SHORT COMMUNICATION

Effects of home confinement during COVID-19 outbreak on glycemic control in patients with type 2 diabetes receiving telemedicine support

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Introduction

The lockdown measures for COVID-19 could interfere with the management of diabetes. Home confinement can impair eating habits, inhibit physical activity, and prevent access to disease monitoring and specialist visits, thus inducing a deterioration of glucose control. Conversely, several studies reported a reduction in mean glucose and glucose variability in patients with type 1 diabetes [1], possibly due to increased self-monitoring and related adjustments of insulin therapy. Results in type 2 diabetes are heterogeneous, reporting either improvement or deterioration of glucose control during confinement. Such differences could be due to diversities in restrictive measures, healthcare organization, or cultural background in different countries, with Asian studies usually showing an improvement, and European studies a deterioration, of glucose control in type 2 diabetes [2].

The reaction of healthcare systems to pandemic restrictions could have moderated the effects of lockdown on glucose control; telemedicine, allowing remote physician contact with patients, may have limited the negative impact of lockdown.

In Tuscany, the Regional Health System promptly provided an official recognition of televisits, i.e., "a health service provided through a remote interaction between physician and patient" [3], as temporary substitute for traditional office visits. In part of the Region, the transition to telemedicine was swift, allowing telemedicine coverage for most planned visits. Aim of this retrospective observational study is the assessment of the effect of lockdown on glucose control and body weight in people with type 2 diabetes, exploring the moderating effect of telemedicine.

Methods

In Italy, strict home confinement was imposed on March 9, 2020 and revoked on May 18, 2020. A consecutive series of adult (> 18 years) subjects with type 2 diabetes, referring to the Diabetes Outpatient Clinic of Careggi Hospital, Florence, from 3 to 5 months after the beginning of lockdown, and who received the previous between December 2019 and March 2020, were enrolled, after acquiring their informed consent. Patients with intercurrent conditions possibly influencing metabolic status (i.e., hospitalization, infection, injury requiring immobilization, glucocorticoid therapy) were excluded.

The principal endpoint was the difference in HbA1c and body weight between after (May–June 2020) and before (November 2019–February 2020) lockdown. Secondary endpoints included lipid profile, current therapy, and the proportion of patients within Italian HbA1c targets [4], i.e., < 48 mmol/mol (< 53 if aged > 75 years or with comorbidities) in patients not treated with insulin/sulphonylureas/glinides, or 48–58 mmol/mol (48–64 if aged > 75 years or with comorbidities) when using insulin/sulphonylureas/glinides. All data were retrieved from patients' clinical records. Separate analyses were performed on subgroup of patients with or without planned visits during lockdown; among patients with planned visits, those receiving visits or televisits were compared with those who missed their appointments.

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Differences in means were compared using paired and unpaired *t* tests whenever appropriate, or single-way ANOVA in the case of more than two groups. All analyses were performed with SPSS 27.

The protocol was approved by the local ethical board (17457_oss).

Results

Out of 269 patients enrolled, 177 (65.8%) had no planned appointment during lockdown and received their control visits as planned, after lockdown; 52 (19.3%) and 31 (11.5%) received a televisit or a visit during lockdown, respectively, whereas 9 (3.3%) missed their appointment. No significant difference in baseline characteristics was detected between patients with or without planned appointments during lockdown (Table 1).

A small but significant reduction in HbA1c, body weight and total cholesterol was observed after lockdown. The proportion of patients at HbA1c target was also modestly but significantly increased after lockdown. Conversely, no significant changes were detected in triglycerides, non-insulin treatments and daily insulin doses (Table 2).

The change in HbA1c and body weight was similar between patients with or without appointments during lockdown (HbA1c $-4.4 \pm 15.1\%$ and $-2.6 \pm 15.8\%$, $p = 0.36$, and body weight $-1.2 \pm 4.2\%$ and $-0.6 \pm 3.4\%$, $p = 0.34$, respectively); among those with appointments, no significant differences were observed between patients who missed their visit, those receiving a traditional visit, or a televisit (data not shown).

Table 1 Baseline characteristics of patients with or without planned appointments during lockdown

Characteristics	No planned appointment (N=177)	Televisit (N=52)	Visit (N=31)	Missed appointment (N=9)	p-value
Age (years)	67.3 ± 8.7	68.5 ± 8.9	67.9 ± 7.6	69.7 ± 8.5	0.74
Diabetes duration (years)	16.5 ± 9.6	14.6 ± 9.5	17.1 ± 9.2	15.6 ± 5.1	0.61
Sex (Female)	64 (36.1)	16 (30.8)	10 (32.2)	4 (44.4)	0.81
HbA1c (mmol/mol)	57.9 ± 10.8	57.9 ± 11.5	57.5 ± 10.3	56.6 ± 11.7	0.99
HbA1c target (yes)	86 (48.6)	25 (48.1)	16 (51.6)	6 (66.7)	0.75
Weight (kg)	83.5 ± 16.9	83.4 ± 17.2	81.9 ± 16.5	81.0 ± 15.5	0.94
BMI (kg/m^2)	29.0 ± 6.1	29.3 ± 5.6	28.5 ± 6.0	27.8 ± 3.4	0.91
Total cholesterol (mg/dL)	169 ± 44	172 ± 39	160 ± 44	165 ± 29	0.67
HDL cholesterol (mg/dL)	48 ± 12	48 ± 13	46 ± 10	47 ± 13	0.94
Triglycerides (mg/dL)	177 ± 317	165 ± 159	128 ± 61	178 ± 90	0.83
Diabetic retinopathy	21 (11.9)	4 (7.7)	9 (29.0)	0 (0.0)	0.18
Diabetic neuropathy	13 (7.3)	2 (3.8)	3 (9.7)	1 (11.1)	0.71
Foot ulcer	2 (1.1)	1 (1.9)	1 (3.2)	0 (0.0)	0.80
Chronic kidney disease	33 (18.6)	9 (17.3)	6 (19.3)	2 (22.2)	0.99
Coronary heart disease	42 (23.7)	9 (17.3)	8 (25.8)	2 (22.2)	0.77
Brain vascular disease	7 (3.9)	2 (3.8)	1 (3.2)	0 (0.0)	0.94
Peripheral artery disease	19 (10.7)	4 (7.7)	3 (9.7)	1 (11.1)	0.93
Microalbuminuria	30 (16.9)	12 (23.1)	6 (19.3)	3 (33.3)	0.52
Metformin	124 (70.0)	44 (84.6)	24 (77.4)	6 (66.7)	0.18
Pioglitazone	15 (8.5)	4 (7.7)	3 (9.7)	2 (22.2)	0.55
SGLT-2 inhibitor	54 (30.5)	18 (34.6)	12 (38.7)	1 (11.1)	0.42
GLP-1 receptor agonist	33 (18.6)	10 (19.2)	5 (16.1)	3 (33.3)	0.71
DPP-IV inhibitors	29 (16.4)	8 (15.4)	5 (16.1)	2 (22.2)	0.97
Acarbose	18 (10.2)	5 (9.6)	5 (16.1)	0 (0.0)	0.54
Sulphonylurea	12 (6.8)	4 (7.7)	2 (6.4)	0 (0.0)	0.86
Basal insulin	70 (39.5)	20 (38.5)	15 (48.4)	4 (44.4)	0.80
Rapid insulin	54 (30.5)	13 (25.0)	9 (29.0)	3 (33.3)	0.88
Daily insulin dose (UI)	17 ± 27	17 ± 29	17 ± 25	28 ± 43	0.75

Data are expressed as number (%) or Mean ± DS

Table 2 Total sample's metabolic profile, body weight and therapy before and after lockdown

Characteristics	Before lockdown	After lockdown	p-value
HbA1c (mmol/mol)	57.8 ± 10.8	55.4 ± 11.2	< 0.01
HbA1c target (yes)	133 (49.4)	159 (59.1)	< 0.01
Body weight (kg)	83.2 ± 16.8	81.6 ± 16.4	< 0.01
Total cholesterol (mg/dL)	168 ± 43	161 ± 38	< 0.01
HDL cholesterol (mg/dL)	47 ± 12	47 ± 12	0.69
Triglycerides (mg/dL)	169 ± 268	152 ± 76	0.22
Daily insulin dose (UI)	18 ± 28	18 ± 28	0.59
Metformin	198 (73.6)	210 (78.1)	0.22
Pioglitazone	24 (8.9)	17 (6.3)	0.25
SGLT2[a] inhibitor	85 (31.6)	87 (32.3)	0.85
GLP1-RA[b]	51 (19.0)	64 (23.8)	0.17
DPP-IV[c] inhibitor	44 (16.4)	47 (17.5)	0.73
Acarbose	28 (10.4)	22 (8.2)	0.37
Long-acting Insulin	109 (40.5)	114 (42.4)	0.60
Short-acting Insulin	79 (29,4)	83 (30.9)	0.71
Sulphonylurea	18 (6.7)	12 (4.5)	0.26

Data are expressed as number (%) or Mean $\pm$ DS

[a]Sodium-glucose cotransporter 2

[b]Glucagon-like peptide-1 receptor agonist

[c]Dipeptidyl peptidase-IV

Discussion

The Spring 2020 lockdown did not appear to induce any relevant deterioration of metabolic profile. Conversely, small although statistically significant improvements were observed for HbA1c, body weight and total cholesterol. A reduction in HbA1c had been reported in Asian studies, but European data previously showed an impairment of glucose control [2].

Behavioral changes determined by home confinement (increased food intake, changes in diet composition, reduction in outdoor exercise) and reduced availability of healthcare (visits and monitoring examinations) could deteriorate glucose control. Conversely, increased time for diabetes self-management and reduced risk for overeating at restaurant meals, parties, and meetings could theoretically improve glucose and weight control. The development of telemedicine, with televisits replacing most office consultations, could have mitigated the negative effects of specialist visits reduction [5], although teleconsultation could theoretically be less effective than direct contact in patient education and motivation.

A relevant proportion of planned visits was missed during lockdown. However, in some areas a rapid development of teleconsultations minimized the impact of the pandemic on specialist care. In the present study, the number of visits lost during follow-up was negligible, since most planned office consultations were transformed into televisits.

Several limitations of this study should be recognized. The relatively small sample size limits the reliability of estimates. In addition, the sample studied, enrolled in a single University Hospital with selective referral of relatively complex cases, is not representative of all patients with diabetes. Notably, although telemedicine could provide an explanation for otherwise unexpected results, the present study does not provide any information on the actual efficacy of telemedicine, which should have been assessed through randomized studies. In addition, the retrospective nature of the study did not allow the assessment of perceived obstacles and acceptability of teleconsultations.

In conclusion, most patients with type 2 diabetes avoided a deterioration of HbA1c and body weight during lockdown. Telemedicine could have limited the negative impact of lockdown, suggesting a possible role of telemedicine in the future, independent of home confinement.

Declarations

References

1. Marigliano M, Maffeis C (2021) Glycemic control of children and adolescents with type 1 diabetes improved after COVID-19 lockdown in Italy. Acta Diabetol 58(5):661–664. https://doi.org/10.1007/s00592-020-01667-6. Epub 2021 Feb 2. PMID: 33532867; PMCID: PMC7853159
2. Antonio SG, Chiara DP, Ilaria D, Matteo M, Edoardo M (2021) Glucose control in diabetes during home confinement for the first pandemic wave of COVID-19: a meta-analysis of observational studies. Acta Diabetol 22:1–9. https://doi.org/10.1007/

s00592-021-01754-2. Epub ahead of print. PMID: 34159476; PMCID: PMC8219181

3. Intesa tra il Governo, le Regioni e le Province autonome di Trento e Bolzano sul documento recante Telemedicina - Linee di indirizzo nazionali. (Repertorio Atti n. 16/CSR del 20/02/2014). https://www.salute.gov.it/imgs/C_17_pagineAree_2515_1_file.pdf (Internet)

4. Standard italiani per la cura del diabete mellito 2018. Cura del diabete

5. Quinn LM, Davies MJ, Hadjiconstantinou M (2020) Virtual consultations and the role of technology during the COVID-19 pandemic for people with type 2 diabetes: the UK perspective. J Med Internet Res 22(8):e21609. https://doi.org/10.2196/21609.PMID:32716898;PMCID:PMC7486671