Comorbidities of Primary Care patients with COVID-19 during the first wave of the SARS-CoV-2 pandemic in the Community of Madrid

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ABSTRACT

Objectives. Recent publications on inpatients with COVID-19 describing their comorbidities and demographic profile exists, but data from large populations requiring only primary care (PC) are scarce. This paper aims to fill this gap and report the prevalence of eight comorbidities (high blood pressure, diabetes mellitus, cancer, cardiovascular disease, asthma, chronic kidney disease, chronic obstructive pulmonary disease, and chronic heart failure) among patients attending PC during the onset of the SARS-CoV-2 pandemic in the Community of Madrid (CoM), Spain.

Patients and methods. This is an observational retrospective study that collects data registered in the CoM between February 25th and May 31st, 2020. Data are divided in two groups: Group-1 (N=339,890) consist of all patients with suspected or proven SARS-CoV-2 infection; and Group-2 is the subgroup (N=48,556, 14.3% of Group-1) of individuals with COVID-19 confirmed by positive RT-PCR test.

Results. Comparing Group-1 with Group-2, 339,890/48,556 patients, respectively, the main results were as follows: average age (60.9/69.9 years), presence of at least one comorbidity (33.51%/47.69%), high blood pressure (19.74%/32.74%), diabetes mellitus (7.13%/13.75%), cancer (6.56%/10.6%), cardiovascular disease (4.52%/9.26%), asthma (7.98%/6.56%), chronic kidney disease (1.84%/4.41%), chronic obstructive pulmonary disease (2%/4.03%), and chronic heart failure (1.14%/2.77%). High blood pressure and diabetes mellitus were seen to be the most frequent (6.56%/8.38%) association.

Conclusions. Patients requiring PC attention during the first wave of the COVID-19 pandemic in the CoM presented with a very high rate of comorbidities, with marked differences among those with or without a confirmed SARS-CoV-2 infection.

Keywords: Comorbidities, COVID-19, Primary Care

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RESUMEN

Objetivos. Existen publicaciones sobre las comorbididades y el perfil demográfico en pacientes hospitalizados por COVID-19, pero son escasas aquellas sobre grandes poblaciones atendidas en Atención Primaria (AP). El objetivo de este trabajo es llenar este vacío describiendo la prevalencia de ocho comorbididades (hipertensión arterial, diabetes mellitus, cáncer, enfermedad cardiovascular, asma, enfermedad renal crónica, enfermedad pulmonar obstructiva crónica e insuficiencia cardiaca crónica) en los pacientes de AP durante el inicio de la pandemia por SARS-CoV-2 en la Comunidad de Madrid (CoM), España.

Pacientes y métodos. Estudio observacional retrospectivo que recopila datos registrados en la CoM, entre el 25 de febrero y el 31 de mayo de 2020. Se diferencian dos cohortes de pacientes que acudieron a AP: Grupo-1 (N=339,890), que incluye todos los pacientes con sospecha de SARS-CoV-2 o infección confirmada; Grupo-2, que es el subgrupo (N= 48,556, 14,3% del Grupo-1) de casos confirmados de COVID-19 mediante prueba RT-PCR.

Resultados. Comparando el Grupo-1 con el Grupo-2 (339,890/48,556 pacientes, respectivamente), los principales resultados fueron los siguientes: edad media (60,9/69,9 años), presencia de al menos una comorbilidad (33,51%/47,69%),...
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INTRODUCTION

During the first wave of SARS-CoV-2 pandemic, the Community of Madrid (CoM) was one of the most important epicentres of this disease, not only in Spain but also in the world. On March 31st, 2020, at the peak of the first pandemic wave, deaths per 100,000 inhabitants in the CoM were 5.7, tripling that of Spain (1.7), followed by Belgium (14.8), Italy (13.4), France (6.24), and UK (5.6). Accumulated deaths at the time in the CoM (3,865) represented 42.7% of those registered in Spain (9,053). Also, the CoM recorded a cumulative incidence of 383.22 cases per 100,000 inhabitants in the last 14 days, while Spain recorded 192.3, followed by Italy (122.2), Belgium (103), France (56.6) and UK (40) during the same period [1,2].

The comorbidities associated with patients with COVID-19 are well known, but have generally been obtained from patients with the most severe forms of the disease often requiring hospital admission [3-6].

This is a retrospective observational study based on the database of the CoM. It provides an opportunity to determine the comorbidity burden in the patients seen in Primary Care (PC) for COVID-19 during the first wave of the pandemic in this region.

PATIENTS AND METHODS

Ethics. The Clinical Research Ethics Committee of Hospital Clínico San Carlos, Madrid (Spain), approved the study (Comité Ético de Investigación Clínica; code: 21/17-E).

The CoM Public Health Service (Servicio Madrileño de Salud, SERMAS) has 430 PC centres and clinics in addition to its hospitals and other services that serve a population of 6.7 million inhabitants [7,8]. Since 2012, the medical records of all patients seen in the PC have been electronically captured in a centralized system of Electronic Health Record (HER) known as “AP-Madrid” (Sistema de Información de Historia Clínica Electrónica Única Centralizada de Atención Primaria).

Design. This is a retrospective observational study based on the information collected in “AP-Madrid” by the family doctors of the SERMAS between February 25th and May 31st, 2020. This study includes information on 339,890 patients with any of the following diagnoses (Figure 1): “infected” with SARS-CoV-2 (code A77.01 of International Classification of Primary Care Second edition, ICPC-2); or “suspected infection” (code A77 of ICPC-2). Two groups were analysed in the study; Group-1: all individuals (339,890) coded as A77.01 or A77; and Group-2: 48,556 individuals from Group-1 with a positive RT-PCR test (representing 14.3% of Group-1). During the first wave, some patients were assigned to codes A77.01 or A77 without an RT-PCR test due to a shortage of tests. Only 68,981 patients, representing 20% of the total in Group-1, underwent the test showing positive results 48,556 (= Group-2). When the two codes coexisted in the same patient, the following hierarchy prevailed: infected case>suspected case.

The data captured in CCC were cleaned and analysed with the business intelligence software (specifically, Microsoft Power BI) and presented through interactive dashboards. The decision-making responsibility was not a part of the CCC’s tasks.

Variables. The variables analysed included the age ranges, sex, and eight comorbidities: high blood pressure (HBP), diabetes mellitus (DM), cancer (diagnosed in the last 5 years), cardiovascular disease (CVD), asthma, chronic kidney disease (CKD), chronic obstructive pulmonary disease (COPD), and chronic heart failure (CHF).

Statistical analysis. Data are expressed as the mean (standard deviation) for continuous variables, and the absolute and relative frequencies for the categorical variables, as appropriate. Inferential analyses were performed using the McNemar test (Mn) for qualitative variables and the related measures t-test (T) for quantitative variables. All p values lower than 0.05 were deemed statistically significant. For comparisons showing statistical significance, the effect size was reported according to the nature of each variable. The Odds Ratio was reported for the qualitative variables and Cohen’s D for the quantitative variables, together with their 95% confidence intervals. Statistical analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

RESULTS

This observational study analysed a total of 339,890 patients (Group-1) who visited their family doctor for symptoms potentially related to the COVID-19. Figure 1 describes the breakdown of the patients assigned to each diagnostic category, detailing the subsample of patients that underwent an RT-
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The mean ± SD age in Group-2 was 59.07±19.04 years, whereas in Group-1 47.97±19.5 years (T = 119.8; p < 0.001; D' = 0.57; D' 95% [0.56 to 0.58]). There was a higher proportion of women in Group-1 (57.29%) than in Group-2 (53.19%) (Mn = 290.9; p < 0.001; OR 1.077; OR 95% [1.68 to 1.987]). In Groups 1 and 2, the mean ± SD age for men was 47.4±19.75 and 60.2±17.89 years, respectively; while the mean ± SD age for women was 48.39±19.29 and 58.06±19.94 years, respectively. Figure 2 shows the sex and age distribution of subjects included in the Groups 1 and 2.

Specifically, in Group-2 (proven COVID-19) the frequencies of the eight comorbidities (Table 1) were HBP (32.74%), DM (13.75%), cancer (10.60%), CVD (9.26%), asthma (6.56%), CKD (4.41%), COPD (4.03%), and CHF (2.77%). Generally, in Group-2, the relative frequencies of comorbidities were higher, particularly among men (where HBP, DM and cancer stand out).

DISCUSSION

Our work demonstrates that a high frequency of patients with comorbidities in the population during the first wave of the COVID-19 pandemic sought care in the PC network of the CoM. Individuals with confirmed COVID-19 had a higher proportion of underlying diseases causing their high morbidity and mortality in the period investigated.
In our paper, we have tried to address this problem by offering in Table 1 the data from the National Health Survey [23]. Unlike our study, the SERMAS report does not include the comorbidities of patients with positive RT-PCR tests that is equivalent to our Group-2. However, it compares the comorbidities of patients seen in the PC who were hospitalized versus those who did not need it. We observed that the frequencies of comorbidities in our Group-1 were analogous to the group that was not hospitalized, while the frequencies of Group-2 were comparable to those that required hospitalization. These results are consistent with previous studies involving PC pa-

Table 1

| Comorbidity       | Group-1 (N = 339,890) | Group-2 (N = 48,556) | General population (CoM) % [23] |
|-------------------|-----------------------|----------------------|--------------------------------|
|                   | Total % | Male % | Female % | Total % | Male % | Female % | Total % | Male % | Female % |
| Cohort            | 339,890 | 145,183 (42.71) | 194,707 (57.28) | 48,556 | 22,731 (46.81) | 25,825 (53.18) |
| HBP               | 67,084 (19.74) | 30,751 (21.18) | 36,333 (18.66) | 15,899 (32.74) | 8,080 (35.55) | 7,819 (30.28) | 19.08 | 19.87 | 18.57 |
| Asthma            | 27,107 (7.98) | 9,645 (6.64) | 17,462 (8.97) | 3,183 (6.56) | 1,053 (4.63) | 2,130 (8.25) | 4.88 | 3.19 | 6.4 |
| DM                | 6,247 (1.84) | 3,273 (2.25) | 2,974 (1.53) | 2,141 (4.41) | 1,208 (5.31) | 933 (3.61) | n.a. | n.a. | n.a. |
| COPD              | 3,859 (1.14) | 1,604 (1.10) | 2,255 (1.16) | 1,345 (2.77) | 632 (2.78) | 713 (2.76) | n.a. | n.a. | n.a. |
| CKD               | 6,247 (1.84) | 3,273 (2.25) | 2,974 (1.53) | 2,141 (4.41) | 1,208 (5.31) | 933 (3.61) | n.a. | n.a. | n.a. |

HBP: High Blood Pressure; DM: Diabetes Mellitus; CVD: Cardiovascular Disease; COPD: Chronic Obstructive Pulmonary Disease; CKD: Chronic Kidney Disease; CHF: Chronic Heart Failure; CoM: Comunidad de Madrid.

Note. The percentage associated with the total number of individuals with each comorbidity has been calculated with respect to the size of the sample to which it belongs (Group-1 N=339,890 and Group-2 N=48,556). The percentage of comorbidities in both sexes has been calculated with respect to the sex distribution in each of the groups.
female sex predominates among COVID-19 patients. In Group-1, the relative frequency of women (57.3%) was the same as that observed for all the patients analysed in the SERMAS report [10] (57.2%), and in the other publications [18,19]. The category of non-hospitalized cases in the National Epidemiological Surveillance Network (RENAVE) cohort also consists of a higher proportion of women (65.5%) [15]. Similarly, the female sex (53.2%) is also prevalent in our Group-2. This preponderance of the female sex contrasts with the findings of the studies carried out in the hospitalized patients where, the male sex was most frequent [5,14,16,17]. In the SERMAS report [10] and the RENAVE cohort.

Table 2 Absolute and relative (>0.5%) frequencies of most frequent comorbidities and its combinations in Groups 1 and 2.

| Comorbidities       | Group-1 N (%) | Group-2 N (%) |
|---------------------|---------------|---------------|
| HBP                 | 32,969 (28.95)| 6,231 (26.91) |
| Asthma              | 19,511 (17.13)| 1,941 (8.38)  |
| Cancer              | 9,557 (8.39)  | 1,668 (7.2)   |
| DM + HBP            | 7,469 (6.56)  | 1,566 (6.76)  |
| DM                  | 5,935 (5.21)  | 1,214 (5.24)  |
| HBP + Cancer        | 4,422 (3.88)  | 1,074 (4.64)  |
| CVD + HBP           | 3,443 (2.92)  | 920 (3.97)    |
| Asthma + HBP        | 3,057 (2.68)  | 647 (2.79)    |
| CVD                 | 2,947 (2.59)  | 552 (2.38)    |
| DM + CVD + HBP      | 1,722 (1.51)  | 546 (2.36)    |
| COPD                | 1,684 (1.48)  | 450 (1.98)    |
| ERC + HBP           | 1,342 (1.21)  | 434 (1.87)    |
| DM + HBP + Cancer   | 1,289 (1.13)  | 345 (1.49)    |
| COPD + HBP          | 1,159 (1.02)  | 310 (1.34)    |
| Asthma + Cancer     | 850 (0.75)    | 243 (1.05)    |
| CVD + HBP + Cancer  | 772 (0.68)    | 242 (1.05)    |
| DM + CVD            | 772 (0.68)    | 227 (0.98)    |
| Asthma + DM + HBP   | 670 (0.59)    | 210 (0.91)    |
| DM + CKD + HBP      | 646 (0.57)    | 168 (0.73)    |
| CKD                 | 643 (0.56)    | 160 (0.69)    |
| DM + Cancer         | 592 (0.52)    | 159 (0.69)    |
| HBP + CHF           | 589 (0.52)    | 152 (0.66)    |

HBP: High Blood Pressure; DM: Diabetes Mellitus; CVD: Cardiovascular Disease; COPD: Chronic Obstructive Pulmonary Disease; CKD: Chronic Kidney Disease; CHF: Chronic Heart Failure.
Table 3: Comorbidities: age range and sex distribution in Groups 1 and 2

| Age range (Years) | Group-1; N (%) | Group-2; N (%) |
|-------------------|----------------|----------------|
|                   | HBP | Asthma | DM | Cancer | CVD | COPD | CKD | CHF | HBP | Asthma | DM | Cancer | CVD | COPD | CKD | CHF |
| **Male**          |     |        |    |        |    |      |     |     |     |        |    |        |    |      |     |     |
| 0-10              | 2   | 483    | 1  | 1.78   | 3  | 0.01 | 0   | 0.03 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 11-20             | 20  | 472    | 11| 4.73   | 7  | 0.27 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 21-30             | 135 | 1,584  | 11| 0.20   | 2  | 0.04 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 31-40             | 876 | 1,667  | 35| 1.07   | 10 | 0.32 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 41-50             | 4,755| 2,014  | 114| 2.84  | 77 | 1.91 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 51-60             | 7,021| 1,326  | 270| 5.87  | 375| 1.31 | 27  | 0.01 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 61-70             | 7,004| 650    | 198| 8.88  | 1,042| 1.29 | 179 | 0.04 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 71-80             | 6,831| 321    | 117| 0.83  | 5,270| 2.29 | 319 | 0.01 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 81-90             | 4,467| 996    | 1,969| 2.11  | 1,204| 1.02 | 242 | 0.04 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 91-100            | 919  | 37     | 408| 3.92  | 197 | 3.79 | 160 | 0.01 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| **Female**        |     |        |    |        |    |      |     |     |     |        |    |        |    |      |     |     |
| 0-10              | 2   | 483    | 1  | 1.78   | 3  | 0.01 | 0   | 0.03 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 11-20             | 20  | 472    | 11| 4.73   | 7  | 0.27 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 21-30             | 135 | 1,584  | 11| 0.20   | 2  | 0.04 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 31-40             | 876 | 1,667  | 35| 1.07   | 10 | 0.32 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 41-50             | 4,755| 2,014  | 114| 2.84  | 77 | 1.91 | 0   | 0.08 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 51-60             | 7,021| 1,326  | 270| 5.87  | 375| 1.31 | 27  | 0.01 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 61-70             | 7,004| 650    | 198| 8.88  | 1,042| 1.29 | 179 | 0.04 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 71-80             | 6,831| 321    | 117| 0.83  | 5,270| 2.29 | 319 | 0.01 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 81-90             | 4,467| 996    | 1,969| 2.11  | 1,204| 1.02 | 242 | 0.04 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |
| 91-100            | 919  | 37     | 408| 3.92  | 197 | 3.79 | 160 | 0.01 | 0   | 4     | 1   | 0     | 3  | 0.01 | 0   | 0.03 |

HBP: High Blood Pressure; DM: Diabetes Mellitus; CVD: Cardiovascular Disease; COPD: Chronic Obstructive Pulmonary Disease; CKD: Kidney Disease; CHF: Chronic Heart Failure.

Note. The percentage (included in parentheses) has been calculated with respect to the total number of patients with a certain comorbidity in each sex and age group.
[15], men predominated (54.3% and 55.6%, respectively) among the patients who had to be hospitalized.

From the beginning of the pandemic, publications focused on identifying the variables that could predict the outcomes in patients with COVID-19. The Chinese Centre for Disease Control and Prevention reported in an early study of 44,672 people (1,023 deaths) that CVD, HBP, DM, respiratory disease, and cancer were associated with an increased risk of death [25]. It also concluded that the fatality rate was increasing with age, and the male patients had a higher risk of death than the female patients. The HBP (most frequent comorbidity in our study) was observed to be an important source of complications such as heart failure, and adverse results [26], thus proving the effect that previous comorbidities have on the evolution of patients with COVID-19. This emphasizes the need to maintain routine control of the chronically ill, especially in pandemic situations like the one we live in [27]. Data collected throughout Spain until May 21st, 2020, by RENAVE [28] also demonstrate that the age and gender are significant risk factors for severe COVID-19 outcomes. For instance, 68% of COVID-19-related ICU admissions were men, and more than 55% of hospitalizations and deaths were also from this sex. This observation, together with the data from our study, leads us to hypothesize the reason for the unfavourable profile of our Group 2 (proven COVID-19). The fact that 47.7% of the individuals in this group presented at least one comorbidity with an average age of 69.9 years, helps us to understand the distressing outcomes seen in the CoM during the first wave of the current pandemic.

Similar to our study, the SERMAS report [10] underpins the crucial role of the PC in the period studied. Out of its total cohort, only 10.6% were hospitalized, and of the 222,905 patients with symptoms — cough (70%), fever (44%) and dyspnoea (31%) were the most frequent. About 90.7% of this group had their first consultation in a PC centre, while the rest (9.3%) had it in the hospital.

The limitations of this paper are due to the circumstances surrounding the outbreak of the first wave. The scarcity of the microbiological tests could explain, in part, why most cases in our cohort (71%) were labelled as "suspected infection". However, it should be mentioned that when a RT-PCR test could be performed, it was positive in 85% of patients diagnosed as infected, whereas, in those diagnosed as suspected, the percentage of positives dropped to 41% (Figure 1). This finding gives value to the clinical judgment of PC doctors, especially, considering that they were evaluating a new nosological entity. It should also be noted that the CCC received the information from the SERMAS. Based on the data not received and the ones that are most lacking are those related to the symptomatology profile, hospitalization, and the mortality of patients seen by the family doctors. Despite these limitations, the strength of this study lies in the large sample of COVID-19 patients it evaluates using a robust study design that stratifies individuals according to the comorbidities, sex, age, and the result of RT-PCR tests (Tables 1-3).

In summary, the impact of the first wave of the SARS-CoV-2 pandemic on the health care system in the CoM is explained in addition to other relevant factors. It was observed that the older individuals with a significant disease burden became sicker and developed severe disease. As the figures show, many patients seeking medical attention for COVID-19 were seen at the PC centres emphasising their key role. This is especially true when a health crisis erupts overwhelming the healthcare systems and the hospitals with unusually high demand for patient care [29]. Therefore, it is essential that PC physicians can identify, diagnose, and carry out a follow-up on patients whose comorbidities, sex and age make them vulnerable and prone to hospitalization. Additionally, the data provided in this paper should serve as a useful guide to prescribe current therapies such as the monoclonal antibodies or any other available in the future.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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