

Frequency and Variation of Chronic Diseases of Covid-19 Cases from 2020 to 2022 in General Medicine and Comparison with Baseline Data from the Same Population in 2017, in Toledo (Spain)

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ABSTRACT

Background: It is not clear whether the comorbidities of covid-19 cases have varied throughout the pandemic and what effect vaccination may have had. **Objective:** To compare chronic diseases between cases of covid-19 in 2020 without vaccination, in covid-19 breakthrough infections in vaccinated people with 1 or 2 doses in 2021, and in covid-19 breakthrough infections in vaccinated people with vaccine booster during 2022, in the same population in general medicine. **Methodology:** Comparison of secondary data among 1) cases of covid-19 without vaccination in 2020; 2) cases of covid-19 breakthrough infections in vaccinated people in 2021; 3) cases of covid-19 with vaccine booster in 2022; 4) and with prevalence of chronic diseases in 1016. All of studies were carried out in the same population of patients treated in a general medicine office in Toledo, Spain. **Results:** The cases of covid-19 as a whole from 2020 to 2022, do not present differences by sex, are younger than that same reference population in 2016, and present less chronic diseases in total, although their frequency shows a mixed pattern, but as their age progressively increased from 2020 (not vaccinated) to 2021 (vaccinated with 1 or 2 doses), and until 2022 (vaccinated with booster), possibly related to the fact that vaccination was prioritized in older people. **Conclusion:** In the context of general medicine in Toledo (Spain), the presence of comorbid chronic diseases does not seem to be, by itself, a risk factor for presenting covid-19.

Key words: COVID-19, SARS-CoV-2, chronic conditions, Epidemiological characteristic, Secondary Analysis, General Practice.

INTRODUCTION

Since the beginning of the coronavirus disease 2019 (covid-19) pandemic, it has been found that an important risk factor for the severity of covid-19 is the patient's health status at the time of infection. Numerous studies focused on specific chronic diseases and identified comorbidities, mainly cardiovascular, associated with poor prognosis (1). Thus, covid-19, a widespread pandemic disease throughout the world, has mortality rates that are highly dependent on an individual's comorbidity (2).

Similarly, from the beginning, age (most importantly) and male gender was found to be associated with severe forms of covid-19 (3). However, although existing data suggest that these chronic conditions or comorbidities may be risk factors for poor prognosis in covid-19, it is not clear whether or not they are risk factors for covid-19. In addition, information on the evolution of the frequency of chronic diseases in covid-19 cases in the course of the pandemic is lacking, and data on non-hospitalized patients are especially lacking (4).

In this context, we present a secondary study of previously published data, to evaluate the frequency and variation

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of chronic diseases of covid-19 cases in 2020 (without vaccination), in 2021 (with vaccination of 1 or 2 doses) and in 2022 (with booster), and they are compared with the baseline data of the same population in 2017, in general medicine.

MATERIAL AND METHODS

This study is a secondary analysis that compares data from previous studies:

1. A set of studies of individuals and families with covid-19 cases in 2020 (5-10). In this period, from March to April, in Spain, the A lineage of the coronavirus predominated, especially the SEC7 and SEC8, and from summer to December, 2020, the 20E (EU1) variant (11, 12).
2. A set of studies of individuals and families with covid-19 cases with complete (2 doses) or incomplete (1 dose) vaccination in 2021 (10, 13-15). In this period, from January 2021 the alpha variant predominated, and from the summer-autumn of 2021 the delta variant (16, 17).
3. A study of covid-19 cases vaccinated with booster in 2022 (18). During the first months of 2022, the Omicron variant was the dominant variant in Spain after having displaced the Delta variant (19).
4. And data from the 2020, 2021, and 2022 studies were compared to a previous chronic disease prevalence study in 2016 (20).

All studies were conducted on the same population: patients seen in a general medicine office in Toledo, Spain, which has a list of 2,000 patients > 14 years of age (in Spain, the general practitioners [GPs] care for people > 14 years of age, except for exceptions requested by the child’s family and accepted by the GP). The GPs in Spain work within the National Health System, which is public in nature, and are the gateway for all patients to the system, and each person is assigned a GP (21). The methodology of these studies has been previously published, so it will only be partially mentioned here, to avoid repetition.

Outcomes of Interest

Evaluation of variation of chronic diseases of covid-19 cases in 2020, 2021 and 2022, compared with baseline data from the same population in 2017.

Definition Of Chronic Diseases

It was defined as “any alteration or deviation from normal that has one or more of the following characteristics: is permanent, leaves residual impairment, is caused by a non-reversible pathological alteration, requires special training of the patient for rehabilitation, and / or can be expected to require a long period of control, observation or treatment (22, 23, 24). And they were classified according to the International Statistical Classification of Diseases and Health-Related Problems, CD-10 Version: 2019 (25).

Statistical Analysis

Comparisons were performed using the Chi Square test (X²) for 2 x 4, 2 x 3, and 2 x 2 contingency tables.

RESULTS

209 chronic diseases / 226 covid-19 cases (0.92 chronic diseases/person) were found in 2020, 153 chronic diseases / 64 covid-19 cases (2.4 chronic diseases/person) in 2021, and 144 chronic diseases / 46 covid-19 cases (3.1 chronic diseases/person) in 2022. The frequency of chronic diseases and age in covid-19 cases was increasing from 2020 (without vaccination), to 2021 (with 1 or 2 vaccinations) and until 2022 (with booster), possibly due to the vaccination strategy that prioritized the older ages. By chronic diseases groups this evolution was mixed, and in any case all of them tend to increase compared to 2020, except Endocrine and Mental, which present progressively lower frequencies from 2020 to 2022 in the cases of covid-19; Circulatory system and Musculo-skeletal changed little between 2020 and 2022; Digestive system showed a peak in 2021; and Genitourinary was increasing until 2022. In any case, the frequency of chronic diseases and age was always lower than prevalence and age in the same population in 2016 (TABLE 1, TABLE 2, TABLE 3) (FIGURE 1, FIGURE 2, FIGURE 3).

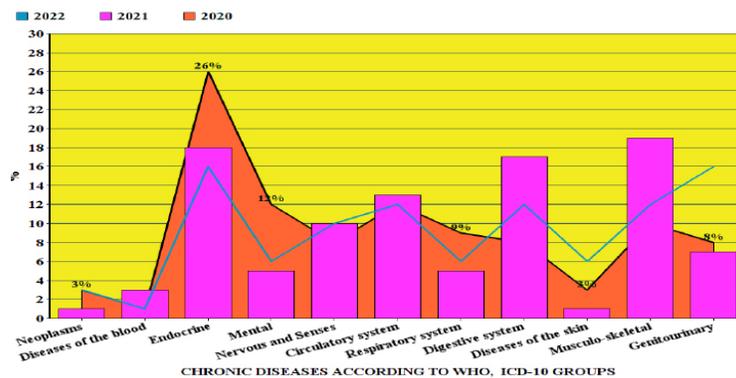


Figure 1. Comparison of chronic diseases in cases of covid-19 between 2020,2021and 2022

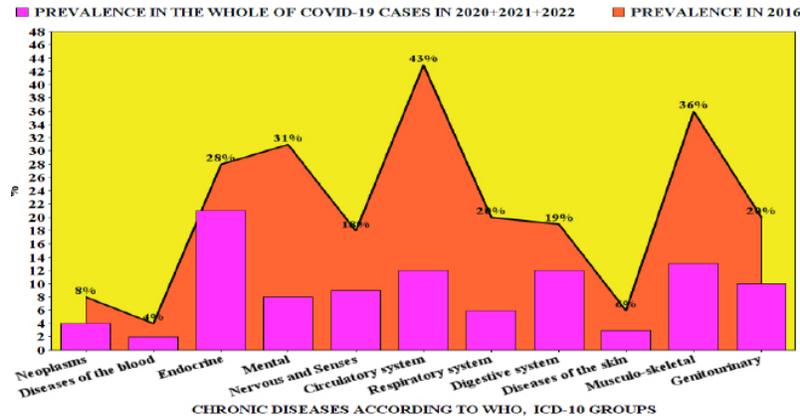


Figure 2. chronic diseases Comparison between 2016 and the set of covid-19 cases from 2020-2022

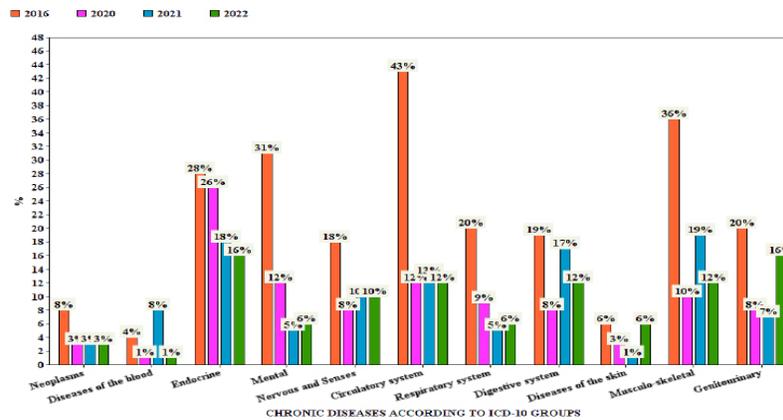


Figure 3. Goup of chronic diseases in the reference population in 2016 and in the covid-19 cases in 2020, 2021 and 2022

Table 1: Age and sex comparison and chronic diseases in cases of covid-19 between 2020, 2021 and 2022

VARIABLES	2020 N=226	2021 N= 64	2022 N=46	STATISTICAL SIGNIFICANCE [Degrees of freedom= (n-1) x (m-1)]
Age =>65 years	17 (7)	17 (27)	13 (28)	X2= 24.0528. p < 0.00001. Significant at p < .05.
Women	135 (60)	32 (50)	27 (59)	X2= 1.9569. p= .375888. NS
CHRONIC DISEASES ACCORDING TO WHO, ICD-10 GROUPS				
-II Neoplasms	7 (3)	2 (1)	5 (3)	X2= 1.7416. p= .41862. NS
-III Diseases of the blood	1 (1)	5 (3)	1 (1)	X2= 5.7386. p= .056738. NS
-IV Endocrine	54 (26)	28 (18)	24 (16)	X2= 5.2584. p= .072136. NS
-V Mental	26 (12)	8 (5)	8 (6)	X2= 8.0278. p= .018063. Significant at p < .05.
-VI-VIII Nervous and Senses	17 (8)	16 (10)	14 (10)	X2= 0.6109. p= .736778. NS
-IX Circulatory system	25 (12)	20 (13)	18 (12)	X2= 0.1003. p= .95073.
-X Respiratory system	18 (9)	7 (5)	8 (6)	X2= 2.67. p= .263164. NS
-XI Digestive system	17 (8)	26 (17)	18 (12)	X2= 6.5772. p= .037305. Significant at p < .05.
-XII Diseases of the skin	7 (3)	1 (1)	8 (6)	X2= 5.8621. p= .053341. NS
-XIII Musculo-skeletal	20 (10)	29 (19)	17 (12)	X2= 7.1314. p= .028277. Significant at p < .05.

-XIV Genitourinary	17 (8)	11 (7)	23 (16)	X2= 7.7999. p= .020243. Significant at p < .05.
TOTAL	209 (100)	153 (100)	144 (100)	---

(): Denotes percentages; *Patients could have more than one chronic disease. The percentages are over the total of chronic diseases; NS: Not significant at p < .05

Table 2: Comparison of age and sex and chronic diseases between the population of the consultation in 2016 and cases of covid-19 in 2020, 2021 and 2022

VARIABLES	PREVALENCE OF CHRONIC DISEASES IN THE WHOLE POPULATION SERVED IN THE OFFICE IN 2016 (A sample of N = 300 out of total N = 2,000 people)	2020 N=226	2021 N= 64	2022 N=46	STATISTICAL SIGNIFICANCE [Degrees of freedom= (n-1) x (m-1)]
Age =>65 years	84 (28)	17 (7)	17 (27)	13 (28)	X2 (2)= 36.7204. p < 0.00001. Significant at p < .05.
Women	171 (57)	135 (60)	32 (50)	27 (59)	X2 (2)= 1.988. p= .574897. NS
CHRONIC DISEASES ACCORDING TO WHO, ICD-10 GROUPS					
-II Neoplasms	23 (8)	7	2	5 (3)	X2= 1.8352. p= .607313. NS
-III Diseases of the blood	13 (4)	1	5	1 (1)	X2= 5.2046. p= .157412. NS
-IV Endocrine	83 (28)	54 (26)	28 (18)	24 (16)	X2= 25.1508. p= .000014. Significant at p < .05.
-V Mental	94 (31)	26 (12)	8 (5)	8 (6)	X2= 13.741. p= .00328. Significant at p < .05.
-VI-VIII Nervous and Senses	55 (18)	17 (8)	16 (10)	14 (10)	X2 (2)= 1.4698. p= .689269. NS
-IX Circulatory system	130 (43)	25 (12)	20 (13)	18 (12)	X2= 8.1466. p= .043077. Significant at p < .05.
-X Respiratory system	59 (20)	18 (9)	7 (5)	8 (6)	X2 (2)= 3.795. p= .284467. NS
-XI Digestive system	58 (19)	17 (8)	26 (17)	18 (12)	X2= 12.6165. p= .005544. Significant at p < .05.
-XII Diseases of the skin	18 (6)	7 (3)	1 (1)	8 (6)	X2= 6.9466. p= .073618. NS
-XIII Musculo-skeletal	108 (36)	20 (10)	29 (19) (quité1)	17 (12)	X2= 7.8677. p= .048827. significant at p < .05.
-XIV Genitourinary	61 (20)	17 (8)	11 (7)	23 (16)	X2= 9.0788. p= .028261. Significant at p < .05.
TOTAL	702 (100)	209 (100)	153 (100)	144 (100)	---

(): Denotes percentages; *Patients could have more than one chronic disease. The percentages are over the total of chronic diseases; NS: Not significant at p < .05.

Table 3: Chronic diseases comparison between the reference population in 2016 and the set of covid-19 cases from 2020-2022

VARIABLES	PREVALENCE OF CHRONIC DISEASES IN THE WHOLE POPULATION SERVED IN THE OFFICE IN 2016 (A sample of N = 300 out of total N = 2,000 people)	2020+2021+2022 N=336	STATISTICAL SIGNIFICANCE
Age =>65 years	84 (28)	47 (7)	X2= 19.0261. p= .000013. Significant at p < .05.

Women	171 (57)	194 (58)	X ² = 0.0353. p= .850951. NS
CHRONIC DISEASES ACCORDING TO WHO, ICD-10 GROUPS			
-II Neoplasms	23 (8)	14 (4)	X ² = 0.2571. p= .612088. NS
-III Diseases of the blood	13 (4)	7 (2)	X ² = 0.3963. p= .528999. NS
-IV Endocrine	83 (28)	106 (21)	X ² = 18.5528. p= .000017. Significant at p < .05.
-V Mental	94 (31)	42 (8)	X ² = 7.625. p= .005756. Significant at p < .05.
-VI-VIII Nervous and Senses	55 (18)	47 (9)	X ² = 0.8039. p= .369933. NS
-IX Circulatory system	130 (43)	63 (12)	X ² = 8.0651. p= .004513. Significant at p < .05.
-X Respiratory system	59 (20)	33 (6)	X ² = 1.4816. p= .22353. NS
-XI Digestive system	58 (19)	61 (12)	X ² = 4.7643. p= .029056. Significant at p < .05.
-XII Diseases of the skin	18 (6)	16 (3)	X ² = 0.3844. p= .535278. NS
-XIII Musculo-skeletal	108 (36)	66 (13)	X ² = 1.3072. p= .252904. NS
-XIV Genitourinary	61 (20)	51 (10)	X ² = 0.675. p= .411315. NS
TOTAL	702 (100) 702/300 people= 2.34 chronic diseases/ person	506 (100) 506/336 people = 1.5 chronic diseases/person	--

(): Denotes percentages; *Patients could have more than one chronic disease; NS: Not significant at p < .05.

DISCUSSION

Main findings

Our study finds, as main results, that the cases of covid-19 as a whole from 2020 to 2022, do not present differences by sex, are younger than the reference population of 2016, and present fewer chronic diseases in total, although both its frequency, which shows a mixed pattern, and its age progressively increases, from 2020 (unvaccinated) to 2021 (vaccinated with 1 or 2 doses), and up to 2022 (vaccinated with booster), possibly related to the fact that it was prioritized vaccination in older people. In other words, our results suggest that, in this population, chronic diseases do not seem to be, by itself, causal risk factors for covid-19. And on the other hand, the progressive increase in the frequency of chronic diseases in covid-19 from 2020 to 2022 is probably associated and confounded with underlying factors, mainly the increase in age in covid-19 cases from 2020 to 2022.

Chronic diseases as a risk factor for morbidity and mortality from Covid-19

The literature suggests a high prevalence of chronic conditions in patients with covid-19 and a significant association between chronic conditions and adverse outcomes in this population. Thus, a significant prevalence of chronic conditions has been reported in people hospitalized with covid-19; the most frequent morbidities reported were hypertension, diabetes mellitus, cardiovascular disease, chronic lung disease, and chronic kidney disease (26-31). However, clinical outcomes among covid-19 patients vary greatly with age, which in turn is associated with a higher prevalence of underlying comorbidities. Age is by far the factor that most influences the vulnerability of older people to develop more severe forms of covid-19 (32).

Prevalence of chronic diseases in covid-19 and in the general population

It has been reported that the prevalence of covid-19 is similar

in carriers or not of chronic diseases (33). In another study, prevalence of cardiovascular disease/hypertension and chronic kidney disease was lower in laboratory-confirmed covid-19 cases compared to the general population. This suggests that these conditions may be risk factors for poor prognosis in covid-19 but not risk factors for covid-19 infection (4).

CONCLUSION

In the context of general medicine in Toledo (Spain), chronic diseases do not seem to be, by itself, causal risk factors for covid-19. The progressive increase in the frequency of chronic diseases in covid-19 from 2020 to 2022 is probably associated and confounded with underlying factors, mainly the increase in age in covid-19 cases from 2020 to 2022.

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