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Early estimation of the risk factors for hospitalisation and mortality by COVID-19 in México

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ABSTRACT

Background. With its high prevalence of chronic non-degenerative diseases, it is suspected that in Mexico there is a high risk of fatal complications from COVID-19. The present study aims to estimate the risk factors for hospitalisation and death in the Mexican population infected by SARS-CoV-2.

Methods and Findings. We used the publicly available data released by the Epidemiological Surveillance System for Viral Respiratory Diseases of the Mexican Ministry of Health (Secretaría de Salud, SS). All records of positive SARS-CoV-2 cases were included. Two multiple logistic regression models were fitted to estimate the association between the hospitalisation and mortality, with other covariables. Data on 10,544 individuals (57.68% men), with mean age 46.47±15.62, were analysed. Men were about 1.54 times as likely to be hospitalized than women ($p<0.001$, 95% C.I. 1.37-1.74); individuals aged 50-74 and ≥74 years were more likely to be hospitalized than people from 25-49 years (OR 2.05, $p<0.001$, 95% C.I. 1.81-2.32, and OR 23.84, $p<0.001$, 95% C.I. 2.90-5.15, respectively). People with hypertension, obesity, and diabetes were more likely to be hospitalised than people without these morbidities ($p<0.01$). Men had more risk of death in comparison to women (OR=1.53, $p<0.001$, 95% C.I. 1.30-1.81) and individuals aged 50-74 and ≥75 years were more likely to die than people from 25-49 years (OR 1.96, $p<0.001$, 95% C.I. 1.63-2.34, and OR 3.74, $p<0.001$, 95% C.I. 2.80-4.98, respectively). Hypertension, obesity, and diabetes presented in combination, provided a higher risk of dying in comparison to not having these diseases (OR=2.10; $p<0.001$, 95% C.I. 1.50-2.93). Hospitalisation, intubation and pneumonia conferred a higher risk of dying (OR 5.02, $p<0.001$, 95% C.I. 3.88-6.50; OR 4.27, $p<0.001$, 95% C.I. 3.26-5.59, and OR=2.57; $p<0.001$, 95% C.I. 2.11-3.13, respectively). The main limitation of our study is the lack of information on mild (asymptomatic) or moderate cases of COVID-19.

Conclusions. The present study points out that in Mexico, where an important proportion of the population develops two or more chronic conditions simultaneously, high mortality is a sever outcome for those infected by SARS-CoV-2.

INTRODUCTION

Since the start of the epidemic of the COVID-19 disease in Wuhan, China in December 2019, the SARS-CoV-2 has continued to spread globally, resulting in more than 3 million confirmed cases and about 230 thousand deaths around the globe by the first week of May 2020 (1). The up-to-date data evidence that the growth of the pandemic had slowed in Asia, while Europe and America contribute to the highest number of cases worldwide. The last is the region with the highest incidence, contributing 49% of cases across the World Health Organization (WHO) regions in the last 14 days of April. Since the first case reported in America by The United States on January 31th, the SARS-CoV-2 disease has spread to 50 countries and territories in the region, including Mexico (2). This country confirmed the first case of COVID-19 on February 27th and the first death on March 19th. On March 23th the health authorities declared the COVID-19 as a health emergency, starting the social isolation as the main action to contain the epidemic (3). The acceleration phase in Mexico was declared almost a month later, on April 21st, when the number of confirmed cases was 9,501 and 857 total deaths had been registered.

The first information on the COVID-19 was generated in China, where the disease transmission mechanisms, the incubation period and the clinical manifestations had been described. (4-7). It has been stated that most of the infected individuals recover spontaneously before approximately 7 to 10 days, while the rest, on the other hand, develop fatal complications including organ failure, septic shock, pulmonary edema, severe pneumonia, and Acute Respiratory Distress Syndrome (ARDS) (5). Older persons and those with underlying health conditions are at higher risk of severe disease and death (8).

Although the aging rate is not as high as in other countries, Mexico has one of the highest prevalence of chronic non-degenerative diseases, especially obesity, diabetes, and hypertension, in both young and older adults (9). In this respect, it is suspected that the risk of fatal complications is higher than in other countries.

Amidst the global health emergency and considering that the knowledge of such information is crucial for the government and the health authorities in the decision-making process during the epidemic, this work aims to estimate the risk factors for hospitalisation and death in the Mexican population infected by SARS-CoV-2.

METHODS

The present analysis was based on the publicly available data of the suspected cases of viral respiratory disease released by the Epidemiological Surveillance System for Viral Respiratory Diseases of the Mexican Ministry of Health (Secretaría de Salud, SS) on April 23rd, 2020 (10). This system contains data collected by 475 viral respiratory disease monitoring units (USMER) located in the different health services throughout the country, and directly from the medical units that attended the cases.

The dataset includes positive, negative, and suspected cases to COVID, with or without pneumonia, both in ambulatory and hospital management. Information on sex, age, nationality, residence place, and migratory status had been registered. Information on the type of medical unit of first contact (USMER or not USMER) and if the individual was hospitalized or stayed in outpatient management, in public or private services was included. The dates when the individual developed the COVID-19 symptoms, were admitted to hospitalisation and death were also recorded. Comorbidities encompassed hypertension, diabetes, obesity, cardiovascular disease, chronic obstructive pulmonary disease (COPD), asthma, chronic kidney disease (CKD), immunosuppression, and other diseases reported by the individual. Other risk factors for severe COVID-19 included smoking and pregnancy. The database does not contain evolution during the stay in the medical units.

For the present analysis, all records of positive SARS-CoV-2 cases were included. No record was deleted due to the presence of missing data since the number of missing values was <2% of the total registers. The data cutoff for the study was April 23rd, 2020.

Variables

Two primary endpoints were defined: hospitalisation and death. The former defined as individuals who tested positive for COVID-19 and required hospitalisation. The last was defined as positive cases for COVID-19 who died, regardless of being hospitalized or remained in outpatient management.

Sex, morbidity, pregnancy, immune-suppression condition, smoking, pneumonia, intubation, admission to ICU, days from the presentation of symptoms to the hospitalization and to death, and from admission to health care unit to death, as well as the health service that provided the treatment, are reported in the present work.

Because of the high prevalence of chronic diseases in Mexico, especially hypertension, diabetes, and obesity, in addition to reporting its prevalence alone, these morbidities were grouped to determine whether together impose a different risk.

Statistical analysis

Descriptive analysis was performed. Continuous variables are presented as means and standard deviations, and categorical variables are expressed as number and percentage. Comparisons of hospitalized vs. no hospitalized individuals and survivors vs. no survivors were estimated through the Mann-Whitney test for continuous variables and χ^2 for categorical variables. From this point, only individuals over 25 years were included in the analysis, as in the above group only 5 deaths had been registered.

Two multiple logistic regression models were fitted to estimate the association between the hospitalisation and mortality, with the rest of the covariables. Those variables that resulted not significant were excluded from the final model. All analyses were performed with the statistical package software STATA 14.

RESULTS

Data on 10,544 individuals with mean age 46.47±15.62 were analysed. From this total, 57.68% (n=6,082) were men (Table 1). Hypertension was the most prevalent morbidity (21.74%), followed by obesity (20.05%) and diabetes (17.65%). It can be seen that the prevalence and number of morbidities increased as age did. From the general population, 55.61% (n=5797) had no comorbidities. The most frequent combination of chronic diseases was diabetes and hypertension (6.05%). This combination is followed by hypertension and obesity (3.75%), Diabetes and Hypertension and Obesity (3.06%), and diabetes and obesity (2.2%). Obesity in combination with hypertension (5.41%) and diabetes (3.01%) was more frequent in individuals from 50-74 years. Obesity alone was more frequent (13.4%) in the 25-49 age group. From the total number of COVID-19 cases, 28.68% developed pneumonia, that was more frequent in individuals over 50 years (61.14% of the total cases), and 37.91% were hospitalised, mainly individuals over 50 years (59.79%). Hospitalisation, intubation, and intensive care unit admission were more frequent in the older age groups. From the total individuals 968 (9.18%) died. It can be seen that deaths increased as age did, with the higher percentage in the older age group. Death was presented in 9.18% of the total number of cases, 0.84% in individuals under 25 years, 4.52% in the 25-49 years group, 14.99% in people between 50 and 74, and 27.95% for the older age group. The mean of days from the symptomatology presentation to the admission was 4.32±3.39 days, from the admission to the dead 5.88±4.95 days, and from the symptomatology presentation to the dead 10.08±5.47 days. The health ministry services (SSA, 48.44%) and the Mexican Institute of Social Services (IMSS, 34.47%) were the institutions that attended the largest number of cases (Table 1).

Table 2 presents the results of the comparisons between the two main outcomes. The vast majority of hospitalised individuals were men; people in this group were older, with a higher prevalence of morbidity, both alone and in combination ($p \leq 0.01$). Immuno-suppression and smoking were also more frequent than in the no hospitalised; pneumonia, intubation, and admission to the ICU were especially higher in this group ($p \leq 0.01$). Regarding mortality, a higher percentage of no survivors were men. In comparison with the survivors, no survivors were older, with a higher prevalence of morbidities alone and in combination ($p \leq 0.01$). Hospitalisation, ICU admission, and intubation were more frequent on no

survivors (p≤0.01). A higher percentage of no survivors were attended in the IMSS, while survivors had been frequently attended at the SSA services (p≤0.01). For both outcomes, obesity alone and the days between the presentation of symptoms, the admission to the hospital and the death, were no different (p≥0.05).

The full logistic regression model for hospitalisation containing seven covariates was statistically significant (n=9847; Goodness-of-fit test x^2=1080.18, df=536, p<0.001; Area under the ROC curve=0.8886). Controlling for other predictors in the model, men were about 1.54 times as likely to be hospitalized than women (p<0.001, 95% C.I. 1.37-1.74); individuals aged 50-74 and ≥74 years were more likely to be hospitalized than people from 25-49 years (OR 2.05, p<0.001, 95% C.I. 1.81-2.32, and OR 23.84, p<0.001, 95% C.I. 2.90-5.15, respectively). People with chronic kidney disease and with COPD was 2.01 and 1.73 times more likely to be hospitalized than people without these comorbidities (p=0.001, 95% C.I. 1.33-3.04, and p=0.003, 95% C.I. 1.20-2.50, respectively). In contrast to individuals without the three main comorbidities, people with diabetes and hypertension, diabetes alone, the combination of the three, diabetes and obesity, hypertension and obesity, obesity alone, and hypertension had 2.60, 2.14, 1.85, 1.78, 1.65, 1.64, and 1.54 times the risk of being hospitalised. People attended in the ISSSTE, IMSS and other services were more likely to be hospitalised than people attended on private services (OR=3.08, 2.15, and 1.72, respectively). Pneumonia had the highest OR for being hospitalised instead of not (OR= 33.62, p<0.001, 95% C.I. 29.22-38.68) in comparison with not having pneumonia.

The full logistic regression model for mortality containing twelve covariates was statistically significant (n=9845; Goodness-of-fit test x^2=2180.73, df=1140, p<0.001; Area under the ROC curve=0.8840). Controlling for other predictors in the model, the highest risk of death was given by IMSS in comparison with private services (OR 9.25, p<0.001, 95% C.I. 5.61-15.24); for the same variable, SSA, other and ISSSTE services had more risk of death in comparison to private services (OR=3.56, 2.45 and 2.25). Men had more risk of death in comparison to women (OR=1.53, p<0.001, 95% C.I. 1.30-1.81) and

individuals aged 50-74 and ≥75 years were more likely to die than people from 25-49 years (OR 1.96, p<0.001, 95% C.I. 1.63-2.34, and OR 3.74, p<0.001, 95% C.I. 2.80-4.98, respectively). People with chronic kidney disease and with COPD had 1.44 and 1.68 times the risk to die than people without these comorbidities (p=0.047, 95% C.I. 1.01-2.06, and p=0.002, 95% C.I. 1.22-2.31, respectively). When the combination of the main chronic diseases was compared with not having these diseases, the combination of the three had the highest risk of die (OR=2.10; p<0.001, 95% C.I. 1.50-2.93), followed by diabetes and obesity, diabetes and hypertension, hypertension and obesity, obesity alone, diabetes, and hypertension, that had 2.06, 1.92, 1.88, 1.74 and 1.49 times the risk of dying. Pregnant women had 3.56 times the risk of dying in comparison with no pregnant women (p=0.025, 95% C.I. 1.17-10.80) and immuno-suppressed individuals are about 1.70 times more likely to die than people without this condition. People who developed pneumonia were 2.57 more likely to die than people without it (p<0.001, 95% C.I. 2.11-3.13), and those who had been hospitalised, intubated and admitted to ICU had a higher risk of dying than their counterparts (OR 5.02, p<0.001, 95% C.I. 3.88-6.50, OR 4.27, p<0.001, 95% C.I. 3.26-5.59, and OR 1.79, p<0.001, 95% C.I. 1.36-2.36, respectively).

DISCUSSION

For our knowledge, this is the first study of COVID-19 reporting the risk factors for hospitalisation and death in the Mexican population. Men, individuals in the older ages groups, CKD, COPD, with chronic diseases in combination or alone, who developed pneumonia and were attended in any public health service, were at higher risk of being hospitalised than people who were not. For death, the same factors in addition to pregnancy, immuno-suppression, hospitalisation, intubation, and admission to the ICU, increased the risk when compared to the survivors.

Shortly after the COVID-19 disease had been reported as a pandemic, small case series reports of individuals attended in different hospitals in China had raised (11-13). Endpoints, especially admission to ICU and invasive ventilation, were frequently reported. Hospitalisation, one of the events of significant concern to health systems due to the risk of saturation, had not been used as a primary outcome. In

fact, a large hospitalisation rate has been reported by Guan et al. (14) who informed that 93.6% of the individuals with COVID-19 received hospital care. In-hospital death mortality had been reported to be as high as 28% and 97% for individuals requiring mechanical ventilation (15). In the present analysis, 40% of the individuals were attended in hospitals. Of the 3922 individuals who had been hospitalised, 67% developed pneumonia, 88% were intubated, and 12% were admitted to the ICU. The death rate within hospitalisation was 22%.

Overall lethality of COVID-19 in the present study was 9.2%. The higher proportion of deaths was observed for the older age group (27.95%) and in individuals with any type of morbidity (73.3%).

Li et al. published a meta-analysis that aimed to analyse the clinical data, discharge rate, and fatality rate of COVID-19 patients for clinical help. Male sex was strongly related to adverse outcomes (16). In the present analysis, men also have more risk of being hospitalised and died, 54% and 53%, respectively, than women. It had been repeatedly informed that fatality rates for males are two to three times higher than for females (17). Wenham et al. (18) had suggested that gender-related social factors, immunological differences, hormonal disparities, and lifestyle habits may play a role in the sex differences for COVID-19.

Regarding age, in Europe, a higher mortality rate had been reported in older age groups (19). A similar pattern has been reported for China (20). It could be thought that in Mexico the risk for the older population would be lower, as the ageing group is smaller compared to these countries. Notwithstanding the hospitalisation and mortality risks were more than twice in the older age groups in our analysis. The reduced immune response and the increased prevalence of multimorbidity that characterised this age group can explain the higher risk of both outcomes.

In the same line, morbidity increased the risk of hospitalisation and death in the present analysis, mainly when chronic degenerative diseases occur simultaneously. From individuals requiring hospitalisation 62% had comorbidities, primarily hypertension (34%), diabetes (30%), and obesity (25%). In fact, the

presence of these three diseases in the same person increases 85% of the risk of hospitalisation. For mortality, a similar pattern can be observed. In individuals who died, hypertension was present in 44%, diabetes in 38%, and obesity in 30%. The risk of dying in individuals presenting the combination of these three diseases was 2.10 times the risk compared with those without these diseases. It is important to note that individuals who died with no morbidities (27%) were younger (56.17±13.42 years) than those who died and did have morbidities (60.41±13.59 years). Considering that in Mexico it had been reported a high proportion of undiagnosed chronic diseases (21), it can be hypothesized that a proportion of hospitalisations and deaths from COVID-19 can be related to undiagnosed morbidities.

Data on pregnancy and COVID-19 is limited, but based on the experience with influenza, SARS, and MERS, pregnant women, especially those in the second and third trimesters of gestation, have a higher risk of complications and death in comparison with no pregnant women (22-24). In the present analysis pregnant women, in comparison to no pregnant, were 3.56 times more likely to die because of coronavirus. It has to be noted that 80% of pregnant women who died, also had hypertension, obesity, or diabetes (data not shown).

Hospitalisation in this population seems to act as a strong risk factor for dying, and this risk further increased when individuals were admitted to the ICU and were intubated. This association can be related to the fact that the vast majority of people with COVID-19 who accessed health services are complicated cases of COVID-19.

Concerning health services, it was observed that the risk of dying is more than twice in public services than in private ones. Of especial interest is the case of IMSS that had 8.25 times the risk of dying. Public hospitals in Mexico are the health services with the greatest demand, as are more affordable and accessible for the vast majority of the Mexican population. This situation puts these institutions in the risk of over-limit their response capacity, increasing the severity and death rates associated with the health services saturation. This raises the issue of inequality that hinders access to quality care,

late arrivals, overcrowded services and poor staffing in public hospital vs. world class care in the private sector.

This study has some limitations. First, given the dynamics of the disease and that in Mexico there are insufficient resources to apply the tests massively, the rates were calculated based on sentinel information that includes all deaths, but not all mild (asymptomatic) or moderate cases that did not access to health services, so the prevalence of the disease could be underestimated and lethality could be overestimated. Therefore, when interpreting the data, it would be convenient to take into account the estimation of real cases, which are mostly mild cases of the disease. Second, more detailed patient information, particularly, dates of hospital discharge of patients who do not die, was unavailable at the time of analysis; this information would be of vital importance to assess the possible saturation of health services and to assess the use of resources.

Nonetheless, this study is, to our knowledge, the largest case series to date of COVID-19 in Mexico, with 10,544 individuals from all over the country, and provides further information on the clinical and epidemiological features of patients. It presents the latest status of COVID-19 in Mexico and a wide range of clinical manifestations can be seen and are associated with adverse outcomes.

CONCLUSIONS

COVID-19 placed substantial strains on the health systems worldwide. For countries starting the accelerated contagion phase, it is important to identify individuals with poor prognosis at an early stage in order to better allocated limited resources. In this respect, the present study points out that in Mexico, where an important proportion of the population develops two or more chronic conditions simultaneously, high mortality is a sever outcome for those infected by SARS-CoV-2.

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Does not apply.

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Table 1. General characteristics by age group

	Total	**<25 y**	**25-49 y**	**50-74 y**	**≥75 y**
	n = 10544	**n= 598**	**n= 5640**	**n= 3823**	**n= 483**
Sex (men)	6082 (57.68)	329 (55.02)	3203 (56.79)	2286 (59.8)	264 (54.66)
Hypertension	2272 (21.74)	7 (1.17)	622 (11.11)	1372 (36.31)	271 (56.58)
Obesity	2097 (20.05)	44 (7.37)	1115 (19.91)	864 (22.84)	74 (15.48)
Diabetes	1845 (17.65)	11 (1.84)	525 (9.38)	1148 (30.38)	161 (33.68)
Cardiovascular Disease	312 (2.99)	2 (0.34)	57 (1.02)	197 (5.22)	56 (11.69)
Chronic kidney disease	222 (2.13)	3 (0.5)	61 (1.09)	135 (3.58)	23 (4.81)
COPD	271 (2.59)	1 (0.17)	39 (0.7)	156 (4.13)	75 (15.66)
Asthma	374 (3.58)	18 (3.02)	243 (4.34)	101 (2.68)	12 (2.51)
Number of Comorbidities	0.7 ± 0.96	0.14 ± 0.42	0.47 ± 0.77	1.04 ± 1.08	1.4 ± 1.15
No Comorbidities	5797 (55.61)	524 (88.07)	3692 (66.05)	1465 (38.91)	116 (24.42)
Combinated Chronic Diseases					
Diabetes & Hypertension & Obesity	323 (3.06)	1 (0.17)	86 (1.52)	207 (5.41)	29 (6.0)
Diabetes & Hypertension	638 (6.05)	0	115 (2.04)	440 (11.51)	83 (17.18)
Diabetes & Obesity	232 (2.2)	4 (0.67)	109 (1.93)	115 (3.01)	4 (0.83)
Hypertension & Obesity	395 (3.75)	0	163 (2.89)	207 (5.41)	25 (5.18)
Only Hypertension	914 (8.67)	6 (1.0)	258 (4.57)	517 (13.52)	133 (27.54)
Only Obesity	1142 (10.83)	39 (6.52)	756 (13.4)	331 (8.66)	16 (3.31)
Only Diabetes	649 (6.16)	6 (1.0)	215 (3.81)	384 (10.04)	44 (9.11)
Pregnancy	54 (0.51)	6 (1.01)	48 (0.85)	--	--
Immuno-suppressed	207 (1.98)	12 (2.01)	76 (1.36)	99 (2.62)	20 (4.18)
Smoking	936 (8.96)	42 (7.04)	517 (9.24)	322 (8.53)	55 (11.48)
Pneumonia	3024 (28.68)	53 (8.86)	1122 (19.89)	1581 (41.35)	268 (55.49)
Hospitalized	3997 (37.91)	75 (12.54)	1532 (27.16)	2040 (53.36)	350 (72.46)
Intubated	466 (4.42)	6 (1.01)	123 (2.18)	289 (7.56)	48 (9.94)
ICU	492 (4.67)	6 (1.01)	153 (2.71)	296 (7.74)	37 (7.66)
Dead	968 (9.18)	5 (0.84)	255 (4.52)	573 (14.99)	135 (27.95)
Days Sint-Adm	4.32 ± 3.39	3.86 ± 3.11	4.26 ± 3.26	4.46 ± 3.56	4.56 ± 3.74
Days Adm-Dead	5.88 ± 4.95	2 ± 2.34	6.12 ± 4.61	5.83 ± 5.03	5.82 ± 5.24
Days Sint-Dead	10.08 ± 5.47	7 ± 3.39	10.23 ± 4.95	9.95 ± 5.71	10.47 ± 5.41
IMSS Services	3634 (34.47)	115 (19.23)	2185 (38.74)	1189 (31.1)	145 (30.02)
ISSSTE Services	641 (6.08)	12 (2.01)	274 (4.86)	293 (7.66)	62 (12.84)
SSA Services	5108 (48.44)	398 (66.56)	2631 (46.65)	1878 (49.12)	201 (41.61)
Other Public Services	415 (3.94)	12 (2.01)	175 (3.1)	190 (4.97)	38 (7.87)
Private Services	746 (7.08)	61 (10.2)	375 (6.65)	273 (7.14)	37 (7.66)

Table 2. General characteristics by outcome

	Total n = 9946	No Hospitalised n= 6024	Hospitalised n= 3922	p value	Survivor n = 8983	No Survivor n= 963	p value
Age, years	48.15 ± 14.35	44.18 ± 12.9	54.24 ± 14.34	<0.0001	46.96 ± 13.91	59.26 ± 13.63	0.0001
Sex (men)	5753 (57.84)	3204 (53.19)	2549 (64.99)	0.0001	5086 (56.62)	667 (69.26)	0.0001
Hypertension	2265 (22.98)	938 (15.73)	1327 (34.1)	0.0001	1845 (20.74)	420 (43.8)	0.0001
Obesity	2053 (20.82)	1066 (17.86)	987 (25.35)	0.0001	1764 (19.82)	289 (30.1)	0.0001
Diabetes	1834 (18.61)	668 (11.2)	1166 (29.97)	0.0001	1470 (16.53)	364 (37.92)	0.0001
Cardiovascular Disease	310 (3.15)	110 (1.84)	200 (5.14)	0.0001	246 (2.77)	64 (6.68)	0.0001
Chronic kidney disease	219 (2.22)	54 (0.91)	165 (4.24)	0.0001	156 (1.75)	63 (6.58)	0.0001
COPD	270 (2.74)	72 (1.21)	198 (5.09)	0.0001	187 (2.1)	83 (8.65)	0.0001
Asthma	356 (3.61)	237 (3.98)	119 (3.06)	0.0177	325 (3.66)	31 (3.23)	0.4925
Number of Comorbidities	0.74 ± 0.97	0.52 ± 0.82	1.07 ± 1.08	<0.0001	0.67 ± 0.92	1.36 ± 1.16	<0.0001
No Comorbidities	5273 (53.64)	3812 (64.01)	1461 (37.7)	0.0001	5018 (56.54)	255 (26.7)	0.0001
Combinated Chronic Diseases							
Diabetes & Hypertension & Obesity	322 (3.24)	122 (2.03)	200 (5.1)	0.0001	246 (2.74)	76 (7.89)	0.0001
Diabetes & Hypertension	638 (6.41)	193 (3.2)	445 (11.35)	0.0001	485 (5.4)	153 (15.89)	0.0001
Diabetes & Obesity	228 (2.29)	100 (1.66)	128 (3.26)	0.0001	190 (2.12)	38 (3.95)	0.0003
Hypertension & Obesity	395 (3.97)	192 (3.19)	203 (5.18)	0.0001	333 (3.71)	62 (6.44)	0.0001
Hypertension	908 (9.13)	431 (7.15)	477 (12.16)	0.0001	779 (8.67)	129 (13.4)	0.0001
Obesity	1103 (11.09)	650 (10.79)	453 (11.55)	0.2385	990 (11.02)	113 (11.73)	0.5028
Diabetes	643 (6.46)	253 (4.2)	390 (9.94)	0.0001	547 (6.09)	96 (9.97)	0.0001
Pregnancy	48 (0.48)	34 (0.56)	14 (0.36)	0.1525	43 (0.48)	5 (0.52)	0.7329
Immuno-suppressed	195 (1.98)	79 (1.32)	116 (2.98)	0.0001	149 (1.68)	46 (4.8)	0.0001
Smoking	894 (9.07)	486 (8.15)	408 (10.49)	0.0001	795 (8.94)	99 (10.33)	0.1524
Pneumonia	2971 (29.87)	327 (5.43)	2644 (67.41)	0.0001	2245 (24.99)	726 (75.39)	0.0001
Hospitalized	3922 (39.43)	--	3922 (100)	0.0001	3054 (34).0	868 (90.13)	0.0001
Intubated	460 (4.63)	--	460 (11.73)	0.0001	234 (2.61)	226 (23.47)	0.0001
ICU	486 (4.89)	--	486 (12.39)	0.0001	294 (3.27)	192 (19.94)	0.0001
Dead	963 (9.68)	95 (1.58)	868 (22.13)	0.0001	--	963 (100)	0.0001
Days Sint-Adm	4.35 ± 3.4	4.31 ± 3.3	4.41 ± 3.55	0.1631	4.37 ± 3.38	4.19 ± 3.62	0.1107
Days Adm-Dead	5.9 ± 4.95	6.03 ± 5.33	5.89 ± 4.91	0.8005	--	5.93 ± 4.93	0.8005
Days Sint-Dead	10.09 ± 5.47	10.79 ± 6.38	10.02 ± 5.36	0.1920	--	10.12 ± 5.45	0.1920

IMSS Services	3519 (35.38)	2023 (33.58)	1496 (38.14)	0.0001	3069 (34.16)	450 (46.73)	0.0001
ISSSTE Services	629 (6.32)	212 (3.52)	417 (10.63)	0.0001	562 (6.26)	67 (6.96)	0.3945
SSA Services	4710 (47.36)	3137 (52.08)	1573 (40.11)	0.0001	4331 (48.21)	379 (39.36)	0.0001
Other Public Services	403 (4.05)	191 (3.17)	212 (5.41)	0.0001	359 (4)	44 (4.57)	0.3874
Private Services	685 (6.89)	461 (7.65)	224 (5.71)	0.0002	662 (7.37)	23 (2.39)	0.0001

Table 3. Logistic regression model for the risk of hospitalisation

	Odds Ratio	Std. Err.	z	p>z	95% C.I.	
Men	1.54	0.09	7.32	<0.001	1.37	1.74
Age 25-49 years (reference)						
Age 50-74 years	2.05	0.13	11.31	<0.001	1.81	2.32
Age ≥ 75 years	3.84	0.56	9.32	<0.001	2.90	5.10
CKD	2.01	0.42	3.33	0.001	1.33	3.04
COPD	1.73	0.32	2.96	0.003	1.20	2.50
None (reference)						
Diabetes & Hypertension & Obesity	1.85	0.31	3.74	<0.001	1.34	2.56
Diabetes & Hypertension	2.60	0.32	7.73	<0.001	2.04	3.31
Diabetes & Obesity	1.78	0.34	3.01	0.003	1.22	2.59
Hypertension & Obesity	1.65	0.24	3.45	0.001	1.24	2.19
Hypertension	1.54	0.16	4.2	<0.001	1.26	1.88
Obesity	1.64	0.15	5.41	<0.001	1.37	1.95
Diabetes	2.14	0.25	6.43	<0.001	1.70	2.69
Pneumonia	33.62	2.40	49.14	<0.001	29.22	38.68
Private Services (reference)						
IMSS Services	2.15	0.28	5.85	<0.001	1.67	2.78
ISSSTE Services	3.08	0.52	6.68	<0.001	2.21	4.28
SSA Services	0.82	0.11	-1.56	0.118	0.63	1.05
Other Services	1.72	0.33	2.88	0.004	1.19	2.49
Constant	0.03	0.01	-14.61	<0.001	0.02	0.04

Table 4. Logistic regression model for the risk of death

	Odds Ratio	Std. Err.	z	p>z	95% C.I.	
Men	1.53	0.13	5.01	<0.001	1.30	1.81
Age 25-49 years (reference)						
Age 50-74 years	1.96	0.18	7.29	<0.001	1.63	2.34
Age ≥ 75 years	3.74	0.55	9.01	<0.001	2.80	4.98
CKD	1.44	0.26	1.99	0.047	1.01	2.06
COPD	1.68	0.27	3.16	0.002	1.22	2.31
None (reference)						
Diabetes & Hypertension & Obesity	2.10	0.36	4.32	<0.001	1.50	2.93
Diabetes & Hypertension	1.92	0.25	4.94	<0.001	1.48	2.49
Diabetes & Obesity	2.06	0.44	3.39	0.001	1.35	3.12
Hypertension & Obesity	1.88	0.33	3.58	<0.001	1.33	2.65
Hypertension	1.49	0.19	3.04	0.002	1.15	1.92
Obesity	1.74	0.23	4.21	<0.001	1.35	2.26
Diabetes	1.50	0.21	2.81	0.005	1.13	1.98
Pregnancy	3.56	2.01	2.24	0.025	1.17	10.80
Inmuno-suppressed	1.70	0.35	2.57	0.010	1.13	2.55
Pneumonia	2.57	0.26	9.45	<0.001	2.11	3.13
Hospitalized	5.02	0.66	12.25	<0.001	3.88	6.50
Intubated	4.27	0.59	10.51	<0.001	3.26	5.59
ICU	1.79	0.25	4.18	<0.001	1.36	2.36
Private Services (reference)						
IMSS Services	9.25	2.36	8.72	<0.001	5.61	15.24
ISSSTE Services	2.25	0.64	2.86	0.004	1.29	3.91
SSA Services	3.56	0.89	5.08	<0.001	2.18	5.81
Other Services	2.45	0.75	2.93	0.003	1.34	4.46
Constant	0.00	0.00	17.18	<0.001	0.00	0.00