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Effect of the first and second COVID-19 associated lockdown on the metabolic control of patients with type 2 diabetes in Greece

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ABSTRACT

The aim of this study was to assess the effect of the COVID-19 lockdown periods on the metabolic control of patients with type 2 diabetes (T2D) in three academic diabetes centers in Greece. There was a slight improvement in BMI, blood pressure and lipid values while the remaining parameters remained stable.

1. Introduction

Coronavirus disease 19 (Covid-19) results from the very contagious severe acute respiratory syndrome coronavirus 2 (SARS-CoV 2) and was classified as a pandemic in a short period of time. Governments from many countries implemented several times the measure of lockdown, with movement restrictions and social distancing, in order to limit the spread of the disease and to protect their health systems. The implementation of lockdown has affected routine health care activities and everyday life. All outpatient activities were cancelled and there was also difficulty in accessibility to medications.

We have previously reported, among others, that the first lockdown, implemented during the first wave of the pandemic, had neutral or even beneficial effects on metabolic control of patients with T2D. Nevertheless, the repeated use of restrictive measures may have had an adverse impact on physical and psychological health of people with chronic metabolic disorders. The aim of this observational study was to retrospectively examine the effect of the first and second COVID-19 associated lockdown on the metabolic control of patients with T2D in three academic centers in Greece.

2. Materials and methods

2.1. Study design

Patients with T2D receiving regular follow-up (every 3–6 months) at the Outpatient Diabetes Clinics of three academic centers in Greece, were enrolled. Clinical and laboratory data were retrospectively collected from the available clinical files. Demographics and clinical data were collected at three time points:1) on the last patient's visit before (up to 3 months) the first lockdown, which occurred between March 16th and April 30th 2020, 2) on the first visit after the first lockdown (up to 3 months) and 3) on the first visit after (up to 3 months) the second lockdown which occurred between November 5th and May 14th, 2021. The protocol was aligned with the principles of the Declaration of Helsinki and was approved by the hospital’s Ethics Committee.

2.2. Statistical analysis

Continuous variables with normal distribution are presented as mean ± one-standard deviation, whereas those lacking normality are presented as median ± interquartile range. Qualitative variables are presented as absolute and relative frequencies (%). Analysis of variance for repeated measures and Bonferroni adjustment was used for the comparisons between the studied parameters at the three time points. Data were analyzed using the Statistical Package SPSS, version 21.0 (SPSS}

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3. Results

The present analysis included 342 participants with available data (mean age 62 ± 9.2 years, 62% males, mean duration of diabetes 14.64 ± 9.52 years). Concerning the antidiabetic treatment of the participants, 85.9% were receiving metformin, 30.3% SGLT-2 inhibitors, 41.6% GLP-1 receptor agonists and 53.2% were receiving insulin (Reviewer 2, Comment 1). Most patients had good glycometric control (HbA1c: 6.9 ± 1.3%), blood pressure (SBP and DBP 138 ± 18 and 80 ± 11 mmHg, respectively) and lipid profile (LDL-C 83 ± 30 mg/dL) at baseline. After the first lockdown, a small but statistically significant reduction in BMI and total cholesterol values was observed. There was a non-significant further decline in BMI after the second lockdown. These findings persisted after adjustment for baseline treatment with GLP-1 receptor agonists (P = 0.005 for BMI) and/or SGLT-2 inhibitors (P = 0.006 for BMI) (Reviewer 2, Comment 2). After the second lockdown, systolic blood pressure, total cholesterol, triglycerides and LDL-cholesterol values, were significantly lower than at baseline, whereas only total cholesterol showed a significant decrease compared to post-first lockdown period (Table 1).

4. Discussion

In this study, we found that during two consecutive lockdowns, patients with T2D exhibited small, statistically significant but clinically negligible reductions in BMI, systolic blood pressure and lipid values. It might be argued, however, that even non-deterioration of complication-related risk factors in type 2 diabetes is a clinically meaningful observation. There are conflicting data in the literature concerning the impact of covid-19 lockdown on metabolic parameters of patients with T2D. In a meta-analysis of 36 observational studies, including patients with type 1 and type 2 diabetes, it was shown that during the first lockdown period, there was an improvement in mean glucose and glucose variability in patients with type 1 diabetes, whereas in people with type 2 diabetes there were no significant changes in glycometric control. Following a recent systematic review and meta-analysis, including only patients with type 2 diabetes, it was demonstrated that during the first lockdown period the levels of HbA1c significantly increased. In another study by B. Hansel et al. regarding the impact of the Covid-19 lockdown on overweight/obese patients with T2D, a reduction in body weight was demonstrated in a significant proportion of the participants.

It has been suggested that during lockdown periods daily activities slowed down and many patients had the opportunity to work from home. Home confinement may have led to better eating behavior and a chance for more leisure-time exercise. Such lifestyle favorable changes may explain the results of the present study. Additionally, the potential improvement in treatment compliance and the psychological support from other family members could have a beneficial effect on metabolic control of patients with type 2 diabetes (Reviewer 2, Comment 3).

Limitations of our study include a) the fact that it was a retrospective study. Clinical and laboratory data were retrospectively collected from the available medical files; b) the hypolipidemic and antihypertensive treatment of the participants were not included in our database and thus we cannot exclude that the observed improvement in lipid values and systolic blood pressure readings could be due to treatment intensification; c) the socioeconomic status and the profession of the participants could have an impact on the results, but this remains to be elucidated within larger cohorts. (Reviewer 1, Comment 2, Reviewer 2, Comment 4).

In conclusion, in a sample of patients with T2D followed in academic outpatient diabetes clinics, consecutive lockdowns related to the COVID-19 pandemic did not seem to deteriorate metabolic control, whereas some slight improvement was noticed in BMI and lipid profile.

Table 1

| Variable                        | Baseline       | After 1st lockdown | After 2nd lockdown | P    |
|---------------------------------|----------------|--------------------|--------------------|------|
| BMI (kg/m²)                     | 30.6 ± 5.4a    | 30.3 ± 5.6a        | 30 ± 5.7a         | 0.006|
| Systolic blood pressure (mmHg)  | 138 ± 19       | 137 ± 16           | 135 ± 17a         | 0.019|
| Diastolic blood pressure (mmHg) | 80 ± 12        | 82 ± 10            | 79 ± 10           | 0.260|
| Fasting plasma glucose (mg/dL)  | 127 ± 42       | 123 ± 35           | 125 ± 35          | 0.255|
| HbA1c (%)                       | 6.9 ± 1.3      | 6.7 ± 0.9          | 6.7 ± 1.1         | 0.168|
| Total cholesterol (mg/dL)       | 160 ± 35       | 154 ± 33b          | 150 ± 31b         | <0.001|
| Triglycerides (mg/dL)           | 138 ± 74       | 132 ± 67           | 129 ± 63a         | 0.011|
| HDL-cholesterol (mg/dL)         | 49 ± 13        | 49 ± 13            | 49 ± 13           | 0.516|
| LDL-cholesterol (mg/dL)         | 82 ± 29        | 80 ± 30            | 76 ± 26           | <0.001|
| Alanine aminotransferase (IU/l) | 23 ± 14        | 22 ± 13            | 23 ± 15           | 0.739|
| Aspartate aminotransferase (IU/l)| 20 ± 9         | 20 ± 9             | 22 ± 10           | 0.105|
| Gamma-glutamyltransferase (IU/l)| 23 ± 12        | 22 ± 12            | 21 ± 13           | 0.513|

a Compared to baseline.
b Compared to post-first lockdown values.

CRediT authorship contribution statement

All authors have read and agreed to the published version of the manuscript.

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Declaration of competing interest

The authors declare no conflict of interest.

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