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Impact effects of COVID-19 pandemic on chronic disease patients: A longitudinal prospective study

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Abstract

Aims: To assess the effects of COVID-19 pandemic on clinical variables as part of the routine clinical monitoring of patients with chronic diseases in primary care.

Design: A prospective longitudinal study was conducted in primary care centres of the Andalusian Health Service.

Methods: Data were recorded before the pandemic (T1), during the declaration of the state of emergency (T2) and in the transition phase (T3). The Barthel index and the Short Portable Mental Status Questionnaire (SPMSQ) were used to analyse functional and cognitive changes at the three time points. HbA1c, systolic and diastolic blood pressure, heart rate, BMI and lipid levels were assessed as clinical variables. Descriptive statistics and non-parametric chi-square test were used for analysis. STROBE checklist was used for the preparation of this paper.

Results: A total fo148 patients with chronic conditions were included in the analysis. Data analysis revealed in T2 only significant reductions in BMI, total levels of cholesterol and HDL during the onset of the pandemic. Barthel Index, SPMSQ, blood pressure and triglycerides and LDL levels worsened in T2, and the negative effects were maintained in T3. Compared to pre-pandemic values, HbA1c levels improved in T3, but HDL levels worsened.

Conclusions: COVID-19 has drastically disrupted several functional, cognitive and biological variables. These results may be useful in identifying clinical parameters that deserve closer attention in the case of a new health crisis. Further studies are needed to assess the potential impacts of each specific chronic condition.

Impact: Cognitive and functional status, blood pressure and triglycerides and LDL levels worsen in short term, maintaining the negative effects in medium-term.

KEYWORDS
chronic disease, COVID-19, lockdown, nurse, nursing, pandemic, primary health care

1 | INTRODUCTION

In early 2020, the infection caused by coronavirus disease 2019 (COVID-19) began a global pandemic that affected millions of lives and became one of the greatest global health challenges of this century (Mahase, 2020). To contain the spread of the disease, movement restrictions were implemented, and therefore millions of people were confined to stay indoors (Ahmed et al., 2020).

The first infection cases in Europe were confirmed in January 2020 (Stoecklin et al., 2020). In March 2020, the Spanish government ordered nationwide confinement to reduce the contagion rate and to avoid the collapse of the national health system. The population was not allowed to leave their homes unless urgently needed, closing all those services considered non-essential (Henríquez et al., 2020).

WHO reported that the COVID-19 pandemic had severely disrupted prevention and treatment services for non-communicable diseases (World Health Organization, 2020). The reasons were cancellations of planned treatments, closure of population-based screening programmes, decreased availability of public transportation and staffing shortages due to the reassignment of healthcare workers to support COVID-19 services (Sisó-Almirall et al., 2022). For this reason and to minimise the risk of exposure to COVID-19, the use of telemedicine was encouraged as an alternative (Majeed et al., 2020).

Despite these measures, people who use continuity of primary care were affected (Beran et al., 2020; Deml et al., 2022). The prioritisation of care for patients with COVID-19 produced a detriment to scheduling in-person visits for chronic illnesses (Sisó-Almirall et al., 2022). Face-to-face consultations were reduced by up to 64.6% and home visits by up to 62.6% (Joy et al., 2020).

In the primary care setting, the diagnosis of chronic diseases was reduced by 12.8% (Van den Bulck et al., 2022), with the reduction in the diagnosis of patients with type 2 diabetes mellitus (T2DM) being up to 49% (Williams et al., 2020). A recent study showed a 70% reduction in control of HbA1c levels during the during the early months of the pandemic (Sharma et al., 2021). Other data even indicate global prescription rates of new diabetes and antihypertensive medications reduced by between 19% and 22% as a result of the COVID-19 pandemic (Carr et al., 2022).

Several articles have analysed the consequences of social isolation measures, and most of them have focused on the impact on mental health (García-Lara et al., 2022; Meng et al., 2020). Other studies have focused on the effect of the pandemic on the control of patients with diabetes mellitus, finding inconsistent results (Abed Alah et al., 2021; Carr et al., 2022; Kaddar et al., 2022; Kofoed & Timm, 2022; O'Mahoney et al., 2022). In Spain, some studies carried out only in diabetic patients found no significant changes during the lockdown and post-lockdown (Oliver et al., 2023; Palanca et al., 2022). However, to date, there are few studies that have evaluated the follow-up over time of clinical parameters in chronic patients (Dehghani Tafti et al., 2023; Fikree et al., 2023), and none have jointly analysed the most common chronic diseases as well as the short- and medium-term effects.

What does this paper contribute to the wider global community?

- Cognitive and functional status, blood pressure and triglycerides and LDL levels worsen in short term, maintaining the negative effects in medium-term.
- In diabetic patients despite worsened the percentage of HbA1c during the onset of the COVID-19 pandemic, the levels improved in the transition phase.
- BMI improved in short term and even more in medium term. Whereas for total cholesterol despite improving, it worsened again after the end restrictions.

The COVID-19 pandemic has had a significant impact worldwide, especially on elderly patients with chronic diseases, who have been identified as one of the groups at higher risk of severe and fatal complications (Riddle et al., 2020; Saqib et al., 2020). However, the extent to which disruptions in primary care services have affected the follow-up of patients with chronic pathology has not yet been established. It is crucial to understand how this population experienced the pandemic in terms of physical, mental and social health (Cullen et al., 2020; Wańkowicz et al., 2021). Therefore, this study aimed to conduct a prospective longitudinal analysis in an elderly population with chronic disease during the COVID-19 pandemic. Clinical data were collected, and a follow-up was conducted over time to assess the effects and consequences of the pandemic on this vulnerable group.

2 | MATERIALS AND METHODS

2.1 | Study design and setting

This prospective longitudinal study was conducted in the primary care centres of the Andalusian Health Service. We used the primary care electronic medical record obtained from the DIRAYA database.

Adult patients with chronic diseases under regular management by primary care professionals were included in the study. Data were collected at three time points: before, during and in the transition phase of the COVID-19 pandemic. The study participants were assessed at the three times, and sociodemographic and clinical data variables were recorded. The data collected was anonymous and confidential. Informed consent for participation was obtained face-to-face or during a routine follow-up visit.

The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for longitudinal studies were applied in this study (Table S1).

2.2 | Participants

The sample was composed of adult patients with chronic diseases under regular management at primary care centres.

The inclusion criteria were: (a) patients over 65 years of age; (b) previous diagnosis of diabetes mellitus, hypertension, obesity, dyslipidemia/hyperlipidemia; (c) routine monitoring before, during and after the end of the state of alarm in the same health centre and (f) no psychiatric or cognitive conditions that would impede ability to participate.

The exclusion criteria were: (a) patients who recently changed or modified medication treatment in the last 12 months before the lockdown period; (b) patients who received treatment for other diseases that could influence the control of chronic pathology in the last 12 months before the lockdown period and (c) patients who had been hospitalised for severe COVID-19 infection.

2.3 | Outcomes measures

For each patient, data were recorded in 3 periods: time 1 (T1), 12 months before the lockdown in Spain [from February 2019 to February 2020]; time 2 (T2), during lockdown and along the six consecutive epidemiological waves of COVID-19 [March 2020–December 2021], time 3 (T3), at the end of emergency phase and beginning of the transition scenario [January 2022–December 2022].

Data collection was collected from DIRAYA as support for electronic medical records. The following variables were included in the analysis:

- Sociodemographic variables: age (years), gender (male/female), marital status (married, single or widowed).
- Functional and cognitive variables:
- Barthel Index was used to assess the basic activities of daily living. It ranges from 0 (totally dependent) to 100 (completely independent). A score of <60 points was used to establish severe and total dependency (Sainsbury et al., 2005). We used the validated version in Spanish (Baztán et al., 1993).
- Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer, 1975) was used to evaluate the organic brain impairment in the elderly with a validated cut-off of 3 or more errors (Martínez De La Iglesia et al., 2001).
- Clinical data variables: good glycaemic control was identified if HbA1c values <7% (American Diabetes Association Professional Practice Committee, 2022). For cardiac variables, the European Society of Cardiology/European Society of Hypertension guidelines define hypertension as systolic blood pressure (SBP) 140 mmHg and/or diastolic blood pressure (DBP) 90 mmHg (Laurent et al., 2018). Heart rate was normal between 60 and 100 beats per minute (bpm) (Kusumoto et al., 2019). The Body Mass Index was scored in accordance with WHO standards (World Health Organization, 2010). For lipid levels, hypertriglyceridemia was defined as follows: 150 to 199 mg/dL borderline high; 200 to 499 mg/dL, high; and ≥ 500 mg/dL, very high (Miller et al., 2011); for cholesterol, optimal total levels were about 150 mg/dL (Grundy et al., 2019); the optimal total LDL (low-density lipoprotein cholesterol) level was <100 mg/dL (Grundy et al., 2019) and ≥ 50 mg/dL for HDL (high-density lipoprotein) (Toth, 2005).

The collected data were carefully managed and organised to ensure accuracy and consistency. Data cleaning and validation procedures were applied to identify and rectify any errors or inconsistencies in the dataset.

2.4 | Ethical considerations

This research was initiated following the reception approval from the Ethics Committee of Andalusia (reference number TES-COVID-RGL) and adhered to the ethical principles outlined in the Declaration of Helsinki. All patients were informed about the study and provided written consent. Participation in the research was voluntary, individual, anonymous and without financial reward.

2.5 | Data analysis

Descriptive statistics were used to summarise the baseline characteristics of the study population, including mean, standard deviation and percentages, where applicable. The significance level was set at $p < .05$ for all statistical tests.

The significant evolution of clinical variable changes in the three times was analysed to be extrapolated at a population level. A non-parametric chi-square test of independence for categorical data was performed. The null hypothesis referred to independence and was rejected if the p-value was less than .05. For each test, the categorical data considered were the clinical variables at two different time points of the study. All statistical analyses were performed using the software R-Statistical Computing 4.1.3.

3 | RESULTS

The study included 148 patients (females, 66.2%) with a mean age of 81.6 (9.65) years. The descriptive analysis of the sociodemographic variables considered is shown in Table 1.

Functional status and cognitive variables before the lockdown (T1), during the lockdown and in the different COVID-19 waves (T2), and during the transition phase (T3) were summarised in Table 2. Table 2 showed an increase in dependence according to the Barthel scale during T2, maintained in T3. In the same way, according to the SPMSQ scale, there was an increase in the number of patients who worsened their cognitive assessment (see Table S1).

The differences in proportions of each level of clinical variables can be observed across all time points considered in relation to the pandemic in Table 3. Table 3 showed that the percentage of patients with controlled diabetes remained maintained throughout the study, although there was an increase in uncontrolled patients during T2, returning to the initial percentage in T3. The number of patients with high systolic and diastolic blood pressure increased during T2, and T3 levels got even worse. For heart rate, despite being influenced by external factors at the time of measurement, it appeared to show that there were no significant changes in the percentages. Regarding the BMI, there was an increase in the number of patients with normal weight throughout the study, and this percentage improved even more in T3. On the other hand, it was interesting to observe how the proportion of patients who improved their levels of total cholesterol increased during T2, only to return to the initial uncontrolled percentages during T3. Levels of triglycerides worsened in T2 and T3, especially worsening high levels. The same fact was observed with LDL levels. However, this was not the case for HDL; in T2, the proportion of patients with optimal levels improved although at T3, levels worsened compared to data before the start of the pandemic. The comparative analysis is also shown in Figures S1–S5.

Table 4 shows the results of the Chi-square test of independence for all the comparisons. There were significant differences ($p < .001$) in the study sample between all the clinical variables at the two time points compared (T1 vs. T2, T1 vs. T3 and T2 vs. T3). The OR of each comparison was estimated (punctually and by 95%CI) in order to be interpreted in terms of the strength for having worsening values of the clinical variables at a time point according to the values of this variable at a previous time point. For example, the OR for a patient with worsening systolic blood pressure at T2 was OR = 9.23 with respect to low levels at T1. A similar reading can be made for the rest of the odds ratio obtained in each comparison.

TABLE 1 Patients demographics.

N = 148	(%) *n*
Gender	
Male	33.8 (50)
Female	66.2 (98)
Marital Status	
Married	56.1 (83)
Single	18.2 (27)
Widow/Widower	25.7 (38)
Age Mean (SD)	81.6 (9.65)

4 | DISCUSSION

This study aimed to conduct a prospective longitudinal analysis of an elderly population with chronic disease during the COVID-19 pandemic. According to the results, the decline in functional and cognitive status during lockdown and in the different waves of COVID-19 was significant, and the negative impact was maintained during the transition phase. Other studies found similar data (Kizir et al., 2023; Ruzafa-Martinez et al., 2023); however, other results found no significant impact on the psychological status of diabetic patients during the lockdown (Alshareef et al., 2020). Given the scarcity of studies in terms of physical and mental health, the significance of the results is still limited.

On the other hand, among the different clinical variables analysed in this study, in diabetic patients, we found a percentage of HbA1c worsened in T2, coinciding with COVID-19 restrictions. However, with the relaxed COVID-19 measures, the percentage of uncontrolled patients improved, and it was close to pre-pandemic levels. This fact may be due to the relationship between the number of HbA1c medical controls and their levels (Khan et al., 2011), and in this sense, the restrictions imposed led to a lack of continuity care. Several studies found a decline in glycaemic control where up to 48.88% had poorly controlled diabetes (Biamonte et al., 2021; Robinson et al., 2020; Varma et al., 2021). However, not all studies have shown a worsening of glycaemic control in relation to the COVID-19 lockdown; for example, studies carried out in Spain (Enguix et al., 2022; Oliver et al., 2023; Palanca et al., 2022) and other different European countries did not find a significant impairment (Bonora et al., 2020; Carr et al., 2021; Kofoed & Timm, 2022; Kowall et al., 2021; Ludwig et al., 2021). This fact could be explained by the increase in insulin prescription rates (Carr et al., 2022). Furthermore,

TABLE 2 Descriptive analysis of cognitive and functional variables for T1, T2 and T3.

Variable (*N* = *148*)	Levels	% (*n*)		
		T1	T2	T3
Barthel Index	<60 Severe/Total	8.8 (13)	16.9 (25)	25.0 (37)
	61–90 Moderate	21.6 (32)	23.0 (34)	22.3 (33)
	91–99 Slight	18.2 (27)	32.4 (48)	25.0 (37)
	100 Independence	51.4 (76)	27.7 (41)	27.7 (41)
SPMSQ	0–2 Normal	84.5 (125)	70.3 (104)	53.4 (79)
	3–4 Slight	10.1 (15)	24.3 (36)	27.0 (40)
	5–7 Moderate	.0 (0)	.0 (0)	14.2 (21)
	8–10 Severe	5.4 (8)	5.4 (8)	5.4 (8)

Abbreviations: SPMSQ, Short Portable Mental Status Questionnaire; T1, 12 months before the lockdown in Spain [from February 2019 to February 2020]; T2, during lockdown and along the six consecutive epidemiological waves of COVID-19 [March 2020–December 2021]; T3, at the end of emergency phase and beginning of transition scenario [January 2022–December 2022].

TABLE 3 Descriptive analysis of the clinical variables.

Variable (*N* = 148)	Levels	T1	T2	T3
HbA1c (%)		**% (*n*)**		
	<7%	67.6 (100)	59.5 (88)	64.2 (95)
	≥7%	32.4 (48)	40.5 (60)	35.8 (53)
		Mean (SD)		
		6.2 (1.54)	6.2 (1.60)	6.2 (1.64)
SBP (mmHg)		**% (*n*)**		
	<140	73.0 (108)	64.2 (95)	54.7 (81)
	≥140	27.0 (40)	35.8 (53)	45.3 (67)
		Mean (SD)		
		123.7 (17.42)	127.3 (15.51)	128.8 (18.33)
DBP (mmHg)		**% (*n*)**		
	<90	82.4 (122)	67.6 (100)	58.8 (87)
	≥90	17.6 (26)	32.4 (48)	41.2 (61)
		Mean (SD)		
		77.7 (10.41)	79.5 (11.83)	77.7 (10.41)
HR (bpm)		**% (*n*)**		
	<60	8.8 (13)	8.8 (13)	8.8 (13)
	60–100	87.2 (129)	91.2 (135)	87.2 (129)
	>100	4.0 (6)	.0 (0)	4.0 (6)
		Mean (SD)		
		75.0 (11.35)	75.4 (10.55)	75.5 (11.09)
BMI (kg/m^2)		**% (*n*)**		
	<18.5	.7 (1)	.7 (1)	.7 (1)
	18.5–24.9	43.2 (64)	50.0 (74)	54.0 (80)
	25–29.9	40.5 (60)	33.8 (50)	26.4 (39)
	30–34.9	14.9 (22)	14.2 (21)	16.9 (25)
	35–39.9	.7 (1)	1.3 (2)	2.0 (3)
	≥40	.0 (0)	.0 (0)	.0 (0)
		Mean (SD)		
		25.8 (3.44)	25.8 (3.51)	25.7 (3.56)
Total cholesterol (mg/dl)		**% (*n*)**		
	<150	70.9 (105)	83.8 (124)	73.0 (108)
	≥150	29.1 (43)	16.2 (24)	27.0 (40)
		Mean (SD)		
		143.3 (24.86)	140.2 (25.02)	147.0 (27.76)
Triglycerides (mg/dl)		**% (*n*)**		
	<150	79.7 (118)	76.4 (113)	61.5 (91)
	150–199	18.2 (27)	8.1 (12)	27.7 (41)
	200–499	2.0 (3)	15.5 (23)	10.8 (16)
	≥500	.0 (0)	.0 (0)	.0 (0)
		Mean (SD)		
		144.2 (23.16)	148.7 (28.68)	152.6 (26.96)

(Continues)

TABLE 3 (Continued)

Variable (*N* = *148*)	Levels	T1	T2	T3
LDL (mg/dl)		**% (*n*)**		
	<100	73.0 (108)	49.3 (73)	53.4 (79)
	≥100	27.0 (40)	50.7 (75)	46.6 (69)
		Mean (SD)		
		100.6 (25.08)	108.5 (29.26)	112.2 (33.07)
HDL (mg/dl)		**% (*n*)**		
	<50	59.5 (88)	45.3 (67)	67.6 (100)
	≥50	40.5 (60)	54.7 (81)	32.4 (48)
		Mean (SD)		
		47.9 (10.92)	48.4 (11.46)	46.5 (11.07)

Abbreviations: DBP, diastolic blood pressure; HDL, high-density lipoprotein; HR, heart rate; IMC, body mass index; LDL, low-density lipoprotein cholesterol; SBP, systolic blood pressure; SD, standard deviation; T1, 12 months before the lockdown in Spain [from February 2019 to February 2020]; T2, during lockdown and along the six consecutive epidemiological waves of COVID-19 [March 2020–December 2021]; T3, at the end of emergency phase and beginning of transition scenario [January 2022–December 2022].

TABLE 4 Chi-square test of independence: statistic, p-value and odds ratio.

Comparison	Chi^2-Stastistic (df = 1)	*p*-Value	Odds ratio (OR)
SBP-T1 versus SBP-T2	32.08	<.001	9.23 (95%CI: 3.91–20.02)
SBP-T1 versus SBP-T3	19.54	<.01	5.76 (95%CI: 2.48–12.39)
SBP-T2 versus SBP-T3	74.17	<.001	52.40 (95%CI: 15.49–137.08)
DBP-T1 versus DBP-T2	28.47	<.001	11.19 (95%CI: 3.94–27.77)
DBP-T1 versus DBP-T3	44.96	<.001	130.63 (95%CI: 7.75–2202.36)
DBP-T2 versus DBP-T3	51.99	<.001	18.81 (95%CI: 7.31–42.46)
Total cholesterol-T1 versus Total cholesterol-T2	54.46	<.001	53.95 (95%CI: 10.83–173.38)
Total cholesterol-T1 vs Total cholesterol-T3	83.21	<.001	62.33 (95%CI: 19.06–162.10)
Total cholesterol-T2 versus Total cholesterol-T3	68.73	<.001	144.76 (95%CI: 17.13–540.77)
HDL-T1 versus HDL-T2	77.42	<.001	177.00 (95%CI: 21.65–64.98)
HDL-T1 versus HDL-T3	43.95	<.001	13.47 (95%CI: 5.59–29.27)
HDL-T2 versus HDL-T3	48.43	<.001	42.71 (95%CI: 9.02–130.60)
LDL-T1 versus LDL-T2	53.33	<.001	167.70 (95%CI: 10.02–2806.49)
LDL-T1 versus LDL-T3	62.74	<.001	218.29 (95%CI: 13.00–3664.73)
LDL-T2 versus LDL-T3	97.96	<.001	112.13 (95%CI: 30.36–305.72)

Abbreviations: df, degree of freedom; T1, 12 months before the lockdown in Spain [from February 2019 to February 2020]; T2 during lockdown and along the six consecutive epidemiological waves of COVID-19 [March 2020–December 2021]; T3, at the end of emergency phase and beginning of transition scenario [January 2022–December 2022].

a recent meta-analysis showed that glycaemic control tended to improve or remain unchanged during and following the lockdown compared with before lockdown (O'Mahoney et al., 2022). In our study, despite not finding significant differences in terms of mean ± SD in the three periods studied, we observed a significant improvement in T3, as corroborated by other studies (Kaddar et al., 2022).

In relation to blood pressure, the results showed poor control in SBP and DBP during T2, with T3 data being even worse. Prior studies also found uncontrolled or severely uncontrolled hypertension levels that rose relative to the pre-pandemic period (Shahn et al., 2022). This could be caused by less frequent follow-up and restricted face-to-face meetings clinical contacts (Carr et al., 2022; Coma et al., 2020). Also, some authors indicate up to a 22% reduction in the prescription of new antihypertensive medications in 2020 (Carr et al., 2022). Other potential explanations are related to sedentary behaviour, stress and distress, changes in daily life routine, or increased alcohol intake (Chambonniere et al., 2021; Yue et al., 2023).

The weight changes during the pandemic were positive. In T2, the number of overweight patients was reduced, and in T3, the data was even better. Other studies showed similar results, without finding an increase in weight in DM2 patients after restrictions (Kowall et al., 2021), although for others there were no significant weight changes over periods (Zach et al., 2021). This result may be due to the fact that having more free time led to the introduction of exercise routines and improvements in diet (Fernandez-Rio et al., 2020).

In relation to blood lipid levels, the percentage of high cholesterol levels was reduced during lockdown and successive waves; however, a worsening was observed in the transition of the pandemic, reaching levels similar to those before the pandemic. Different studies indicate, as ours results, a substantially lower total cholesterol during the first lockdowns months, and this fact may be related with an overall decline of 39.2% in tests for total cholesterol performed (Gumuser et al., 2021). However, in T2 for triglyceride levels, the percentage of patients with high levels increased, which, despite being reduced in T3, remained higher compared to pre-pandemic levels. Nevertheless, other authors indicated a decrease in triglyceride levels related to decreased metabolic capacity in frail subjects (Tel et al., 2022), although other found no statistically different changes for triglycerides (Falcetta et al., 2021), thus the results remain controversial.

The same upward trend was observed with LDL levels, showing a possible relationship with a decrease in the number of routine controls (Coma et al., 2020). On the other hand, HDL levels improved in T2, but the positive effects were not maintained over time, since in T3 we found a return to even worse numbers than at the beginning of the pandemic. Although other studies found LDL- and HDL-cholesterol lower after lockdown compared to prior to the pandemic (Falcetta et al., 2021).

This study showed a decline in the health condition in chronic patients due to the different measures implemented to avoid contagion by COVID-19, such as confinement and restrictions (Dehghani Tafti et al., 2023). In addition, there was saturation in access to medical care, delays in treatment, low patient compliance with medications, as well as reduced physical activity and unhealthy lifestyle habits (Karatas et al., 2021). In Spain, some studies indicated that prioritising COVID-19 care produced a detriment of up to 41% in visits for chronic disease detection and follow-up (Sisó-Almirall et al., 2022), worsening healthcare quality indicators in the management of patients with chronic diseases by up to 85% (Coma et al., 2020).

The decline in face-to-face visits controls and monitoring visits had a negative effect on chronic patients (Zhu et al., 2022). Although the implementation of telemedicine services could have had positive effects (Aliberti et al., 2022), the results were not encouraging (Aubert et al., 2022). A recent meta-analysis that analysed remote monitoring in chronic patients found slight reductions in HbA1c and SBP; however, the results were negative in variables such as weight (Muller et al., 2022).

4.1 | Limitations

Some limitations must be considered. First, the sample was relatively small, although our longitudinal study is the largest of chronic patients so far reported. Second, data collection could not provide information about patients who do not have routine control visits or who are not attached to a primary care provider. Furthermore, demographic and socioeconomic factors that could influence medical management were not analysed in this study. Finally, some variables, such as heart rate or blood pressure, could be influenced by external factors at the time of measurement, and some variables can also suffer from natural deterioration due to the duration of the study (3 years).

4.2 | Implication for practice and research

The pandemic has led to a serious decline in continuity of care for patients with chronic conditions, and to date, few studies have assessed the functional, cognitive or clinical impact of COVID-19 on this population. If these damages remain over time, the negative effects could be irreparable.

This study highlights the impact on medical care routine of chronic patients during the COVID-19 pandemic. The data collected provides information about the follow-up in different phases of the pandemic. The results may be useful in identifying clinical parameters that deserve closer attention in the case of a new health crisis and in ensuring more efficient and effective care in the future.

To return to pre-pandemic levels of detection and control of chronic diseases, specific actions need to be carried out for the highest-risk groups, including a reorganisation of primary care, a significant increase in primary care doctors and nurses, a higher number of face-to-face visits, training patients in greater self-care skills or the development of more effective tele-health systems (Mughal et al., 2021; Sisó-Almirall et al., 2022; Zhu et al., 2022).

The variability in the different parameters analysed in this study reflects the importance of conducting more research with a larger sample size that involves measurements and monitoring of physiological, chemical and anthropometric parameters to draw a conclusion about the real impact of the pandemic and current panorama on chronic patients.

5 | CONCLUSION

The COVID-19 pandemic has drastically disrupted the primary care system. Functional, cognitive and biological variables such as HbA1c, blood pressure and levels of triglycerides and LDL significantly worsened as a consequence of the onset pandemic. These results may be useful in identifying clinical parameters that deserve closer attention in the case of a new health crisis. Further studies are needed to assess the potential impacts of each specific chronic condition.

AUTHOR CONTRIBUTIONS

RAGL, JLRB, JLGU and NSM made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; SSM, GDV and VGM involved in drafting the manuscript or revising it critically for important intellectual content; RAGL, JLRB, JLGU, NSM, SSM, GDV and VGM given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; RAGL, JLRB, JLGU, NSM, SSM, GDV and VGM agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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CONFLICT OF INTEREST STATEMENT

None.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

PATIENT CONTRIBUTION

No patient or public contribution.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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