



Review Paper

Epidemiology of COVID-19 in the most pandemic Countries: A review article

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ABSTRACT

The novel coronavirus SARS-COV-2 or COVID-19 was first discovered in Wuhan, China in late December 2019 and soon became a global pandemic. The virus causes flu-like symptoms and rapidly spread leaving the world in total paralysis and has devastating effects on the health, economic and social levels of most countries. The World Health Organization (WHO) announced the epidemic disease caused by SARS-CoV-2 as coronavirus disease 2019 (COVID-19). Currently, COVID-19 has spread widely around the world, affecting more than seventy countries. In this review, we summarized the epidemiological characteristics, clinical features, and transmission routes of COVID-19. A comprehensive understanding will help to control the disease.

Key words: COVID-19, Epidemiology, Transmission routes.

INTRODUCTION

Since emerging in Wuhan, China, in December 2019, the coronavirus disease 2019 (COVID-19) epidemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has progressed rapidly into a pandemic (Rim et al., 2020). COVID-19 is characterized by fever, cough, fatigue, shortness of breath, pneumonia and other respiratory tract symptoms (WHO, 2020; Chen et al., 2020; Li et al., 2005) and in many cases progresses to death (Figure 1). As of October 11, 2020, there have been 37,501,260 confirmed Coronavirus Cases, divided into: Deaths: 1,077,951, Recovered: 28,145,941 (Huang et al., 2020). Most cases were initially confined to Hubei province in China, but there has since been substantial spread not only elsewhere in China but worldwide. A rapid and robust response by the global scientific community has described many important aspects of SARS-CoV-2 transmission and natural history (Guan et al., 2020; Liu et al., 2020; WHO, 2020), but key questions remain.

Prevalence in China

Local hospitals in Wuhan, China reported on 31 December

2019 that a group of cases were infected by corona virus (Rim et al., 2020). On 9 January 2020, WHO identified the causative agent of these infections as "2019-nCoV" (WHO, 2020). On the same date, Huanan seafood market was identified as the site of elementarily exposure event, then on 11 January 2020 this market was closed and several studies proposed that bats may be the potential reservoir of SARS-CoV-2, knowing that recently these bats considered a natural reservoir of MERS-COV and SARS-COV viruses (Chen et al., 2020; Li et al., 2005). On 2 January 2020, 41 patients were admitted to the hospitals as having laboratory-confirmed COVID-19 infection, less than half of these patients had hypertension, diabetes and cardiovascular disease (Huang et al., 2020). On 14 February 2020, Guan et al., reported the most commonly method for transmission of COVID-19 in China and it was divided into: 31.3% of patients travelled to Wuhan recently, 72.3% of patients contacted with people non-residents of Wuhan and 3.8% of the patients infected with corona virus were healthcare workers (Guan et al., 2020).

All available evidence indicates that corona-virus is transmitted by cough and vomit droplets of patients and reach to nose, eyes or mouth of healthy people. However,

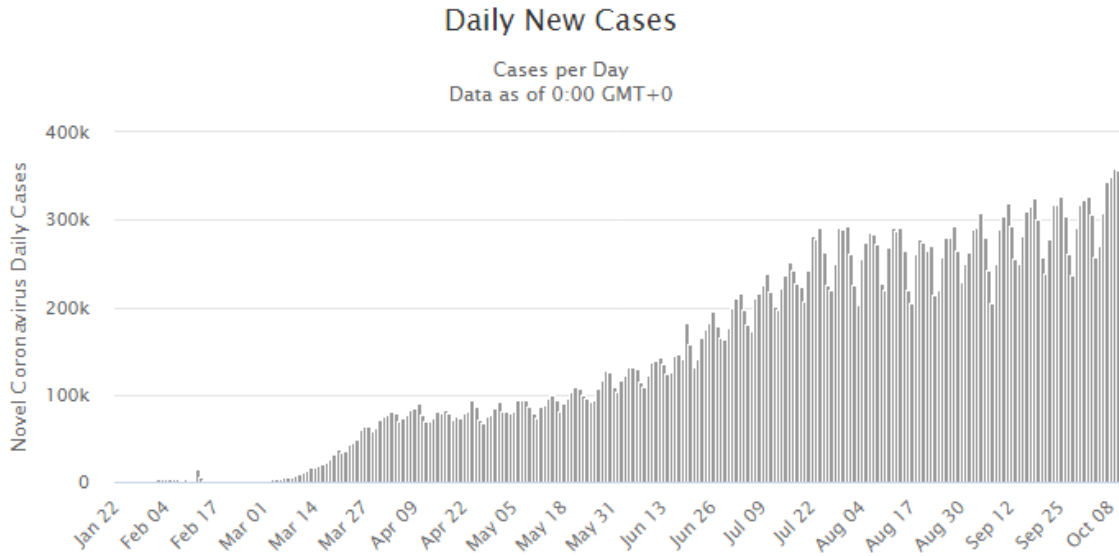


Figure 1: Daily new coronavirus cases worldwide till 11 Oct.

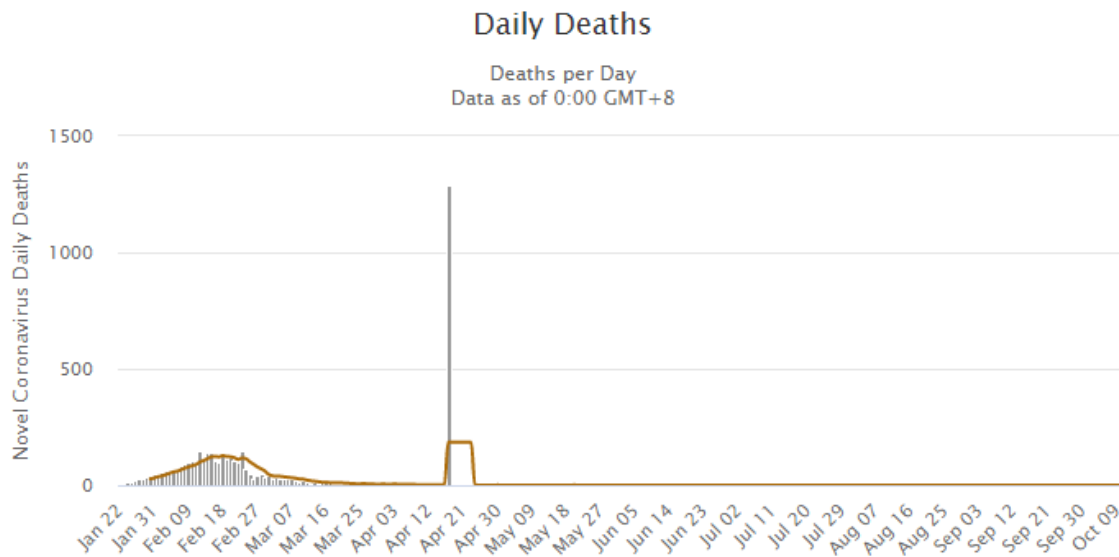


Figure 2: Illustrate the daily death average by novel coronavirus.

when heavy droplets had landed on surfaces, other people may be in close contact with these contaminated surfaces and touched their mucous membranes (Huang et al., 2020; Liu et al., 2020). On 26 March 2020, WHO reported that total confirmed cases in China reached 81961 and total deaths were 3293 and the transmission classification of COVID-19 between patients was local transmission (WHO, 2020). On 11 October 2020, there were just 218 infected patients and their health condition ranged from mild to moderate and no critical case was recorded. We also note that after April 23, the death cases that were recorded may

be non-existent as it is shown in Figure 2, indicating an improvement in the medical situation, the strictness of the preventive and precautionary measures applied there. World Health Organization (WHO) still recommend that we have to wash our hands frequently, clean and decontaminate surfaces, also keeping social distancing and be aware of contact with people which they have fever or respiratory symptoms, that could limit viral transmission. It is also recommended to use medical masks for those who deal with COVID-19 patients such as FFP2 or FFP3, N95 masks (WHO Infection Prevention and Control Guidance

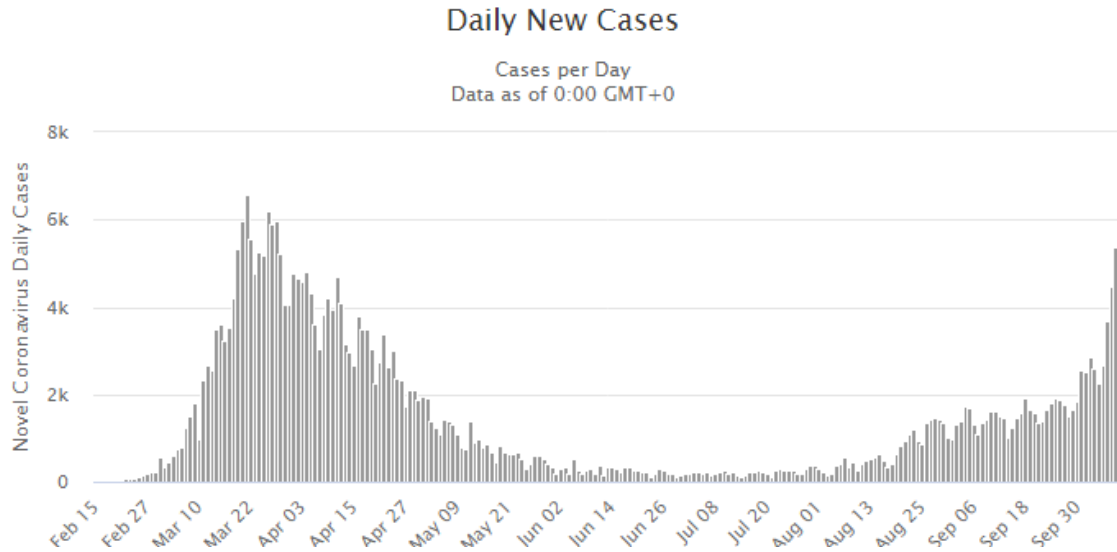


Figure 3: Demonstrate the new increase in coronavirus prevalence.

for COVID-19).

Prevalence in Iran

The first two reported cases in Iran were on 19 Feb 2020 as two patients in Qom city were infected (Abdi, 2020), these two cases were registered in the report-31 of WHO COVID-19 states reports (WHO, 2020). The legislative elections in Iran were announced on 21 Feb 2020 which contributed with the rapid prevalence of the COVID-19 epidemic, due to the congestion without any protection equipment and the high travel rate between cities in the time of NAIROUZ Persia New Year which also increased the risk of virus prevalence (Abdi, 2020). After the first week, the number of confirmed cases reached 141 patients and the number of deaths was 10 times more than the first case confirmed according to the 38th reports of WHO in 27 Feb 2020 (WHO, 2020). During the next weeks the confirmed cases increased more rapidly and the number of total cases and deaths were consequently 496,253 and 28,293 according to the (COVID-19) Weekly Epidemiological Update and Weekly Operational Update of WHO issued on 11 October 2020 (WHO, 2020).

Prevalence in Italy

The epidemic of COVID-19 which Italy had suffered emerged in the Lombardy region on the 20th of February, 2020. A case of unidentified not-responding-to-treatment pneumonia was reported, without any connection, the number of proved cases increased to 36 in the second next day (Grasselli et al., 2020; Day, 2020). The main cause of

transmission during the early stages of the epidemic in Italy was traveling. That's what made Lombardia and Veneto regions in Northern Italy the most contagious in the country (Porcheddu et al., 2020). The median age of those infected in Italy is 64. However, 40-50 people have been developing severe types of the disease which take the lives of the elderly ones (Paterlini, 2020). The average age of critically ill patients in need of intensive care was 69, with 44% above the age of 70 and a significant percentage of 30, consequently, they represent an important cause of transmission Covid-19. Therefore, Lombardia has made 1000 beds for patients in need of intensive care (Paterlini, 2020). From March 1 up until March 11, the percentage of patients need intensive care was 9% to 11% of actively infected people (Remuzzi et al., 2020). On March 26, 2020, total confirmed cases were 74386, correspondingly new cases are still reported, a total of 7505 deaths occurred among confirmed cases (WHO, 2020).

On March 8, 2020, the Italian government made an important step limiting disease transmission in the region of Lombardy by not only making the test for people who show clinical symptoms but also for those who have no symptoms. Because of the catastrophic situation, medical authorities encouraged asymptomatic doctors who come into contact with coronavirus patients to continue working with very effective precaution. Moreover, they made some specialists work outside their fields, such as gastroenterologists and cardiologists. The median age of death is 81 years with more than two-thirds of these patients having chronic underlying diseases (diabetes, hypertension, heart disease, etc.) the percentage of female patients was 20%. From August 25, Italy has returned to record a new increase in infections as shown in Figure (3), which is feared to be as a new wave of spread, where WHO

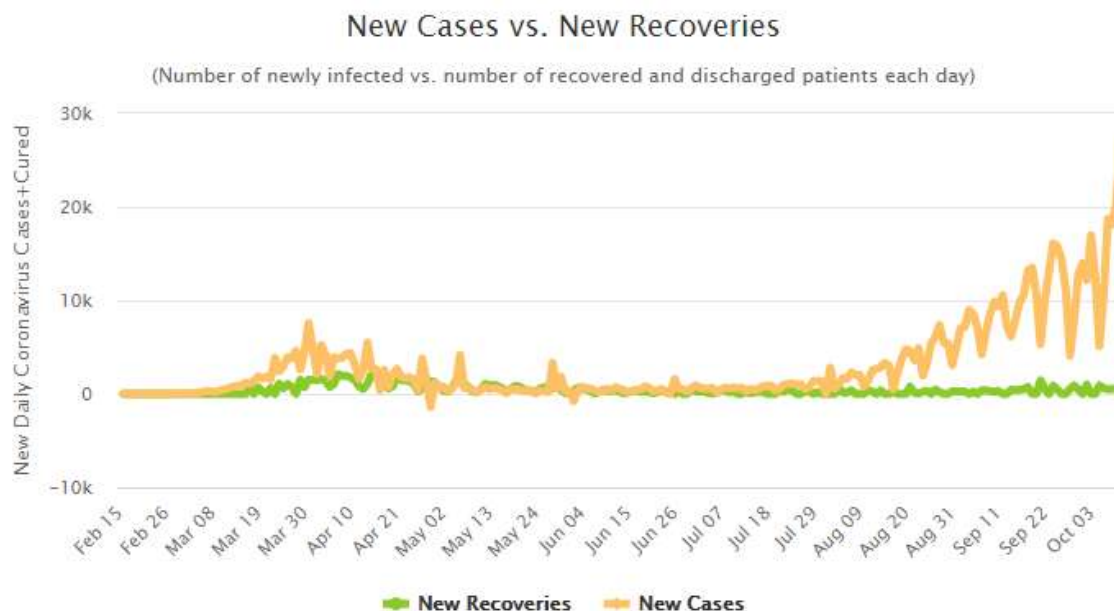


Figure 4: New cases vs. new recoveries in France.

recorded 74,829 active cases, including 390 cases (1%) classified as critical condition on October 11, 2020. Last but not least, Italian society is hugely affected by psychological, social and economic levels with predictions to plunge into a recession (Paterlini, 2020; Remuzzi et al., 2020).

Prevalence in France

In January 2020, strengthened surveillance of COVID-19 cases was implemented to identify imported cases early and to prevent secondary transmission in the community or among healthcare workers. On 24 January 2020, the first three imported cases of COVID-19 identified in France referred to persons with arecent stay in Wuhan. Two cases were detected in Paris and one in Bordeaux (Sibylle et al., 2020). Case 1 was a 48-year-old male living in France, he was travelling for professional reasons in China, Wuhan on 16 January and flew back to Bordeaux on 22 January, while case 2 was a 31-year-old Chinese male tourist who arrived in Paris on 19 January and travelled with 30-year-old Chinese female tourist (case 3) (Sibylle et al., 2020). The first cases on the European continent were diagnosed in France on 24 January 2020, while, the first case outside of China was confirmed in Thailand (WHO, 2020). As of March 5, 2020, the European Centre for Disease Prevention and Control (ECDC) reported 91315 COVID-19 confirmed cases in 81 countries and 3282 deaths (3,4%). In Europe, France was ranked the second country after Italy with 423 confirmed cases and 5 deaths (1.2%) (Santé Publique France, 2020). On the 7th March 2020, Santé Publique France reported 949 confirmed cases leading to 11 deaths

(1.2%) (Julie et al., 2020). As of 10 March, the most two affected regions in France, were Grand Est with 489 cases and Ile-de-France with 468 cases and the most affected people were aged over 75 years. On midnight of 10 March, 2020, 2030 cases were confirmed resulting 44 deaths (2.2%) and 102 cases had been hospitalized into Intensive Care Units (ICU), 38% of them were 65-year-old or less. Between 8-11 March, the number of cases increased from 1126 to 2269, and from 2,269 to 4469 cases between 11-14th March [24]. On 11th October, 2020, there were a total of 718,873 coronavirus cases registered in all of France with 32,637 deaths (WHO, 2020), Figure 4 reflect the new cases vs. new recoveries in France.

After modeling the propagation of COVID-19 from March 10 to April 14, across all French regions the total number of infected cases were expected to range from 22872 in the best case ($R_0=1,5$) to 161832 in the worst considered case ($R_0=3$) and the total number of death were expected to vary from 1021 to 11032 but the worst did not happen due to the strict measures and the imposition of lockdown and restrictions (Clément et al., 2020). The basic reproductive number (R_0) was rated in different studies beginning at 1.4 up to 7.23. For France the R_0 was between 1.4 and 2.3 on 13 March 2020, therefore, to reduce the R_0 , countries implemented serious control strategies including quarantine, isolation measures to minimize risk. In France, 138 hospitals were identified as a referral centers for the treatment of COVID-19 cases. The population was divided into 17 age-groups (5 years age-band) and can be either susceptible(S), exposed to the virus but not infectious (E), infectious (I) and removed from the chains of infection (R). Also the Intensive Care Unit (ICU) capacities were identified

Table 1: Persistence of some strain of SARS-COV on some surfaces.

Specie of surface	Virus	Strain	Persistence
Metal	SARS-COV	Strain P9	5 d
Wood	SARS-COV	Strain P9	4 d
Paper	SARS-COV	Strain P9	Dependent on
		Strain GVU 6109	Inoculum
Glass	SARS-COV	Strain P9	4 d
Plastic	SARS-COV	Strain P9	4 d
		Strain FFM1	6-9 d
Disposable gown	SARS-COV	Strain GVU6109	Dependent on Inoculum From 1-2 d

in each French region that would be overrun by the COVID-19 epidemic, in the worst case with $R_0=2.25$ half of French region will be overrun before 14 April 2020 (Clément et al., 2020). In addition to that, since early February five French laboratories capacities had reinforced to be able to perform the diagnostic for COVID-19 and Santé Publique France deployed the outbreak investigation tool developed by the WHO to facilitate case data management at the national and local level in France (Sibylle et al., 2020).

Prevalence in United States

In United States, the first confirmed case of infection reported on 20 January 2020. The patient returned from a visit to Wuhan, China but he reported that he had not spent any time at the Huanan seafood market and no known contact with ill person during his visit (Holshue et al., 2020). On 31st January 2020 the United States declared public health emergency to respond to the new epidemic. After that, on 4 February 2020, 11 cases of COVID-19 had been reported (Patel and Jernigan, 2020). On 26th February 2020, 12 travel-related cases had been diagnosed, three cases with no travel history and 46 cases among repatriated citizens (Burke, 2020). There was no death in USA as of the end of February 2020 (Chih-Cheng et al., 2020). On 14th March 2020, the number of total confirmed cases was 1678 and 41 deaths in total (<https://www.who.int/docs/default>). These numbers still stable until 17 March when there were 1825 new cases and more than 15 new deaths (<https://www.who.int/docs/default>). According to WHO reports, the incidence and mortality rate severely increased exceeding numbers in China where the total case reached to 7,945,945 on 11 October, 2020, with 219,291 death cases. At least 13 states have reported more than 100,000 coronavirus infections and four of them California, Florida, Texas and New York -- have recorded more than 400,000. California, with more than 516,000 positive cases, has been reported to the most infections in the nation. The statistics from Jan 20 to 4 August 2020 show a total of 4,629,459 confirmed cases of COVID-19 with 154,226

deaths (<https://www.cdc.gov/covid-data-tracker/#cases>).

Transmission Routes

Previous studies showed that corona virus can survived only 2 days in hospital wastewater and in dechlorinated tap water at 20°C (Wang et al., 2005). World Health Organization reported that COVID-19 has not been discovered in drinking-water fittings and the risk to water supplies is low (WHO, 2017). Laboratory studies demonstrated that the water contaminated with feces of infected patients could promote the survival of the virus for days to weeks (Casanova et al., 2009). Besides transmitting by droplet, the oral-fecal route is considered as a crucial route to spread the virus. Earlier, SARA-CoV and MERS-CoV are proved to transmit by stools. Thus, it is possible to transmit SARS-CoV-2 via the fecal-oral route. Therefore, it is crucial to get rid of patients' fecal in an exceedingly hygienic way (Yeo et al., 2020; Gu et al., 2020). Wei et al reported that there is no relationship between absolute humidity and transmission of COVID-19 (Wei et al., 2020). Lately, one study showed that SARS-COV2 still in the aerosol for 3 h, 72 h on plastic and for 48 h on stainless steel, no viable SARS-COV2 was measured on copper and cardboard after 4 h, 24 h respectively. In addition, the novel coronavirus stayed for up to seven days on the outer layer of a surgical mask and for two days on a cloth, but the virus was killed in three hours on printing paper like newspapers (<https://www.dailymail.co.uk/sciencetech/article-8160885/>). As for SARS-COV1 it had a half-life approximately 1.1 to 1.2 in aerosols, and no viable SARS-COV1 was measured after 8 h on copper and cardboard, therefore it stayed up to 72 h on plastic and for 48 h on stainless steel similar to SARS-COV2 on these surfaces (Table 1). It still may be contagious for 2 h-9 days. However, this can be related to the temperature of the environment for instance 30°C to 40°C can decrease the period of presence. On the contrary, 4°C would raise the period of persistence to over than 28 days (Kampf et al., 2020).

CONCLUSION

COVID-19 disease is still a challenge to all health organizations and works, due to its uncontrolled distribution and high fetal capability in high risk patients such as diabetic, cancer, asthma patients. We need urgently new strategies to stop the rapid spread of this virus especially a active vaccine that passes all the clinical trials.

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