Archivos de Cardiología de México

PERMANYER

Check for updates

RESEARCH ARTICLE

Impact of COVID-19 pandemic on cardiometabolic patients without SARS CoV-2 infection in Latin America

Impacto de la pandemia COVID-19 en pacientes cardiometabólicos sin infección por SARS CoV-2 en Latinamerica

Jorge Camilletti[1], Nicolas F. Renna[2,3], Ricardo López-Santi[1], Juan Erriest[1], Eliomar García-Bello[4], John Araujo[5], Paola Varleta-Olivares[6], Eduardo Gómez-Díaz[7], Gisselle Ramírez[8], Ana Berni-Betancourt[9], Gustavo Escalada-Lesme[10], Lourdes V. Campos-Alcántara[11], Leonardo Moya-Loor[12], Claudio Rey-Benavente[13], Claudia Almonte[8], Maicol Cortez-Sandoval[14], María Alvarado-Cuadros[15], Monica I. Rosario[4], Shyla Gupta[16], Martin Ibarrola[17] and Adrián Baranchuk[16], on behalf of the CorCOVID Latam Investigators

[1]Division of Cardiology, Hospital Italiano de La Plata, Buenos Aires; [2]Department of Cardiology, Hospital Español de Mendoza, Mendoza; [3]Laboratoy of Cardiovascular Physiopathology, IMBECU-CONICET, Mendoza. Argentina; [4]Cardiovascular Center, Centro de Diagnóstico Medicina Avanzada y Telemedicina, Santo Domingo, Dominican Republic; [5]Department of Cardiology, Centro Cardiovascular Somer Incare, Rionegro, Colombia; [6]Department of Cardiology, Hospital Dipreca, Santiago, Chile; [7]Department of Cardiology, Hospital Metropolitano del Norte, Valencia Carabobo, Venezuela; [8]Department of Cardiology, Medicina Cardiovascular Asociada, Santo Domingo, Dominican Republic; [9]Deparment of Cardiology, Hospital Central Sur de Alta Especialidad, PEMEX, Mexico City, Mexico; [10]Department of Cardiology, Centro Médico Nacional-Hospital Nacional Itaguá, Paraguay; [11]Department of Cardiology, Consultorio de Lourdes Victoria Campos Alcántara, Lima, Perú; [12]Department of Cardiology, Hospital Santa Margarita, Porto Viejo, Ecuador; [13]Department of Cardiology, Hospital Arroyabe Pichanal, Salta, Argentina; [14]Department of Cardiology, Hospital Nacional Edgardo Rebagliti Martins, Lima, Peru; [15]Department of Cardiology, Institution, Guayaquil, Ecuador; [16]Department of Medicine, Queen's University, Kingston, Ontario, Canada; [17]Cardiovascular Center BV, Buenos Aires, Argentina

Abstract

A cross-sectional survey including 38 questions about demography, clinical condition, changes in health habits, and medical treatments for cardiometabolic patients in outpatient follow-up was conducted. From June 15 to July 15, 2020, a total of 13 Latin-American countries participated in enrolling patients. These countries were divided into 3 geographic regions: Region 1 including North, Central, and Caribbean Regions (NCCR), Region 2 including the Andean Region (AR), and Region 3 including the Southern Cone Region (SCR). 4.216 patients were analyzed, resulting in a coefficient of 33.82%, 32.23%, and 33.94% for NCCR, AR, and SCR, respectively. Significant differences were found between the AR, SCR, and NCCR regions. The analysis of habitual medication usage showed that discontinued use of medication was more present in AR, reaching almost 30% ($p < 0.001$). The main finding of this study was the negative impact that restrictive measures have on adherence to medications and physical activity: Rs = 0.84 ($p = 0.0003$) and Rs = 0.61 ($p = 0.0032$), respectively. AR was the most vulnerable region. Restrictive quarantine measures imposed by the different countries showed a positive correlation with medication discontinuation and a negative correlation with physical activity levels in patients analyzed. These findings characterize the impact of the consequences left by this pandemic. Undoubtedly, restrictive measures have been and will continue to have reverberating negative effects in most Latin-American countries.

Keywords: *COVID-19. Pandemic. Lockdown. Cardiometabolic patients. Latin America.*

Correspondence:
*Ricardo Lopez Santi
E-mail: lopezsan@live.com.ar

Date of reception: 31-05-2021
Date of acceptance: 29-11-2021
DOI: 10.24875/ACM.21000181

Available online:
Arch Cardiol Mex (Eng). 2022;92(2):1-9
www.archivoscardiologia.com

Resumen

Se realizó una encuesta transversal que incluyó 38 preguntas sobre demografía, estado clínico, cambio de hábitos de salud, tratamientos médicos a pacientes cardiometabólicos en seguimiento ambulatorio. Un total de 13 países latinoamericanos inscribieron pacientes del 15 de junio al 15 de julio de 2020. Los países se dividieron en 3 regiones geográficas Región 1 (NCCR) Región Norte, Centro y Caribe; Región2 (AR) Región Andina; Región 3 (SCR) Región Cono Sur. Las medidas de aislamiento se estimaron a partir de informes nacionales y se correlacionaron utilizando el coeficiente R de Spearman. Se analizaron 4.216 pacientes, NCCR (33.82%); AR (32.23%) SCR (33.94%). Se encontraron diferencias significativas entre regiones. Este análisis de la medicación habitual mostró que la discontinuación de la medicación fue mayor en RA, llegando a casi el 30% (p < 0.001). El principal hallazgo de este estudio fue el impacto negativo que tienen las medidas restrictivas sobre la adherencia a la medicación y la actividad física, Rs = 0.84 (p = 0.0003) y Rs = 0.61 (p = 0.0032), respectivamente. Se encontraron diferencias significativas entre regiones. AR es la región más vulnerable. Las medidas restrictivas impuestas por los diferentes países (cuarentena) mostraron una correlación positiva con la interrupción de la medicación y una correlación negativa con la cantidad de actividad física. El impacto de las consecuencias que deja esta pandemia será muy profundo en la mayoría de los países latinoamericanos.

Palabras clave: *COVID-19. Pandemia. Aislamiento. Pacientes cardiometabólicos. Latinoamérica.*

Background

One of the leading causes of death around the world is cardiovascular diseases (CVD). It is estimated that CVDs are responsible for approximately 1.8 million deaths annually in the Americas. According to recent data, 75% of these deaths in the region are attributable to chronic diseases, a percentage that represents an increase of almost 20% with respect to 1990. The main cause of mortality and morbidity among older adults in Latin America (LA) are CVD, which represent 25% of the total burden of diseases among population aged 60 years. Furthermore, the prevalence of CVDs increases linearly with age[1].

In LA, a broad association of social, demographic, and political factors exists. This region is vulnerable to health inequities due to the socio-economic reality in which residents of the region find themselves in[2]. Currently, LA is facing an exponential increase in health inequities, due to consequences generated by the coronavirus disease (COVID-19) pandemic[3-5]. This scenario has transformed LA into a health region with immense vulnerability to pandemic and post-pandemic events. Thus, it is imperative to diagnose the situation in order to prepare us for the vast changes the pandemic has brought on us.

In recent months, governments and health science experts have promoted different strategies to alleviate the COVID-19 crisis, most of them being isolation or social distancing policies. However, the effectiveness of these measures is largely conditioned by underlying social structure. Thus, it is evident that there is a major gap in the consequences of the crisis between the highest and lowest income sectors of the region[6,7].

LA is facing a pressing challenge: maintaining an epidemiological strategy to promote social distancing without generating social and political crises. Furthermore, the economic damage from social distancing policies (accounting for the fact that a large percentage of the population depends on their daily work outside the home to survive) must be considered. The simultaneous balance of these components must be considered when developing a comprehensive solution, to ensure basic levels of well-being, and political stability are maintained[8,9].

The objective of our study was to analyze the impact of the different strategies used to control the pandemic on the health status of patients with cardiometabolic diseases, who did not have a COVID-19 infection, in the different regions of LA.

Methods

Study design

This study used a cross-sectional telephone survey. The rationale and design of CorCOVID LATAM have been published previously[10].

Setting

The Interamerican Society of Cardiology (IASC) opened the call for cardiologists of Spanish speaking Latin American countries to join as researchers on June 1st, 2020. 66 investigators from 13 countries (divided into three geographic regions) applied and were approved:

1. Region North, Central and Caribbean (North, Central, and Caribbean Regions [NCCR]): Costa Rica, Cuba, El Salvador, Guatemala, Mexico, Dominican Republic.
2. Andean Region (AR): Colombia, Ecuador, Perú, Venezuela.
3. Southern cone Region (SCR): Argentina, Chile, Paraguay.

To conduct a comparative study, this study uses commercial regionalization of LA. Regionalization in LA consists of the constitution of a series of groups or blocks of American countries. The regions implement a series of initiatives to strengthen their competitiveness and economies and provide better opportunities and alternatives to commercial actions. These regions have similar education and health policies. This study has used the existing regionalization to compare different facets of inquiry in the survey.

From June 15, 2020, and July 15, 2020, the survey platform was available for use for the investigator team. Reminders were emailed daily, to maximize response rates.

Participants

The study population included patients with cardiometabolic disease, who are being followed by cardiologists in Latin American countries. Eligible patients included those who did not have previous symptoms, signs, or clinical indications of COVID-19.

Inclusion criteria included patients over the age of 18 years with cardiovascular (hypertension, coronary, myocardial, valvular, or pericardial disease) or metabolic disease (metabolic syndrome, obesity, dyslipidemia, diabetes), being followed by cardiologists who voluntarily agree to participate in the study.

Exclusion criteria included patients without CVD, under the age of 18 years, and without a completed primary education.

Variables and measurements

A cross-sectional online survey consisting of 38 questions was developed using Google Forms (Google Inc, Mountain View, CA). The survey was divided into two sections. Questions in the first section examined patients' demographics profile, educational level, socio-economic aspects, history of CVD, and number of pills related to CVD per day (enalapril, rosuvastatin, aspirin, etc). The questions in the second section examined the patient's behavior (evaluated 30 days before answer survey questions), by analyzing physiological and pathological habits. Questions contained dichotomous, and open-ended response choices. Respondents were permitted to select multiple response choices depending on the question content.

The patient's behavior during the past 30 days of the survey was analyzed. These behaviors included levels of physical activity, diet changes, perception of body weight, habits of alcohol intake and tobacco consumption, access to medications, adherence to treatments, new activities, and interest in those that are habitual, quality of sleep, and perception of depression.

Discontinuation of medication was defined as when patients reported not taking their medication for the 30 days after the completion of the survey.

COVID-19 worldwide data

To assess the impact of COVID-19 in LA, the data published by the Coronavirus Resource Centre of Johns Hopkins University of Medicine[11] was consulted. Data on the number of deaths per 100 confirmed cases (observed fatality rate) or per 100,000 inhabitants (a general characterization of a country's population, with confirmed cases and healthy people) was used.

Impact of isolation or social isolation in LA

The measures adopted against the COVID-19 pandemic by governments in LA ranged from curfews and mandatory confinements to regions with no imposed restrictions.

To establish a quantifiable measure, the interactive map obtained from the BBC journalistic team[12] was consulted, according to the individual reports of each country. This system classified them as:

- More restrictive (5 points): there is a mandatory curfew or restrictions on the movement of people and other punitive measures such as fines or the possibility of imprisonment.
- Restrictive (4 points): there is a mandatory curfew or restrictions on the movement of people.
- Medium high (3 points): there are traffic restrictions and there is no curfew.
- Medium (2 points): governments recommend (not forced) restriction of population movement.
- No restrictions (1 point): there are no restrictive measures.

To carry out this analysis we grouped the countries individually and not by region, due to the type of statistical analysis used.

Statistical analysis

Data were collected in Google Forms. All statistical analysis was performed using Medcalc 13.1 (USA). Data were described using measures of central tendency such as mean and standard deviations for continuous variables, and frequencies and percentages for categorical variables. Independent sample t-tests were used to compare the normally distributed continuous variables. The Mann-Whitney U was used for non-normally distributed continuous variables and the Pearson chi-squared test (or the Fisher's Exact test as appropriate) for categorical variables. ANOVA and Bonferroni post-test were used when group variables were compared. A $p < 0.05$ was considered statistically significant. Spearman's Rho Correlations was calculated for non-parametric variables.

Ethics

All patients provided informed consent when answering survey questions either in person or through virtual platforms. Patients were informed about the objective of the survey and the anonymity of their responses. Ethics approval was obtained from the IASC Research Ethics Board.

In accordance with government measures to limit population mobilization in some countries, the survey was conducted by phone or video chat. Face-to-face visits were allowed in countries that permitted these interactions.

Results

Descriptive analysis

Of the total of 4.216 surveys obtained in Latin American countries (reference to the core study), 3 different geographical areas were separated. The distribution was as follows: NCCR: 1.426 (33.82%); AR: 1.359 (32.23%) and SCR: 1.431 (33.94%) surveys.

Population characteristics

Age and sex differences were showed in table 1. Regarding unemployment analysis, it was evident that AR presents with a higher unemployment rate, with statistical significance ($p < 000.1$). When analyzing variables that are associated with the poverty indices, which have a great impact on the affectation of SARS-CoV-2, the overcrowding index was analyzed. This measure did not show significant differences between the different zones (Table 1).

With regards to education levels, a lack of primary school completion was higher in AR, compared to the other zones with statistically significant differences. While the percentage of people who achieved a university degree was higher in NCCR compared to the rest of the zones, with significant differences (Table 1). Table 1 also shows cardiometabolic variables.

Medication and adherence

Another aspect of the study that was analyzed is access to prescribed medication. The surveys looked at the number of medications prescribed and whether the patient discontinued their medication usage for any reason. This analysis showed that discontinued usage of medication was greater in AR, reaching almost 30%. This finding was demonstrated to a lesser extent in NCCR and ultimately the least in SCR, showing a significant difference between zones ($p < 0.001$) (Fig. 1).

Effects of the pandemic

The presence of smoking as a dichotomous variable showed significant interregional differences. The prevalence of smoking was higher in AR, compared to SCR. NCCR had the lowest prevalence of the three. These differences are statistically significant ($p < 0.001$). When studying the intake of alcoholic beverages, a similar finding was observed. This variable is also dichotomous and showed the highest prevalence in SCR, then AR, and to a lesser extent in NCCR ($p < 0.001$) (Fig. 2).

Table 2 depicts variables affected by the COVID-19 pandemic. The analysis of physical activity during the last surveyed month showed the frequency of a sedentary lifestyle. As seen in figure 2, SCR showed a significant reduction in physical activity compared to the other zones. This area, therefore, is the one with the highest sedentary lifestyle. Regarding the diet consumed by the respondents, we can see that NCCR presents a lower rate of consumption of fruits and vegetables, by the number of daily snacks portions, with significant differences compared to AR and SCR (Fig. 2).

Impact of isolation measures due to the COVID-19 pandemic

The impact of restrictive isolation measures was analyzed, as they had an influence on some relevant indicators in these patients. It was observed that there was an increase in sedentary lifestyle in the most restrictive countries ($r = -0.60$; CI = −0.5 - −0.87; $p = 0.003$) (Fig. 3).

Table 1. Population characteristics studied in the are shown divided by regions

	NCCR	AR	SCR	p value
N	1.426	1.359	1.431	
Age	59.45 (DS = 15.17)	58.90 (DS 16.19)	62.63 (DS 14.56)	< 0.001
Men	50.35% (718) 95% CI = 47.72-52.97	45.84% (623) 95% CI = 43.16-48.53	50.87% (728) 95% CI = 48.24-53.49	0.015
Unemployment	3.58% (51) 95% CI = 2.67-4.67	6.99% (95) 95% CI = 5.69-8.47	3.35% (48) 95% CI = 2.56-4.57	< 0.001
Overcrowding	0.84% (12)	1.03% (14)	1.61% (23)	0.139
Education level, *if App==1* (n: 612) 0 None 1 Primary 2 Bachelor 3 High School 4 Universitary	 – 4.37% (11/252) 17.06% (43/252) 11.90% (30/252) 66.67% (168/252)	 0.90% (2/222) 0.90% (2/222) 44.59% (99/222) 9.91% (22/222) 43.69% (97/222)	 0.72% (1/138) 4.35% (6/138) 36.23% (50/138) 25.36% (35/138) 33.33% (46/138)	< 0.001
Prevalence of Cardiovascular Disease				
Stroke	3.37% (48)	3.90% (53)	4.68% (67)	0.195
Peripheral vascular disease	4.00% (57)	3.53% (48)	5.31% (76)	0.054
Coronary disease	20.62% (294) 95% CI = 18.54-22.81	16.26% (221) 95% CI = 14.33-18.33	17.75% (254) 95% CI = 15.80-19.83	0.010
Diabetes	23.28% (332)	20.60% (280)	20.06% (287)	0.080
Hypertension	71.04% (1013) 95% CI = 68.60-73.38	65.34% (888) 95% CI = 62.74-67.87	81.76% (1170) 79.66-83.72	< 0.001
Dyslipidemia	23.77% (339) 95% CI = 21.58-26.07	33.48% (455) 95% CI = 30.97-36.06	53.18% (761) 95% CI = 50.55-55.79	< 0.001
Heart Failure	8.13% (116) 95% CI = 6.76-9.67	14.35% (195) 95% CI = 12.52-16.32	8.74% (125) 95% CI = 9.43-11.30	< 0.001
Cardiomyopathy	5.12% (73) 95% CI = 4.03-6.39	3.16% (43) 95% CI = 2.29-4.23	3.91% (56) 95% CI = 3.50-4.72	0.031
Valvulopathy	11.92% (170) 95% CI = 10.28-13.71	7.95% (108) 95% CI = 6.56-9.51	4.75% (68) 95% CI = 3.70-5.98	< 0.001
Arrhythmias	14.73% (210) 95% CI = 12.92-16.67	18.03% (245) 95% CI = 16.01-20.17	18.10% (259) 95% CI = 16.13-20.19	0.024
Presence of cardiac devices	5.54% (79) 95% CI = 4.41-6.85	3.68% (50) 95% CI = 2.74-4.82	2.45% (35) 95% CI = 1.70-3.38	< 0.001
Established Cardiovascular Disease	28.40% (405)	24.87% (338)	27.81% (398)	0.082

On the other hand, access to medications was analyzed based on the evaluation of the degree of adherence during the last month in a pandemic. A high negative correlation was observed between the level of adherence and the degree of severity of the restrictions ($r = -0.868$; CI = −0.96 - −0.57; $p < 0.001$) (Fig. 3).

In the rest of the variables studied, there was no identified significant correlation with the restrictive measures.

Discussion

The main finding of study is the relationship between the degree of confinement in each country and variables such as decreased adherence to medication and lowered levels of physical activity in patients with cardiovascular risk. Overall, AR was the most vulnerable region with a lower income and education level, and higher medication discontinuation.

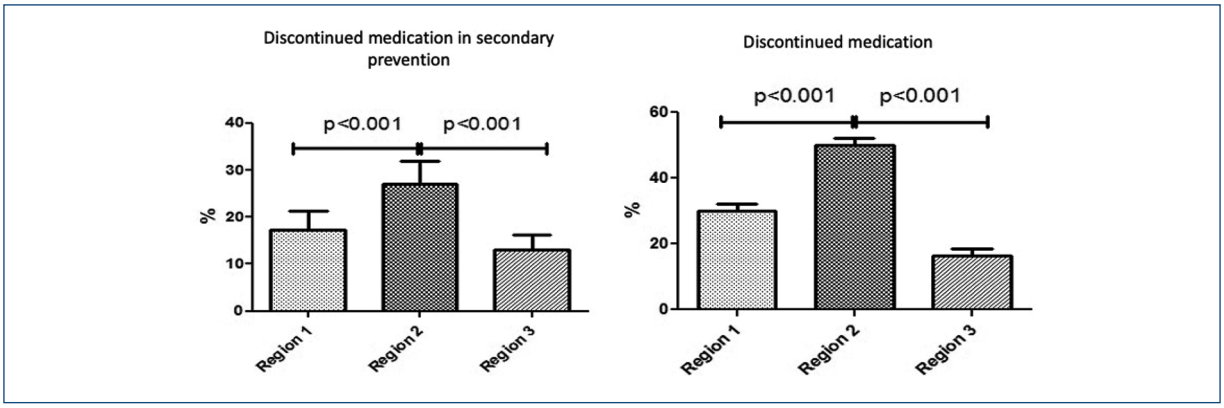

Figure 1. Medication and Adherence. Medication and Adherence analysis showed that discontinued of medication was greater in AR, reaching almost 30% (1 in 3 patients), to a lesser extent in NCCR and ultimately less in SCR, showing a significant difference between zones ($p < 0.001$).

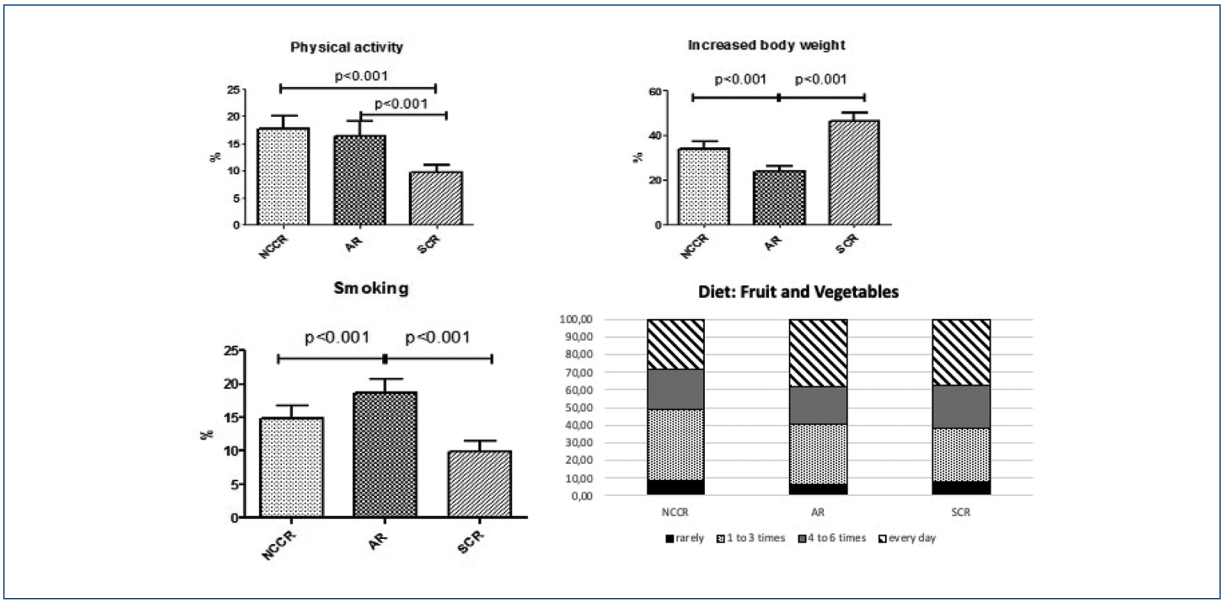

Figure 2. Pathological Habits. The presence of smoking variable showed significant interregional differences, its prevalence being is higher in AR, compared to SCR and NCCR ($p < 0.001$). The variables alcoholic beverage intake showing the highest prevalence in SCR, then in AR, and to a lesser extent in NCCR ($p < 0.001$).

The analysis of the population characteristics from the surveys showed a difference in the average age when comparing to similar epidemiological studies in the region. This older age may be due to higher life expectancy in the Southern Cone. Furthermore, the low percentages of unemployment and overcrowding may be associated with the specific characteristics of surveyed population. Many of the patients who participated in the study came from the private sector or had union medical coverage. This shows that at the time of the consultation, they were still employed through formal positions.

The higher presence of valvular heart disease and lower number of implanted devices is attributable to a lower income level in SCR and AR[13].

Regarding variables, in the past 30 days (during the pandemic), there was a lower consumption of fruits and vegetables. This finding coincides with several epidemiological reports from the surveyed countries. However, it is difficult to establish whether this was caused by the pandemic or is a persistent characteristic of this population. Some reports show that this index is not as low as in this study[14-16].

Table 2. Effects of the pandemic studied in the survey (food intake, body weight, influenza and pneumococcal vaccine) are shown divided by zones

	NCCR	AR	SCR	p value
N:	1.426	1.359	1.431	
Food Intake (Fruit and Vegetables) 0/Rarely 1/1-3 times/week 2/4-6 times/week 3/Everyday	 8.98% (128) 39.62% (565) 22.86% (326) 28.54% (407)	 6.40% (87) 34.22% (465) 21.04% (286) 38.34% (521)	 7.76% (111) 30.68% (439) 24.18% (346) 37.39% (535)	< 0.001
Body weight perception 0 Lost 1 Same 2 Increased	 20.27% (289) 45.37% (647) 34.36% (490)	 23.77% (323) 52.47% (713) 23.77% (323)	 12.86% (184) 40.67% (582) 46.47% (665)	< 0.001
Influenza vaccine	35.20% (502) 95% CI = 32.72-37.74	34.44% (468) 95% CI = 31.90-37.03	69.39% (993) 95% CI = 66.93-71.77	< 0.001
Pneumococcal vaccine	11.08% (158) 95% CI = 9.49-12.82	19.94% (271) 95% CI = 17.84-22.16	42.63% (610) 95% CI = 40.04-45.23	< 0.001
Discontinuation medication	13.53% (193) 95% CI = 11.80-15.42	28.70% (390) 95% CI = 26.30-31.18	9.57% (137) 95% CI = 8.09-11.21	< 0.001
Discontinuation medication if secundary prevention (n: 1141)	17.28% (70/405) 95% CI = 13.72-21.32	26.92% (91/338) 95% CI = 22.26-31.98	12.56% (50/398) 95% CI = 9.46-16.22	< 0.001
Tabacco	14.87% (212) 95% CI = 13.05-16.82	18.62% (253) 95% CI = 16.57-20.78	9.85% (141) 95% CI = 8.35-11.51	< 0.001
Alcohol consumption	41.44% (591) 95% CI = 38.87-44.05	36.35% (494) 95% CI = 33.78-38.97	49.76% (712) 95% CI = 47.13-52.37	0.000
Physical Activity	17.67% (252) 95% CI = 15.72-19.75	16.34% (222) 95% CI = 14.40-18.41	9.64% (138) 95% CI = 8.16-11.29	< 0.001

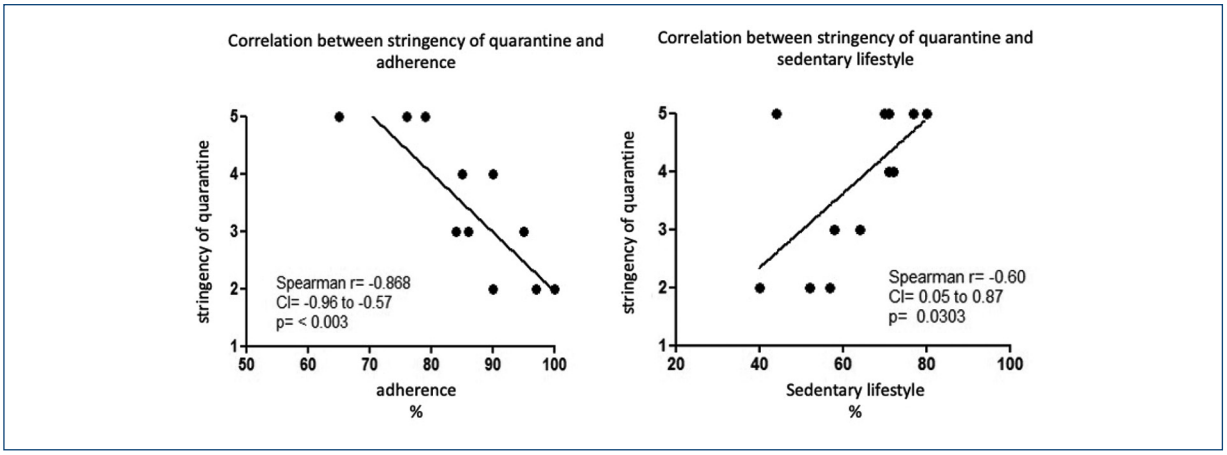

Figure 3. Impact of isolation measures due to the COVID-19 pandemic. It observed that there is an increase in sedentary lifestyle in the most restrictive countries (r = –0. 60; CI = –0.5 to -0.87; p = 0.003). Access to medications was analysed, a high negative correlation could be observed between the level of adherence and the degree of severity of the restrictions (r = –0.868; CI = –0.96 - –0.57; p <0.001).

The SCR region was most affected by a higher increase in consumption of alcoholic beverages and increases in the rates of a sedentary lifestyle.

One of the most important differences we found was weight gain, with clear differences between regions. There was an evidently higher rate of obesity in the

southern cone. National reports and the World Health Organization (WHO) show that both Argentina, Chile, and Paraguay have rates of excess weight that range between 50 and 65%[14-16].

Another finding is the high percentage of vaccinated citizens, especially in SCR. These results have been discussed extensively in a separate publication because a comprehensive detail of the findings is deserved. Some differences can be accounted by the fact that some of the centers that participated in the study, belonged to centers of reference in geographic areas with high population density[17].

It was observed that AR was the most affected by unemployment, smoking, medication adherence, and a lower educational level. Regarding adherence to medication, worrying results were depicted through the findings. Although it is known that adherence to medications globally is low, this problem does not only affect CVD. Data from the National Institute of Health regarding antihypertensive drugs report an adherence rate below 60%. Data from other studies in different countries of LA show adherence rates ranging between 50 and 70%. The data obtained from this survey shows a significant worsening of adherence, at least from the 1st months of the pandemic[18-22].

Isolation and social distancing imposed by governments were analyzed, coinciding with lower adherence rates and lower physical activity in the most restrictive countries[23-25]. Due to the significant differences between nations and regions, a particular health analysis is necessary in each case to implement the appropriate strategies. In the CorCOVID study, similar results have been found in other studies such as INTERHEART[26] and PURE[27]. SARS-Cov2 pandemic greatly deepened these differences. Likely, the long and strict quarantines prevented adequate controls and follow-up of patients with CVD. Thus, this generated a new short-term pandemic of heart disease, advanced kidney disease, and stroke disability. Fear of contracting COVID-19 and government messaging about self-isolation and avoiding hospital visits unless necessary likely resulted in patients not seeking and delaying medical care. This finding may have manifested itself as the increase in the number of out-of-hospital cardiac arrest that has been observed in Italy and France[28,29].

The impact of the consequences left by this pandemic will be very profound in most Latin American countries. These consequences will not only deepen the current deficiencies but also worsen the quality of life and overall life expectancy in different regions. Several international organizations were aware of these consequences and advocated for stricter measures in countries that already have additional risk factors, such as the absence of permanent drinking water or overcrowding, among others.

Limitations

One of the main limitations of this study is that the data was obtained from a registry of different social, economic, and political strata, not allowing for homogeneity within the studied population. The isolation or social distancing scenario was analyzed by country, but in each region, it was noted that countries had varying levels of stringency in their guidelines.

The data comes from different centers, public and private, which limits the ability of the authors to estimate whether the results can be extrapolated to the general population. Thus, information on the perception of the respondents, availability of doctors, medicines, and varied resources in different countries, may lead to an overestimation or underestimation of the data.

The survey was conducted at the same time in all participating countries. This is a potential limitation because the varying peaks of the pandemic in different regions of the world at different times were very notable. However, when analyzing the database of the University of Johns Hopkins, the peaks with the highest incidence of COVID19 in LA were almost equitemporal, so the authors consider the results valid despite this difference.

Conclusions

In our observational study, it was evident that AR is the most vulnerable region, with a lower income and educational coinciding with a higher rate of medication discontinuation. Confinement measures have caused a worsening of two fundamental indicators of CVD in patients. One is poor adherence to prescribed medications, either due to not being able to attend medical check-ups, loss of employment due to the closure of factories or companies or fear of leaving home, resulting in extremely low values. Another is low physical activity, a likely product of home confinement. Both likely demonstrate serious consequences in these regions with increases in deaths, heart attacks, strokes, or heart failure.

Because this study is an observational study, the methodology does not allow for drawing causal conclusions. However, it is important to note that urban areas have greater social risk.

Sanitary measures should be applied to improve the deficiencies found, as well as to develop clinical trials with more robust data.

Acknowledgment

To Dr. Fernando Lanas, and to all the work teams for the CorCOVID Latam's study.

Funding

This research has not received any specific grant from public, commercial, or non-profit sector agencies.

Conflict of interests

The authors declare that they have no conflict of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

References

1. Grainger-Gasser A, Perel P, Lagier-Hässig L, Wood D. The road to 25×25: update on WHF CVD roadmaps. Glob Heart. 2017;12:269-70.
2. Poggio R, Serón P, Calandrelli M, Ponzo J, Mores N, Matta MG, et al Prevalence, patterns and correlates of physical activity among the adult population of the Southern Cone of Latin America: cross-sectional results from the CESCAS I Study. Glob Heart. 2016;11:81-8.e1.
3. Murray CJ, Lopez AD. Mortality by cause for eight regions of the world: Global burden of disease study. Lancet. 1997;349:1269-76.
4. Schargrodsky H, Hernandez-Hernandez R, Champagne BM, Silva H, Vinueza R, Ayçaguer LC, et al. CARMELA: assessment of cardiovascular risk in seven Latin American cities. Am J Med. 2008;121:58-65.
5. Burki T. COVID-19 in Latin America. Lancet Infect Dis. 2020;20:547-8.
6. Atalan A. Is the lockdown important to prevent the COVID-9 pandemic? Effects on psychology, environment and economy-perspective. Ann Med Surg (Lond). 2020;56:38-42.
7. Holmdahl I, Buckee C. Wrong but useful what Covid-19 epidemiologic models can and cannot tell us. N Engl J Med. 2020;383:303-5.
8. Stewart R, El-Harakeh A, Cherian SA; LMIC Members of COVID-END. Evidence synthesis communities in low-income and middle-income countries and the COVID-19 response. Lancet. 2020;396:1539-41.
9. World Health Organization. A Coordinated Global Research Map: 2019 Novel Coronavirus. Geneva, Switzerland: World Health Organization; 2020.
10. Santi RL, Piskorz D, Marquez MF, Ramos CR, Renna N, Ibarrola M, et al. Impact of the pandemic on non-infected cardiometabolic patients. A survey in countries of Latin America. Rationale and design of CorCOVID LATAM study. Can J Cardiol (Open). 2020;2:671-7.
11. Coronavirus Resource Centrer of Johns Hopkins University of Medicine. Available from: https://coronavirus.jhu.edu
12. Equipo de Periodismo Visual BBC News Mundo. Coronavirus: el Mapa Interactivo que Muestra las Medidas o Distintos Tipos de Cuarentena que Adoptaron los Países de América Latina. BBC America Latina; 2020 https://www.bbc.com/mundo/noticias-america-latina [Last accessed on 2020 Apr 27].
13. CBlomström-Lundqvist C, Traykov V, Erba P, Burri H, Nielsen J, Bongiorni M, et al. ESC Scientific Document Group, European Heart Rhythm Association (EHRA) international consensus document on how to prevent, diagnose, and treat cardiac implantable electronic device infections endorsed by the Heart Rhythm Society (HRS), the Asia Pacific Heart Rhythm Society (APHRS), the Latin American Heart Rhythm Society (LAHRS), International Society for Cardiovascular Infectious Diseases (ISCVID) and the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS). EP Europace. 2020;22:515-49.
14. Instituto Nacional de Estadística y Censos; Encuesta Nacional de Factores de Riesgo. Resultados Definitivos. 1st ed. Ciudad Autónoma de Buenos Aires: instituto Nacional de Estadística y Censos INDEC; Ciudad Autónoma de Buenos Aires: secretaría de Gobierno de Salud de la Nación; 2019.
15. MacDonald J, Brevard PB, Lee RE, Wagner T. Link between diet and cardiovascular disease in Latin America and the Caribbean using geographic information systems. Rev Panam Salud Publica. 2009;26:290-8.
16. PAHO Panel. Ultra-processed Food and Drink Products in Latin America: sales, Sources, Nutrient Profiles and Policy Implications. Washington, DC: PAHO Panel; 2019.
17. Liprandi ÁS, Zaidel EJ, Santi RL, Araujo JJ, González MA, Busso JM, et al. Influenza and pneumococcal vaccination in non-infected cardiometabolic patients from the Americas during the COVID-19 pandemic. A sub-analysis of the CorCOVID-LATAM study. Vaccines (Basel). 2021;9(2):123.
18. Mills KT, Bundy JD, Kelly TN, Reed JE, Kearney PM, Reynolds K, et al. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation. 2016;134(6):441-50.
19. Lindenfeld J, Jessup M. "Drugs don't work in patients who don't take them' (C. Everett Koop, MD, US Surgeon General, 1985). Eur J Heart Fail. 2017;19:1412-3.
20. Hill MN, Miller NH, Degeest S, Materson BJ, Black HR, Izzo JL, et al. Adherence and persistence with taking medication to control high blood pressure. J Am Soc Hypertens. 2011;5:56-63.
21. Burnier M, Egan B. Adherence in hypertension. Circ Res. 2019;124:1124-40.
22. Bate KL, Jerums G. Preventing complications of diabetes. Med J Aust 2003;179:498-503.
23. American Diabetes Association. Glycemic targets: standards of medical care in diabetesd2019. Diabetes Care. 2019;42 Suppl 1:S61-70.
24. Guzman-Holst A, DeAntonio R, Prado-Cohrs D, Juliao P. Barriers to vaccination in Latin America: a systematic literature review. Vaccine. 2020;38:470-81.
25. Litewka SG, Heitman E. Latin American healthcare systems in times of pandemic. Dev World Bioeth. 2020;20(2):69-73.
26. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364:937-52.
27. Teo K, Chow CK, Vaz M, Rangarajan S, Yusuf S; PURE Investigators-Writing Group. The prospective urban rural epidemiology (PURE) study: examining the impact of societal influences on chronic noncommunicable diseases in low-, middle-, and high-income countries. Am Heart J. 2009;158:1-7.e1.
28. Baldi E, Sechi GM, Mare C, Canevari F, Brancaglione A, Primi R, et al. Out-of-hospital cardiac arrest during the Covid-19 outbreak in Italy. N Engl J Med. 2020;383:496-8.
29. Marijon E, Karam N, Jost D, Perrot D, Frattini B, Derkenne C, et al. Out-of-hospital cardiac arrest during the COVID-19 pandemic in Paris, France: a population-based, observational study. Lancet Public Health. 2020;5:e437-43.