Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Epidemiological characteristics of the COVID-19 outbreak in a secondary hospital in Spain

Christine Giesen a,1, Laura Diez-Izquierdo a,1,*, Carmen Maria Saa-Requejo a, Inmaculada Lopez-Carrillo a, Carmen Alejandro Lopez-Vilela a, Alicia Seco-Martínez a, María Teresa Ramírez Prieto b,c, Eduardo Malmierca c,d, Cristina García-Fernández a,c, on behalf of COVID Epidemiological Surveillance and Control Study Group

INTRODUCTION

On December 31, 2019 the Wuhan Municipal Health and Sanitation Commission reported a cluster of 27 cases of pneumonia of unknown aetiology in Wuhan, Hubei province, People’s Republic of China. Symptoms started on December 8, 2019. The only common exposure was a wholesale market for shellfish, fish and live animals. However, the outbreak’s source was not identified. The market was

Key Words:
Pandemics
Coronavirus infections
SARS-CoV-2
Epidemiology
Infection control
Hospital

Objectives: In 2019 Chinese authorities alerted of the appearance of a cluster of cases of unknown pneumonia related to a new type of coronavirus. Spain is among the most affected countries. Our aim is to describe the cases of COVID-19 at Infanta Sofía University Hospital (Madrid), a public secondary hospital that increased its hospital beds to provide assistance during the outbreak.

Methods: Retrospective descriptive study of cases that met COVID-19 clinical diagnosis criteria or had a positive PCR test from February 27 to June 29, 2020. A description of demographic variables, hospital stay, mortality and the epidemiological curve was performed.

Results: Of 1,828 confirmed cases, 64.4% were hospitalised, 5.6% were admitted to the ICU. About 52.2% were male. The median age was 63.2 years. About 13.1% were nursing home residents. Nineteen percent were of Latin American origin of which 6.8% were admitted to the ICU. Overall case fatality was 14.6%. We observed a biphasic epidemiological curve.

Conclusions: Sixty to 79-year-old males were admitted and deceased more often than women. Mortality reached 14.7%. Latin Americans were admitted more often to the ICU. Further studies about epidemiological characteristics of COVID-19 in hospitals are necessary.

© 2020 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.
shut down on January 1, 2020 and on January 7, Chinese authorities identified a new type of virus from the Coronaviridae family as the etiologic agent. This virus was named SARS-CoV-2. Its genetic sequence was shared by Chinese authorities on January 12. Hubei province was locked down on January 23 to avoid further spread of the epidemic. The outbreak has been declared as a Public Health Emergency of International Importance by the Emergencies Committee of the International Health Regulations on January 30. The World Health Organization (WHO) has named this new disease COVID-19 (infectious disease caused by coronavirus-19) and declared the global pandemic on March 11, when the virus had already been reported in 114 countries.

Outbreaks of other coronavirus related diseases have been reported previously. In 2003, a cluster of cases due to SARS-CoV was reported in Guangdong, People’s Republic of China. It was defined by the WHO as the first severe new disease to have emerged in the 21st century.

In comparison to other epidemics, COVID-19 is characterized by a bigger number of affected people and the basic estimated reproduction number might differ between countries, being highest in Bahrain, Slovenia, Qatar, Spain, Denmark, and Finland. Since the last major outbreak of MERS-CoV in 2012, 27 countries have reported cases of this disease, 80% of which have occurred in the Kingdom of Saudi Arabia. However, cases and deaths have seen a significant decline since 2016. Whereas MERS-CoV showed a mortality rate of approximately 35%, so far COVID-19 mortality stands at approximately 5%.

One of the possible reasons why the current outbreak is of a bigger magnitude than previous coronavirus epidemics is due to global air traffic. International flights have been identified as potential risk factors in spreading the virus and 1 imported case can generate hundreds of secondary cases. The WHO already addressed this issue during the SARS-CoV outbreak in 2003. Imported cases from Spain have already been reported abroad.

First cases in Europe were reported in France on January 24. Since then, as of June 30, 10,117,687 confirmed cases and 502,278 deaths have been reported in 216 countries and territories. In Spain the outbreak spread fastly across the whole country from the occurrence of first imported cases on January 31 and February 9 on the Canary and Balearic Islands, respectively, thus becoming one of the epicentres of coronavirus in Europe. The first cases in mainland Spain occurred in Madrid (2 cases), Castellón (1 case), and Barcelona (1 case) on February 25.

On March 15, as cases continued to rise, the Spanish government declared a state of emergency. On March 22, a support hospital for the entire Madrid Region was opened at the city’s main exhibition centre. As of June 30, Spain is among the countries in Europe reporting the most cases of COVID-19. So far, 248,970 confirmed cases and 28,346 deaths have been declared by Spanish health authorities, 71,885 and 8,421, respectively in the Madrid Region. Positive cases are defined with at least 1 positive PCR test for SARS-CoV-2 from nasopharyngeal or oropharyngeal swabs and respiratory samples or according to the case definition used by the national epidemiological surveillance network. The process of reporting in Spain is shown in Figure 1.

Infanta Sofia University Hospital (HUIS) is a public hospital in the municipality of San Sebastián de los Reyes, within the metropolitan area of Madrid. It provides health care to a population of approximately 328,217 people, including 54 nursing homes. It has 271 beds and 1 intensive care unit (ICU) with 8 beds. To cope with the recent outbreak, a series of measures and major changes were put in place. The first positive case was identified on February 27. Since then inpatient beds increased up to 366, 3 new ICU areas were established, providing the hospital with a total of 40 ICU beds, and the whole emergency department (ED) was reorganised. Furthermore, health care personnel was relocated and hired.

**MAIN OBJECTIVE**

In this study we aimed at assessing the epidemiological features and dynamics of COVID-19 during the first 4 months of the 2020 outbreak in Spain in a secondary hospital. So far, few studies have described demographic and epidemiological characteristics of patients with COVID-19 in several countries and different health care settings.

**MATERIAL AND METHODS**

Retrospective review of confirmed COVID-19 cases among inpatients and those who sought medical assistance at the ED during the first 4 months of SARS-CoV-2 pandemic at Infanta Sofia University Hospital, San Sebastián de los Reyes (Madrid). Institutional Investigation Review Board approval was obtained.

All polymerase chain reaction (PCR) results for SARS-CoV-2 requested at our centre were checked. To facilitate the notification of cases to Public Health, a specific tag was created by the Madrid Health Board to identify those patients in whom SARS-CoV-2...
infection was either suspected or confirmed, which was entered into the SELENE application, a legacy system to process medical records at our centre. Patients were classified as suspected, that is a presumed SARS-CoV-2 infection with pending result of the extracted PCR; or confirmed cases, that is either a positive PCR result or clinical, radiological and laboratory findings of COVID-19. Every day, all patients admitted to the hospital (ED, Day Hospital, dialysis, hospitalisation and ICU) were tagged according to their PCR or clinical suspicion status. All the input information was downloaded from the SELENE application. Finally, the multidisciplinary COVID Epidemiological Surveillance and Control Study Group screened the hospital beds daily using SELENE to identify new cases and monitor known cases. Figure 2 shows the information collection process and data sources.

A standardized Excel (Version 2010, Microsoft Corporation, Richmond, WA) spreadsheet was used to extract patient data. Positive cases were defined as at least 1 positive PCR test for SARS-CoV-2 or as meeting case definition criteria. PCR samples were taken from nasopharyngeal or oropharyngeal swabs or respiratory samples.

The Versant Simple Preparation 1.0 Reagents Siemens Healthineers extraction system was used for the extraction of nucleic acids. The extract from each sample is used to carry out the identification of SARS-CoV-2 with the VIASURE SARS-CoV-2 Real Time PCR detection kit, that uses specific oligonucleotides and a fluorescently labelled probe that hybridizes to a target region of the ORF1ab and N genes. This kit has a detection limit of ≥10 copies of RNA per reaction for both genes.

A sample is considered to be positive if the obtained cycle threshold (Ct) value is less than 40 for the ORF1ab and/or N genes. An indeterminate result is emitted if only the N gene is amplified (Ct <40). In this case, it is advisable to repeat the determination with a new sample of nasopharyngeal exudate. A sample is considered to be negative if no amplification is observed for any of the 2 genes.

Age groups were categorized in accordance to the ones employed by the National Centre of Epidemiology (CNE); younger than 2 years, 2-4 years, 5-14 years, 15-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years and over 80 years. The identification of infected health care professionals was done by the Occupational Health Service (OHS), that also extracted PCR for SARS-COV-2. In our analysis, only those professionals who were attended at the ED or were hospitalised were taken into account. Those health care professionals who did not require hospitalisation were not included in the analysis.

Patient characteristics, nursing home residency, case distribution by age and sex, mortality and the epidemiological curve were analysed. Patients who had not been discharged on April 23 were excluded from the mortality analysis. We also calculated the median admission and ICU stay by using dates of admission and discharge. Confirmed cases were divided into 6 categories (Spain, Europe, Africa, Asia, North America, Latin America, and the Caribbean) according to patient country of birth. Although geographically Mexico belongs to North America, in our analysis it was included in the Latin America and the Caribbean category. Since new cases were reported daily, a 7-day moving average approach was used to calculate the epidemiological curve. Three cases that were diagnosed on February 27 (n = 1) and March 6 (n = 2) were removed from the epidemiological curve analysis because the calculation of moving averages with empty values could not be performed. Stata (version 15) was used for data analysis.

RESULTS

Patients characteristics

A total of 24,491 patients were attended at the ED of our hospital during the period from February 27 until June 30. One thousand twenty-eight cases were either tested positively or classified as
confirmed cases due to their clinical, laboratory and radiological findings during the study period, 16.6% of all attended patients at the ED during that period. Data were extracted and included in the analysis from all 1,828 patients. One thousand forty-three patients presented a positive PCR result and 585 were clinically confirmed cases. Most of the positive PCR samples were nasopharyngeal swabs (976/1,243). Figure 3 shows the patient identification algorithm. About 51.6% (CI 95% 49.3-53.9) of all patients were male and 48.4% (CI 95% 46.1-50.7) were female. The male-to-female ratio was 1.1:1. The median age was 64.4 years. About 15.2% of all confirmed cases were nursing home residents. A total of 269 deaths occurred among 1,828 confirmed cases with an overall case fatality of 14.7%.

About 64.4% of patients were hospitalised, 5.6% at the ICU. Noninvasive mechanical ventilation was used in 9% of all confirmed cases. A total of 29% confirmed cases sought medical assistance more than once and 6.1% were readmitted to hospital over the course of this study. The median number of days from the discharge date and the readmission date was 12.2 days (SD 8.9). On April 29 there were 18 inpatients and 4 patients in ICU. The average length of hospital stay for all patients was 9.9 days, with a minimum of 23 hours and a maximum of 89 days. The average length of hospital stay for critically ill patients was 14.4 days, with a minimum of 23 hours and a maximum of 80 days. Regarding the length of stay, we identified significant statistical differences between the 2 groups (P value <.01 among hospitalised patients and P value <.01 among critically ill patients). Hospitalisation status according to gender and age group is shown in Figure 4.

Statistically significant differences between cases confirmed by PCR or clinical diagnosis of COVID-19 were observed in age, length of hospitalisation and ICU stay, deceased patient hospitalisation status and known health care professionals. All these parameters were higher in patients who were diagnosed with COVID-19 by positive PCR testing. Baseline characteristics and length of stay at different hospital departments of PCR and clinically confirmed cases are presented in Table 1. Figure 5 shows the distribution of the confirmed cases’ country of birth. We observed that most of the patients were born in Spain, as expected, followed by South American countries. 77.2% (CI 95% 75.3-79.2) of all confirmed cases were born in Spain and 18.3% (CI 95% 16.5-21.1) in Latin America and the Caribbean. The remaining were as follows: Europe 2.1% (CI 95% 1.5-2.9), Africa 1.5% (CI 95% 1.0-2.2), Asia 0.7% (CI 95% 0.3-1.1) and North America 0.2% (CI 95% 0.0-0.5). Statistically significant differences in age, gender, hospital admission and death were observed between people born in Spain and Latin America and the Caribbean (Supplementary Table 2). Latin Americans accounted for 14.9% of all hospital admissions, 23.3% of all ICU admissions and 24.1% of all deaths.
admissions and 5.2% of all deaths. 7.2% of all Latin Americans were admitted to the ICU. We observed that 50.6% of under 60-year-old Spaniards were admitted to hospital and 3% to ICU. By contrast, 46.7% of under 60-year-old Latin Americans were hospitalised and 6.5% were admitted to the ICU.

**Epidemiological curve**

Figure 6 shows the COVID-19 epidemic curve with number of cases plotted by date of diagnosis from February 27 to June 29, 2020. A trend line of total daily confirmed, hospitalised, ICU-admitted and deceased cases by date of diagnosis is represented. Before March 14 only sporadic cases/day were diagnosed. We observed a biphase epidemiological curve whose peak occurred between March 20 and March 23, whereas hospital and ICU admissions remained stable. Since then, diagnosis of new cases has declined.

**DISCUSSION**

The first confirmed case at HUIS occurred on February 27. The greatest health care pressure observed at our centre was reached between March 20 and March 23, which coincides with the epidemiological curve’s peak reported at national level. 24,491 people were attended at our ED during the study period, of which 1,828 were confirmed COVID-19 cases. To cope with the extreme health care pressure, our centre increased its number of ICU beds by 400% and its hospitalisation beds by 39.2% in just a few days.

We observed that more than half of our confirmed cases occurred in the male population (51.6%). However, this differs from the latest published national findings from May, where 56.6% of all cases were reported in women. Furthermore, our findings show a median age of 64 years, which is slightly higher than the national 60 years. In that sense, the most affected age groups in our study corresponded to 40-49 years (14.3%) and ≥ 80 years (22.5%).

**Table 1**

| Results | SARS-COV-2 confirmed cases | P Value |
|---------|-----------------------------|---------|
|         | Patients with positive PCR (n = 1,243; 68%) | Clinical diagnosis (n = 585; 32%) |       |
| **Characteristics of patients** | | | |
| Age | | | |
| average in years, (SD) | 63.4 (18.6) | 66.6 (18.7) | .01 |
| Age group in years (%) | | | |
| < 2 | 2 (0.2%) | 0 (0%) | .04 |
| 2-4 | 0 (0%) | 0 (0%) | |
| 5-14 | 0 (0%) | 0 (0%) | |
| 15-29 | 56 (4.5%) | 14 (2.4%) | |
| 30-39 | 80 (6.4%) | 32 (5.5%) | |
| 40-49 | 178 (14.3%) | 84 (14.4%) | |
| 50-59 | 194 (15.6%) | 78 (13.3%) | |
| 60-69 | 206 (16.6%) | 92 (15.7%) | |
| 70-79 | 247 (19.9%) | 102 (17.4%) | |
| ≥ 80 | 280 (22.5%) | 183 (31.3%) | |
| Gender | | | |
| Male (%) | 653 (52.5%) | 291 (49.7%) | .27 |
| Female (%) | 590 (47.5%) | 294 (50.3%) | |
| Known health care professional | | | |
| Yes (%) | 31 (2.5%) | 2 (0.3%) | .01 |
| **Characteristics of hospital admission** | | | |
| Emergency Department | | | |
| Patients currently discharged (%) | 1,242 (99.6%) | 583 (99.7%) | .20 |
| Average stay in days at the Emergency Department, (SD) | 1.2 (0.9) | 1.2 (0.8) | .74 |
| Number of times patients were attended at Infanta Sofía University Hospital (%) | | | |
| 1 | 896 (72.1%) | 402 (62.7%) | .38 |
| 2 | 241 (19.4%) | 114 (19.5%) | |
| 3 | 73 (5.9%) | 47 (8%) | |
| 4 | 21 (1.7%) | 15 (2.6%) | |
| 5 | 6 (0.5%) | 4 (0.7%) | |
| 6 | 6 (0.5%) | 3 (0.5%) | |
| Number of patients who have been to the hospital more than once (%) | 347 (27.9%) | 183 (31.3%) | .14 |
| Hospitalisation | | | |
| Patients who were hospitalised (%) | 804 (64.7%) | 335 (57.3%) | <.01 |
| Patients currently discharged (%) | 801 (98.3%) | 358 (98.4%) | .82 |
| Patients currently hospitalised as of June 29, 2020 | 12 (15.3%) | 6 (22.0%) | .82 |
| Average stay in days of hospitalisation, (SD) | 11.1 (12) | 8.1 (8.4) | <.01 |
| Readmission (%) | 61 (4.9%) | 51 (8.7%) | |
| Intensive care unit | | | |
| Patients who were admitted to the ICU (%) | 83 (6.7%) | 20 (3.4%) | .00 |
| Patients currently discharged (%) | 79 (95.2%) | 20 (100%) | .32 |
| Patients currently hospitalised as of June 29, 2020 | 4 (4.8%) | 0 (0%) | .32 |
| Average stay in days in ICU, (SD) | 18.8 (8.0) | 7.5 (3.0) | .02 |
| Mortality | | | |
| Number of deaths (%) | 195 (15.7%) | 74 (12.7%) | .08 |
| Emergency department | | | |
| Hospitalisation | 19 (9.7%) | 17 (22.9%) | -.01 |
| ICU | 142 (72.8%) | 55 (74.3%) | |
| Standard deviation (SD). Percentages were calculated from the total number of patients in each group (patients with positive PCR and clinical diagnosis). Source: own elaboration.
to older ages than those observed nationally. A reason for this could be the fact that young and healthy people might have been attended at Primary Care, thus not having sought medical assistance at our centre. Nonetheless, hospitalisation differed significantly, with 64.4% of all confirmed cases requiring hospital admission, compared to 38.4% nationwide, although ICU admission was similar to the national level. These differences could be due to the fact that mild cases were attended at Primary Care and did not need hospitalisation. A second reason could be population characteristics in our area. San Sebastián de los Reyes and its surroundings host a large number of nursing homes whose patients received mainly medical care at their own institution. Another reason for these differences could be due to a greater admission capacity, since our centre increased its bed number by 127 beds. The mortality in Spain is 11.4%, lower than ours.

**Fig 5.** Distribution of country of birth of confirmed cases through June 29. A total of 1,828 cases is shown. Source: own elaboration.

**Fig 6.** Epidemiological curves of COVID-19 at Infanta Sofía University Hospital through June 29. The epidemiological curve shows the progression of diagnosis of new cases in the outbreak over time from February 27 to June 29. A total of 1,828 cases are shown and confirmed cases (blue) are compared to admitted cases (green), ICU-admitted cases (yellow), and deceased cases (red). The line represents the trend and the dots total daily cases. Source: own elaboration.
Again, this could be due to the people attended at Primary Care and to our population’s advanced age. Our data are a hospital series while the national data are global including hospitalised and primary care patients. Interestingly, Madrid’s mortality rate is also slightly higher than the national one (11.7%). This could be because Madrid is one of the epicentres of the pandemic in Spain, its cumulative incidence of 15.5 as of June 30 being higher than that of most other regions in the country.

The number of over 80-year-old women admitted to hospital is higher than men which reflects the higher proportion of women over 80 years old in Madrid’s population, we do not find disproportion in our data. Another interesting result we would like to point out is the fact that the median stay at the ED was short, even for those patients that sought hospitalisation and in spite of the enormous health care pressure we experienced at our centre. This was thanks to the changes that were implemented to cope with this situation.

Our study shows statistically significant differences in length of stay between cases confirmed by PCR or clinical diagnosis of COVID-19. Patients who were tested positively for SARS-CoV-2 stayed longer not only at the ED but also at the ICU and other hospitalisation departments. Case confirmation by clinical diagnosis was introduced on March 17 as a result of PCR testing kits shortage across different hospitals throughout the region and growing pressure on Spanish healthcare facilities. Therefore, first cases of COVID-19 at our centre correspond to patients who presented a positive PCR, when little was known about this new virus. However, we would like to point out that clinical diagnosis criteria changed over the weeks, thus complicating a homogeneity among clinically diagnosed cases. At first, clinical diagnosis criteria were very restrictive, but they were constantly changed over time.

Confirmed cases attended in our centre on more than one occasion were 19% of all confirmed cases. This could be because of the disease’s natural course. The patients’ condition shows a tendency to worsen around between 5 and 10 days from the onset of symptoms. Some cases present a clinical duration of several weeks.

We observed that, although most of our confirmed cases were Spanish citizens, many people born in Latin America and the Caribbean were also affected. Approximately 9.2% of our area’s population are people born in Latin America. These patients showed a longer ICU stay at younger ages. Racial variations in COVID-19 deaths could be a result of androgen receptor genetic variants. Socioeconomic disparities could be another reason, as they influence nutritional status and a delayed search for medical assistance. Further studies, especially those who analyse interracial variations or the impact of socioeconomic factors on COVID-19 disease, are necessary.

Our findings showed a bifasic curve. Unlike other epidemic curves, the date of clinical diagnosis or positive PCR result were used to construct the curve and not the day of symptoms start. Therefore, a time lag of 8-10 days cannot be excluded. In some cases, 7-8 days to construct the curve and not the day of symptoms start. Therefore, certain heterogeneity among patients cannot be excluded.

Moreover, in some cases COVID-19 diagnosis remained uncertain, due to misleading and contradictory clinical, laboratory and radiological findings and a false negative PCR result. These suspected but unconfirmed cases were not taken into account. By excluding these unconfirmed cases, our analysis gains specificity.

The definition of clinically diagnosed patients differed throughout time. Therefore, certain heterogeneity among patients cannot be excluded.

Additionally, the use of country of birth to define possible differences among different ethnic groups, could lead to the exclusion of those people who were born in Spain to foreign parents or to the inclusion of Spanish citizens who were born abroad.

Another limitation is the fact that length of admission and median length of stay was calculated including patients who were still hospitalised.

Furthermore paediatric care was reorganised and centralised in the Madrid Region. Therefore, all paediatric cases except for those attended before March 21, were transferred. This could lead to an underestimation of confirmed cases at young ages.

Finally yet importantly, due to the enormous health care pressure certain patients had to be transferred from the ED to other centres and were excluded our analysis. Hospitalisation would have been higher if we had included these cases.

Considering all these limitations, although our findings could lack certain generalizability and applicability to other populations, we consider our results precious information to broaden current knowledge about the COVID-19 epidemic dynamics, as well as demographic population characteristics.

CONCLUSIONS

During the period from February 27 until June 29, 16.6% of all attended cases at our ED were confirmed COVID-19 cases. To cope with the outbreak hospitalisation beds at our centre increased by 39% and ICU beds by 400%. About 64.4% of all confirmed cases were hospitalised, 5.6% of whom at the ICU. Approximately, 14.7% of all confirmed cases deceased at our centre. Contingency plans to avoid further spread and collapse of health care facilities are recommendable and need to be developed. It would be interesting to compare our results to the observed epidemiological features of cases in other European hospitals of the same characteristics as ours. So far, no such studies have been reported.

According to our results, the most affected group were 60-79-year-old males who required hospital admission more often and...
showed a higher number of deaths. Latin Americans also showed a higher level of ICU hospitalisation. Our study also shows statistically significant differences between patient characteristics and hospital stay between PCR confirmed and clinically diagnosed cases. Further studies are necessary to elucidate whether these variations are due to dissimilarities in epidemiological patient characteristics.

Acknowledgments

The corresponding author's affiliation centre belongs to the Consejería de Sanidad, Madrid. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

We would like to thank Mr Edrit Franquiz Salinas, senior consultant at EY Switzerland, for his technical support and advice; and Ms Catherine L. Morley and Ms Zaida Herrador for their valuable inputs and review.

We would also like to recognise the effort and commitment shown by all health care workers, first responders and essential personnel who have fought against one of the biggest public health crisis our country has ever experienced.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.ajic.2020.07.014.

References

1. Spanish Ministry of Health. New coronavirus disease. https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Informacion_inicial_alerta.pdf. Accessed April 26, 2020.
2. Reuters. Wuhan lockdown ‘unprecedented’, shows commitment to contain virus; WHO representative in China. https://www.reuters.com/article/us-china-health-who-idUSKBN1Z1M1C0. Accessed April 26, 2020.
3. World Health Organization (WHO). WHO Director-General’s opening remarks at the media briefing on COVID-19. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11-march-2020. Accessed April 26, 2020.
4. World Health Organization (WHO). SARS: a puzzling and difficult new disease. Severe Acute Respiratory Syndrome (SARS): Status of the Outbreak and Lessons for the Immediate Future2003. Available at: https://www.who.int/cs/media/sars_wha.pdf?ua=1. Accessed April 26, 2020.
5. Liu Y, Gayle AA, Wilder-Smith A, Rocklov J. The reproductive number of COVID-19 is higher compared to SARS coronavirus. J Travel Med. 2020;27:taaa021.
6. Kwock KO, Lai F, Wei WI, Wong SYS, Tang JWT. Herd immunity - estimating the level required to halt the COVID-19 epidemics in affected countries. J Infect. 2020;80:e32–e33.
7. World Health Organization (WHO). Middle East respiratory syndrome coronavirus (MERS-CoV). Available at: https://www.who.int/news-room/q-a-detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov). Accessed April 26, 2020.
8. European Centre for Disease Prevention and Control (ECDC). Situation update worldwide, as of 26 April 2020. Available at: https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases. Accessed April 26, 2020.
9. World Health Organization (WHO). Summary of SARS and air travel. Available at: https://www.who.int/csr/travel/airtravel/en/. Accessed April 26, 2020.
10. Hodcroft EB. Preliminary case report on the SARS-CoV-2 cluster in the UK, France, and Spain. Swiss Med Wkly. 2020;150:20212.
11. Spanish Ministry of Health. Update 31: Coronavirus disease (COVID-19). Available at: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_31_COVID-19.pdf. Accessed April 26, 2020.
12. Spanish State Official Newsletter (BOE). Royal Decree 2210/1995, of December 28, creating the National Epidemiological Surveillance Network. Available at: https://www.boe.es/buscar/doc.php?id=BOE-A-1996-1502. Accessed April 27, 2020.
13. Carlos III Health Institute (ISCIII). Report on the Situation of COVID-19 in Spain: Report n° 33 [Internet]. Madrid; ISCIII; May 29, 2020. Available at: https://www.isciii.es/QueHacemos/Servicios/VigilanciaSaludPublicaRENAVE/EnfermedadesTransmisibles/Documents/Informes/Fichas/SARS-CoV-2020/Informe%2033_COVID-19_Estrategia_vigilancia_y_control_e_indicadores.pdf.
14. Spanish State Official Newsletter (BOE). Royal Decree 2210/1995, of December 28, creating the National Epidemiological Surveillance Network. Available at: https://www.boe.es/buscar/doc.php?id=BOE-A-1996-1502. Accessed April 27, 2020.
15. Spanish Ministry of Health. Update 49: Coronavirus disease (COVID-19). Available at: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_49_COVID-19.pdf. Accessed April 27, 2020.
16. Spanish National Statistics Institute (INE). Distribution by Age Groups and Gender, Madrid Region [Internet]. Madrid; INE; 2020. Available at: https://www.ine.es/jaxi/dataset/pobreza-sociale/0202032014pdf. Accessed April 27, 2020.
17. Spanish Ministry of Health. Coronavirus Disease (COVID-19) Procedure [Internet]. Madrid: Spanish Ministry of Health; 2020. Available at: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_49_COVID-19.pdf. Accessed April 27, 2020.
18. Madrid Statistics Institute. Population Classified According to Place of Birth [Internet]. Madrid: Madrid Statistics Institute; 2016. Available at: http://www.madrid.org/iestadis/fijas/estructura/-demograficas/padron/pcc15ext.htm. Accessed April 27, 2020.
19. Madrid Statistics Institute (INE). Distribution by Age Groups and Gender, Madrid Region [Internet]. Madrid; INE; 2020. Available at: https://www.ine.es/jaxi/dataset/pobreza-sociale/0202032014pdf. Accessed April 27, 2020.
20. McCoy J, Wambier CG, Vano-Galvan S, et al. Racial variations in COVID-19 deaths may be due to androgen receptor genetic variants associated with prostate cancer and androgenetic alopecia. are anti-androgens a potential treatment for COVID-19? J Cosmet Dermatol. 2020;19:1542–1543.
21. Pathirana TI, Jackson CA. Socioeconomic status and multimorbidity: a systematic review and meta-analysis. Aust N Z J Public Health. 2018;42:186–194.
22. Darmon N, Drewnowski A. Contribution of food prices and diet cost to socio-economic disparities in diet quality and health: a systematic review and analysis. Nutr Rev. 2015;73:643–660.
23. Madrid Health Board. The Region reorganises urgent Paediatric Care to avoid possible infections by coronavirus to patients and parental guardians. Available at: https://www.comunidad.madrid/sites/default/files/doc/sanidad/comu/200321_comunicado_sanidad_coronavirus_centros_urgencias_atencion_pediatrica_0.pdf. Accessed April 28, 2020.