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The Effect of the COVID-19 Crisis on Metabolic Control of Patients with Type 2 Diabetes in Tunisia: A Cross-Section and Retrospective Cohort Study

Introduction

The pandemic of coronavirus disease 2019 (COVID-19) was an international health crisis that imposed restrictive measures in order to limit the spread of the virus. These measures affected everyday life, routine healthcare activities and accessibility to medications. The effects of the COVID-19 crisis on metabolic control in patients with type 2 diabetes (T2D) were different in the literature [1–5]. The objective of this study was de determine the impact of the COVID-19 crisis on metabolic parameters in T2D in Tunis, Tunisia.

Materials and methods

It was a cross-sectional study conducted during the months of December 2021 and January 2022 at the outpatient clinic of the department of Endocrinology in La Rabta University Hospital of Tunis. It included 350 consecutive patients with T2D enrolled at routine clinical visit, aged more than 25 years and followed up at the same department for at least three years. Patients with acute infectious or cardio vascular diseases, malignancy and pregnant women were not included.

Patients were questioned about age, gender, duration of T2D, ongoing treatment, and COVID-19 infection and vaccination. Number of visits, weight, height, and data on glycemic control (fasting plasma glucose and HbA1c), lipids (total cholesterol, triglycerides, and HDL cholesterol), and serum creatinine during 2019 and 2021 were collected from medical files.

Controlled T2D was defined as HbA1c $\leq$ 7.0% for patients under 65 years old and $\leq$ 8.0% for patients over 65 years old or with severe renal insufficiency or coronary artery disease.

The study was approved by the Ethical Committee of University Hospital La Rabta, Tunis. All patients signed an informed consent.

Statistical analysis

Analyses were carried out using the Statistical Package for the Social Sciences version 25 (SPSS Inc., Chicago, IL, USA). Comparisons of continuous and categorical variables were performed using Student and Mc Nemar tests for paired groups, respectively.

Results

Data of 339 patients were analyzed: 134 males (39.5%), mean age = 62.2 ± 9.3 years (28–91), mean duration of T2D = 9.9 ± 6.2 years (2–35), 126 (37.2%) were treated with insulin and 213 (62.8%) with only

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Table 1. Comparison of Clinical and Biological Parameters between 2019 and 2021

Parameters	2019	2021	p
Number of medical visits per year, mean ± SD	1.8 ± 0.7	1.9 ± 0.7	0.054
BMI, mean ± SD [kg/m$^{2]}$	30.4 ± 6.2	30.5 ± 6.3	0.663
FPG, mean ± SD [mmol/L]	9.49 ± 3.16	9.82 ± 3.60	0.144
HbA1c, mean ± SD [%]	8.2 ± 1.7	8.3 ± 1.8	0.327
GFR, mean ± SD, mL/min/1.73m^2	88.6 ± 20.7	90.2 ± 21.9	0.044
Total Cholesterol, mean ± SD [mmol/L]	4.53 ± 1.08	4.39 ± 1.32	0.058
Triglycerides, mean ± SD [mmol/L]	1.57 ± 0.88	1.70 ± 1.33	0.118
HDL cholesterol, mean ± SD [mmol/L]	1.16 ± 0.28	1.16 ± 0.33	0.515
LDL cholesterol, mean ± SD [mmol/L]	2.66 ± 0.93	2.45 ± 1.08	0.002
Controlled diabetes* (%)	38.9	38.3	0.912

*Controlled T2D was defined as HbA1c ≤ 7% for patients under 65 years old and ≤ 8% for patients over 65 years or with GFR < 30 mL/min/1.73m^2 or coronary artery disease
BMI — body mass index; FPG — fasting plasma glucose; GFR — glomerular filtration rate; HbA1c — glycated hemoglobin; HDL — high density lipoprotein; LDL — low density lipoprotein ; SD — standard deviation

oral anti-diabetic agents. Diabetes complications were retinopathy in 94 (27.7%), peripheral neuropathy in 44 (12.9%), and nephropathy in 89 (26.2%). Glomerular filtration rate was below 60 mL/min/1.73m^2 in 32 (9.4%). Hypertension was present in 192 patients (56.6%), coronary artery disease in 67 (19.8%), cardiac insufficiency in 23 (6.8%), stroke in 18 (5.3%), and peripheral artery disease in 21 (6.2%). Diabetes foot complications were present in 11 patients (3.2%). One hundred and twenty patients (35.4%) have been infected by COVID-19 and 304 (89.7%) were vaccinated.

There were no significant differences in the number of medical visits and in the mean annual levels of fasting plasma glucose and HbA1c between 2019 and 2021. There were significant improvements in glomerular filtration rate and LDL cholesterol level (Tab. 1).

Discussion

Metabolic control was not worsened during the COVID-19 crisis in patients with T2D. Studies conducted in different countries showed different impacts of the COVID-19 crisis on glycemic control [1–5]. In the meta-analysis of Silverii et al. (n = 9591, in 2021), no significant variation in HbA1c was detected [1]. However, two meta-analyses showed a significant deterioration in glycemic control with a mean increase in HbA1c of 0.34 % (95% CI: 0.30-0.38) in the study of Ojo et al. [2] (pre-COVID, n = 8478; post-COVID lockdown, n = 8417, in 2022) and 0.14 % (95% CI: 0.13–0.40) in the study of Eberle et al. [3] (n = 1823, in 2021).

The decrease in LDL cholesterol in the present study can be explained by the increased prescription of statins at higher doses. The improvement of glomerular filtration rate can also be secondary to statin intake.

Article information

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards and with the 1964 Helsinki declaration. Approval was granted by the Ethics Committee of La Rabta University Hospital.

Data availability

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Author contribution

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Melika Chihaoui, Chayma Bel Haj Ali and Anis Grassa. The first draft of the manuscript was written by Melika Chihaoui and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

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