinology and Nutrition Unit of University Hospital of Ferrol, Galician Healthcare System, Spain.

Data from 2 weeks before confinement, between March 1st and 14th (period 1, P1), were compared with data from after 4 weeks of confinement, between April 6th and 19th (period 2, P2) and compared to with the Spanish phase 1 to return normality, with relaxing of the lockdown, from 11th May to 25th (period 3, P3).

The sensor data were downloaded from Libreview®. People with a sensor use less than 70% were excluded. Estimated HbA1c, mean glucose, standard deviation, coefficient of variation, number of scans per day were recorded. According to international consensus [9], TIR 70–180 mg/dL, time in hypoglycemia <70 mg/dL and <54 mg/dL and time in hyperglycemia >180 mg/dL and >250 mg/dL were reported.

The study was in accordance with the Helsinki Declaration and the basic principles of Good Clinical Practice. Patients had provided online informed consent when they started using FGM device to be connected in a remote way to our Unit to use their data for healthcare and for research purpose. All the data about participants were anonymous.

IBM SPSS Statistics v24 was used for analysis. Results are represented as mean ± SD values. The T-student-test was used for comparison of means. A p value <0.05 was defined as statistical significance.

3. Results

Forty-four PLWD were included. Demographic characteristics were as follows: age 37 ± 18 years [16] and 67% female (31). Regarding the sensor data capture, no differences were observed (P1 89 ± 10%; P2 89 ± 9%; P3 88 ± 10%). Scan rate per day were similar (P1 9 ± 6 scans/day; P2 9 ± 6 scans/day; P3 10 ± 7 scans/day).

Results are shown in Tables 1 and 2.

Considering relevant a change in estimated HbA1c $\geq$ 0.4% and an increase in TIR$\geq$ 5%, we found and improvement in 22.7% (n = 10) and 20.4% (n = 9) of the subjects, respectively, in P2. We found and improvement in 34.0% (n = 15) and 25.0% (n = 11) of the subjects, respectively, in P3.

None participant reported COVID-19 infection during the study.

4. Discussion

This data show that during the lockdown no deleterious effect on glycemic control measured by FGM. Maybe more time for doing sport and healthy cooking may explain that. The relaxing of restrictive measures regarding some sport time, showed an enhanced in TIR and time > 180 mg/dL and a fallen in average glucose, estimated HbA1c and time > 250 mg/dL. Outings for sports and fear to hypoglycemia out home could justify these findings.

Beato-Víbora [10] had presented data about 79 FGM users in which during the lockdown estimated HbA1c decreased 0.2% and TIR was 2.5% superior. Bonora et al [11] collected data about 33 FGM users during confinement in which stop working and stayed at home demonstrated overall better glycemic control. In the present study, occupation was not analyzed and maybe be a confusion factor in the results.

In these findings could influence the inclusion criteria for reimbursement of FGM by Galician Healthcare System, only reimbursed for PLWD younger than 18 years old, pregnant or with severe hypoglycemia. This fact may explain the relative high basal time-below-range. In addiction, the economic level is a limitation of access to this device. We did not evaluate other factor like changes in insulin doses, diet, exercise or diabetes related distress, factors well known that impact in glycemic control.

The number of cases of COVID-19 in our health care area represented the 0.02% of total Spanish cases. This means that it is one of the areas in Spain with the lowest number of cases [12].

SARS-CoV-2 crisis putting the focus on COVID-19 patients to the detriment of other chronic diseases like diabetes [13,14]. Traditional visit had transformed in virtual visit during this pandemic using telemedicine and remote monitoring [15] and FGM enables PLWD to communicate with their healthcare providers.

Each day, we have more data about diabetes and COVID-19 in hospitals worldwide [16] but reports of PLWD in the home during confinement are underrepresented. These data sup-

Table 1 – FGM metrics before (P1) and during lockdown (P2) in the study participants. Data are expressed as mean ± SD. * Paired sample T-student test.

FGM metrics (n = 44)	Before lockdown	During lockdown	P value
CGM use (%)	89 ± 10	89 ± 9	0.642
Mean glucose (mg/dL)	165 ± 33	161 ± 40	0.240
Estimated HbA1c (%)	7.2 ± 0,8	7.1 ± 0,9	0.204
TIR (%)	58.0 ± 18.1	60.6 ± 20.0	0.168
Time > 180 mg/dL (%)	23.3 ± 9.4	21.4 ± 9.8	0.064
Time > 250 mg/dL (%)	13.2 ± 12.7	12.4 ± 14.8	0.642
Time < 70 mg/dL (%)	4.0 ± 3.6	4.9 ± 6.3	0.191
Time < 54 mg/dL (%)	1.6 ± 3.3	1.0 ± 2.1	0.598
Glycemic variability (CV%)	37.5 ± 7.4	36.8 ± 7.1	0.572

Table 2 – FGM metrics during (P2) and post lockdown (P3) in the study participants. Data are expressed as mean ± SD. * Paired sample *T-student* test.

FGM metrics (n = 44)	During lockdown	Post lockdown	P value
CGM use (%)	89 ± 9	88 ± 10	0.537
Mean glucose (mg/dL)	161 ± 40	153 ± 30	**0.033**
Estimated HbA1c (%)	7.1 ± 0,9	6.8 ± 1,0	**0.007**
TIR (%)	60.6 ± 20.0	64.0 ± 17.4	**0.05**
Time > 180 mg/dL (%)	21.4 ± 9.8	28.4 ± 18.9	**0.004**
Time > 250 mg/dL (%)	12.4 ± 14.8	8.84 ± 10.5	**0.018**
Time < 70 mg/dL (%)	4.9 ± 6.3	6.2 ± 5.5	0.387
Time < 54 mg/dL (%)	1.0 ± 2.1	5.7 ± 5.8	**<0.0001**
Glycemic variability (CV%)	36.8 ± 7.1	36.6 ± 7.5	0.900

port the usefulness of FGM in a real world setting and allowed PLWD to be connected to the healthcare team during this pandemic and will be important in the next COVID-19 wave.

5.   Conclusions

FGM is a useful tool in a real world setting for PLWD for self-control during this pandemic.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

REFERENCES

[1] Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med. 2020 20;382(8):727–33.

[2] COVID-19 Map [Internet]. Johns Hopkins Coronavirus Resource Center. [cited 2020 Jul 19]. Available from: https://coronavirus.jhu.edu/map.html.

[3] BOE.es - Documento BOE-A-2020-3692 [Internet]. [cited 2020 May 26]. Available from: https://www.boe.es/eli/es/rd/2020/03/14/463.

[4] Ceriello A, Standl E, Catrinoiu D, Itzhak B, Lalic NM, Rahelic D, et al. Issues of Cardiovascular Risk Management in People With Diabetes in the COVID-19 Era. Diabetes Care 2020.

[5] Katulanda P, Dissanayake HA, Ranathunga I, Ratnasamy V, Wijewickrama PSA, Yogendranathan N, et al. Prevention and management of COVID-19 among patients with diabetes: an appraisal of the literature. Diabetologia 2020.

[6] Lind M, Polonsky W, Hirsch IB, Heise T, Bolinder J, Dahlqvist S, et al. Continuous Glucose Monitoring vs Conventional Therapy for Glycemic Control in Adults With Type 1 Diabetes Treated With Multiple Daily Insulin Injections: The GOLD Randomized Clinical Trial. JAMA. 2017 24;317(4):379–87.

[7] Beck RW, Riddlesworth T, Ruedy K, Ahmann A, Bergenstal R, Haller S, et al. Effect of Continuous Glucose Monitoring on Glycemic Control in Adults With Type 1 Diabetes Using Insulin Injections: The DIAMOND Randomized Clinical Trial. JAMA. 2017 24;317(4):371–8.

[8] Gomez-Peralta F, Dunn T, Landuyt K, Xu Y, Merino-Torres JF. Flash glucose monitoring reduces glycemic variability and hypoglycemia: real-world data from Spain. BMJ Open Diabetes Res Care. 2020;8(1).

[9] Battelino T, Danne T, Bergenstal RM, Amiel SA, Beck R, Biester T, et al. Clinical targets for continuous glucose monitoring data interpretation: recommendations from the international consensus on time in range. Diabetes Care 2019;42(8):1593–603.

[10] Beato-Víbora PI. No deleterious effect of lockdown due to COVID-19 pandemic on glycaemic control, measured by glucose monitoring, in adults with type 1 diabetes. Diabetes Technol Ther 2020.

[11] Bonora BM, Boscari F, Avogaro A, Bruttomesso D, Fadini GP. Glycaemic control among people with type 1 diabetes during lockdown for the SARS-CoV-2 outbreak in Italy. Diabetes Ther Res Treat Educ Diabetes Relat Disord. 2020;11:1–11.

[12] Novas [Internet]. [cited 2020 Jul 19]. Available from: https://saladecomunicacion.sergas.gal/Paginas/ListaxeNovas.aspx?idioma=ga.

[13] Gupta R, Ghosh A, Singh AK, Misra A. Clinical considerations for patients with diabetes in times of COVID-19 epidemic. Diabetes Metab Syndr. 2020;14(3):211–2.

[14] Maddaloni E, Buzzetti R. Covid-19 and diabetes mellitus: unveiling the interaction of two pandemics. Diabetes Metab Res Rev. 2020;31:e33213321.

[15] Jones MS, Goley AL, Alexander BE, Keller SB, Caldwell MM, Buse JB. Inpatient transition to virtual care during COVID-19 pandemic. Diabetes Technol Ther 2020.

[16] Scheen AJ, Marre M, Thivolet C. Prognostic factors in patients with diabetes hospitalized for COVID-19: Findings from the CORONADO study and other recent reports. Diabetes Metab 2020.