



Overview of COVID-19 cases in the USA and Globally

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- Received Date: 02 Feb 2021
- Accepted Date: 07 Feb 2021
- Publication Date: 15 Feb 2021

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Abstract

Reported by WHO, up until December 29, 2020, there have been 79 million COVID-19 infected cases and over 1.7 million deaths across the world posing a serious risk to public health. Those infected with COVID-19 have symptoms varying from asymptomatic to a common cold like illness to severe pneumonia, severe acute respiratory distress syndrome, neurologic and hepatic disease, and death. The most common symptoms of SARS CoV-2 infected patients are fever, cough, shortness of breath, fatigue, mental confusion, sore throat, headache. COVID-19 has an incubation period of 2-14 days. Droplet inhalation from coughing, sneezing, or coming in close contact with COVID-19 infected cases is found to be the most common mechanism through which people have and continue to acquire this infection. In addition, touching the contaminated surfaces and inhaling COVID-19 particles from contaminated air can also escalate the risk of developing COVID-19 infection. During these unprecedented times, the COVID-19 pandemic is still on the rise. As of the December 21, 2020, there are about 77,242,026 million confirmed cases globally. Active cases as of December 21, 2020 were 21,389,271 cases worldwide of which 106,319 were in serious or critical condition. With this manuscript we provide an overview of incidence and mortality rate of COVID-19 cases in the United States of America (USA) and globally.

Epidemiology

In December 2019, the first case of severe acute respiratory syndrome coronavirus (SARS CoV-2) was reported in Wuhan, China. SARS CoV-2 virus rapidly disseminated infecting humans throughout China and spontaneously to the rest of the world. In February 2020, the World Health Organization (WHO) named this virus COVID-19, and in March 2020 declared a pandemic [1]. COVID-19 has taken numerous lives across the globe. Reported by WHO, up until December 29, 2020, there have been 79 million COVID-19 infected cases and over 1.7 million deaths across the world posing a serious risk to public health. Italy and Spain were the most affected countries at the beginning of the pandemic.

COVID-19 belongs to a family of coronavirus which also consists of Middle East respiratory syndrome coronavirus and severe acute respiratory syndrome-related coronavirus. Due to some similarities with SARS CoV-2 virus, such as having a similar receptor binding gene region and using the same receptor angiotensin converting enzyme (ACE) to penetrate human cells, it was given the name SARS CoV-2 [2,4]. COVID-19 is a positive sense single-stranded

enveloped RNA virus belonging to the beta coronavirus family.

Those infected with COVID-19 have symptoms varying from asymptomatic to a common cold like illness to severe pneumonia, severe acute respiratory distress syndrome, neurologic and hepatic disease, and death. The most common symptoms of SARS CoV-2 infected patients are fever, cough, shortness of breath, fatigue, mental confusion, sore throat, headache [3,5,6]. COVID-19 has an incubation period of 2-14 days. All age groups are vulnerable to SARS CoV-2 with age greater than 60 years old being even at higher risk with males and females equally at risk.

At the onset of the pandemic, China's Center of Disease Control (CDC) reported that the virus is a zoonotic disease and is acquired through exposure to live wild animals (pangolins and snakes) sold in Hunan seafood market [1]. This reporting was derived after noticing a group of infected patients with SARS CoV-2 all of whom had visited this seafood market. However, as the number of COVID-19 infected cases increased rapidly even in those who didn't have any history of visiting such a market, it was discovered that the virus spreads via human-to-human contact.

Citation: Khan I, Naffa F, Hankins E, et al. Overview of COVID-19 cases in the USA and Globally. *Med Clin Sci.* 2021;3(1):1-8.

Droplet inhalation from coughing, sneezing, or coming in close contact with COVID-19 infected cases is found to be the most common mechanism through which people have and continue to acquire this infection. In addition, touching the contaminated surfaces and inhaling COVID-19 particles from contaminated air can also escalate the risk of developing COVID-19 infection [5,6].

General View of Morbidity and Mortality COVID-19

COVID-19 has become a cause of significant morbidity and mortality throughout the world. It is a serious public threat due to its high transmission rate and relatively high rate of causing serious complications. It is important to understand the spectrum of illness and identify at-risk populations in order to provide timely and adequate care.

According to the US CDC Morbidity and Mortality Weekly Report released on July 2020, the majority of hospitalizations and deaths reported had one or more underlying medical conditions or were aged >65 years [7,11]. Among the most common reported comorbidities were hypertension, cardiovascular disease, diabetes. Chronic kidney disease and chronic lung disease were also included as risk factors associated with increased mortality [7,11,17]. In a large US cohort study, obesity was mentioned as an important underlying condition as well. All of this is consistent with reports describing the characteristics of deaths in patients with COVID-19 in the United States, China and England [11]. Hospitalizations from COVID-19 could be used to assess morbidity while some morbidities are still being evaluated. There is a wide range of clinical severity, from asymptomatic or mildly symptomatic, to severe acute respiratory distress syndrome (ARDS) and fatal multi-organ failure with high mortality [11,12].

It is too soon to know if the severe pulmonary damage observed in some adults who recovered from severe COVID-19 will have any long-term respiratory implications [10]. Evidence has shown that patients who develop several clinical outcomes during disease evolution such as ARDS, cardiac injury, acute kidney disease, DIC, and sepsis, are at increased risk of mechanical ventilation and death [9]. Cardiovascular complications are possible clinical consequences of severe disease, and are one of the most significant and life threatening. Heart failure, arrhythmias, or myocardial infarction are common in patients with COVID-19 pneumonia [19].

A study in the Wuhan population, provided important information about neurologic manifestations, like acute cerebrovascular diseases, impaired consciousness, especially in those with severe disease presentation [18]. The Case-Fatality Rate seen among those with preexisting comorbid conditions is higher, mainly because they are more likely to develop a more serious illness, thus increasing mortality rate [8,20]. Throughout this pandemic, an age-associated susceptibility has been revealed, several studies have reported increased age to be a significant risk factor for COVID-19 mortality [8,11,16,17].

Obesity is well-recognized to be a pro-inflammatory condition with complications such as diabetes and hypertension [13,14]. In fact, the chronic condition with the strongest association with critical illness was obesity, with a substantially higher risk than any cardiovascular or pulmonary disease, according to a large study in New York City [14].

Besides clinical risk factors, a retrospective cohort study, the first large study in the US, identified also several laboratory

risk factors for death in hospitalized patients. Elevated levels of markers as D-dimer, IL-6, cardiac troponin I, lactate dehydrogenase, and lymphopenia were more commonly seen in severe COVID-19 illness [16].

Due to the fluctuating numbers depending on the source of information, it is difficult to predict the exact mortality of COVID-19. Nevertheless, the mortality of critically ill patients with COVID-19 pneumonia is significant.

Global Incidence of COVID-19 Cases

During these unprecedented times, the COVID-19 pandemic is still on the rise. As of the December 21, 2020, there are about 77,242,026 million confirmed cases globally. Active cases as of December 21, 2020 were 21,389,271 cases worldwide of which 106,319 were in serious or critical condition [21]. These numbers of confirmed cases are expected to be lower than the actual number of cases due to limited testing especially in countries with limited resources or in countries who suffer from internal conflicts where testing could be only available to a certain section of the population. Another cause which might also contribute to lower numbers than the actual ones is the recent blast that happened in Lebanon. Hospitals in Lebanon had to shift their attention to help those affected by the blast rather than test for coronavirus.

Climate changes such as high temperature and low humidity have also been associated with an increased incidence of coronavirus. Thus, these changes should be taken into consideration in hospitals and other community settings to try and decrease the number of new cases [22].

By February 29, 2020, COVID-19 had affected 85,403 patients in 57 countries/territories and caused 2924 deaths in 9 countries. The incidence (per 1,000,000 people) ranged from 61.4 in Republic of Korea to 0.0002 in India. Daily cumulative index (DCI) of COVID-19 (cumulative cases/number of days between first reported case and 29 February 2020) was greatest in China (1320.85). High DCIs were also seen in the Republic of Korea (78.78), Iran (43.11) and Italy (30.62). The incidence and mortality were correlated with the DCI [23].

There are several factors that have been affecting the prognosis; most importantly, comorbidities such as chronic lung disease and cardiovascular disease. That's why elderly patients who have such conditions have been suffering from poorer prognosis and higher fatality rates [24].

The USA incidence of COVID-19 Cases

The first case of COVID-19 in the US was identified in February 2020 but wreaked havoc in all 50 states by mid-March. The incidence largely varies across 50 states; however, a rise in the overall incidence rate was seen since February 12, 2020. As of April 7, 2020, it increased from 20.6 to 915.3 cases per 100,000 population. The highest rate reported was in New York City, including 497.3/100,000 people, with total cases documented at 76,876. This was followed by New York (city excluded) (293.1), New Jersey (209.9), and Louisiana (112.4) per 100,000 population with total reported at 61,897, 44,416, and 16,284, respectively [21]. A cohort study investigating the incidence of COVID-19 was conducted in a pediatric population with a mean age of 7.5 years, who were presented for surgery at three tertiary care hospitals in the US. The data was collected from Children's Hospital of Philadelphia in Philadelphia city of Pennsylvania, Texas Children's Hospital in the city of Houston, and Seattle Children's Hospital in Seattle, Washington between March 26, 2020, to April 22, 2020. Although the individual hospital incidence varies, the cumulative incidence rate calculated was 0.93% (12/1295) [22].

Table 1. New cases for all 50 states [26]

State	Date	New Cases/day	Per 100, 000 people
Arizona	Dec 20, 2020	7772	Per 100 K people
California	Dec 20, 2020	43868.50	Per 100 K people
New York	Dec 20, 2020	10872	Per 100 K people
New Jersey	Dec 20, 2020	4379.25	Per 100 K people
Michigan	Dec 20, 2020	3310.25	Per 100 K people
Connecticut	Dec 20, 2020	1250.25	Per 100 K people
Wisconsin	Dec 20, 2020	3640.50	Per 100 K people
Minnesota	Dec 20, 2020	2726.75	Per 100 K people
Iowa	Dec 20, 2020	1638.75	Per 100 K people
Oklahoma	Dec 20, 2020	3902	Per 100 K people
Texas	Dec 20, 2020	14755.25	Per 100 K people
Florida	Dec 20, 2020	11557.75	Per 100 K people
Georgia	Dec 20, 2020	6824.75	Per 100 K people
Alabama	Dec 20, 2020	4203	Per 100 K people
Kentucky	Dec 20, 2020	2907	Per 100 K people
Maryland	Dec 20, 2020	2260	Per 100 K people
Virginia	Dec 20, 2020	3652	Per 100 K people
West Virginia	Dec 20, 2020	1373	Per 100 K people
Massachusetts	Dec 20, 2020	4854.75	Per 100 K people
North Carolina	Dec 20, 2020	6824	Per 100 K people
South Carolina	Dec 20, 2020	3322	Per 100 K people
Missouri	Dec 20, 2020	3231	Per 100 K people
Kansas	Dec 20, 2020	1498	Per 100 K people
Pennsylvania	Dec 20, 2020	8579	Per 100 K people
Utah	Dec 20, 2020	2562.25	Per 100 K people
Louisiana	Dec 20, 2020	2650	Per 100 K people
Indiana	Dec 20, 2020	5876	Per 100 K people
Illinois	Dec 20, 2020	7442.50	Per 100 K people
Idaho	Dec 20, 2020	1127	Per 100 K people
Washington	Dec 20, 2020	2083.75	Per 100 K people
Colorado	Dec 20, 2020	3043.50	Per 100 K people
Alaska	Dec 20, 2020	714	Per 100 K people
Delaware	Dec 20, 2020	671.75	Per 100 K people
District of Columbia	Dec 20, 2020	249.75	Per 100 K people
Maine	Dec 20, 2020	408.75	Per 100 K people
Mississippi	Dec 20, 2020	2172.50	Per 100 K people
North Dakota	Dec 20, 2020	337.25	Per 100 K people
South Dakota	Dec 20, 2020	531	Per 100 K people
Nebraska	Dec 20, 2020	1069.75	Per 100 K people
Montana	Dec 20, 2020	631.50	Per 100 K people
New Mexico	Dec 20, 2020	1409	Per 100 K people
New Hampshire	Dec 20, 2020	777.25	Per 100 K people
Puerto Rico	Dec 20, 2020	1187	Per 100 K people
Oregon	Dec 20, 2020	1327	Per 100 K people
Rhode Island	Dec 20, 2020	400.75	Per 100 K people
Nevada	Dec 20, 2020	2461.75	Per 100 K people
Vermont	Dec 20, 2020	108.50	Per 100 K people
Tennessee	Dec 20, 2020	8850	Per 100 K people

State	Date	New Cases/day	Per 100, 000 people
Virgin Island	Dec 20, 2020	23.25	Per 100 K people
Wyoming	Dec 20, 2020	338	Per 100 K people
Hawaii	Dec 20, 2020	161.50	Per 100 K people
Northern Mariana Islands	Dec 20, 2020	0.75	Per 100 K people
Guam	Dec 20, 2020	NA	Per 100 K people
American Samoa	Dec 20, 2020	NA	Per 100 K people

Abbreviation: K=1000

Table 2. Reported outcomes among COVID-19 patients of all ages, by hospitalization status, underlying health condition, and risk factor for severe outcome from respiratory infection — United States, February 12–March 28, 2020 [30,31,32]

Underlying health condition/Risk factor for severe outcomes from respiratory infection (no., % with condition)	No. (%)			
	Not hospitalized	Hospitalized, non-ICU	ICU admission	Hospitalization status unknown
Total with case report form (N = 74,439)	12,217	5,285	1,069	55,868
Missing or unknown status for all conditions (67,277)	7,074	4,248	612	55,343
Total with completed information (7,162)	5,143	1,037	457	525
One or more conditions (2,692, 37.6%)	1,388 (27)	732 (71)	358 (78)	214 (41)
Diabetes mellitus (784, 10.9%)	331 (6)	251 (24)	148 (32)	54 (10)
Chronic lung disease* (656, 9.2%)	363 (7)	152 (15)	94 (21)	47 (9)
Cardiovascular disease (647, 9.0%)	239 (5)	242 (23)	132 (29)	34 (6)
Immunocompromised condition (264, 3.7%)	141 (3)	63 (6)	41 (9)	19 (4)
Chronic renal disease (213, 3.0%)	51 (1)	95 (9)	56 (12)	11 (2)
Pregnancy (143, 2.0%)	72 (1)	31 (3)	4 (1)	36 (7)
Neurologic disorder, neurodevelopmental, intellectual disability (52, 0.7%)†	17 (0.3)	25 (2)	7 (2)	3 (1)
Chronic liver disease (41, 0.6%)	24 (1)	9 (1)	7 (2)	1 (0.2)
Other chronic disease (1,182, 16.5%)§	583 (11)	359 (35)	170 (37)	70 (13)
Former smoker (165, 2.3%)	80 (2)	45 (4)	33 (7)	7 (1)
Current smoker (96, 1.3%)	61 (1)	22 (2)	5 (1)	8 (2)
None of the above conditions¶ (4,470, 62.4%)	3,755 (73)	305 (29)	99 (22)	311 (59)

As of December 21, 2020, the COVID-19 reported cases curve is still on the horizon in many states of the USA. Total cases reported by the WHO in the US from January 6 to December 21, 2020 are 17,515,091. The collective incidence is following a fluctuating course, and as of December 21, 2020, 200,257 cases have been recorded in the last 24 hours via community transmission [23]. Similarly, the newly reported cases by the CDC are 197,616 as of December 21, 2020 and by the USA Facts.org 184,754 on December 19, 2020 [24,25]. According to John Hopkins Coronavirus Resource Center, new cases reported per day as of December 20, 2020, across all 50 states are given in Table 1 [26].

COVID-19 Mortality Rate in the United States

Having been documented first in late 2019, COVID-19 has spread tremendously throughout the planet with around 85.2 million people being affected and 1.85 million people dead as of 5th January 2021 [28]. The United States alone documents around 20.8 million COVID-19 cases and 352 thousand deaths. It is evident that the larger the country and its population, the higher are the numbers of cases and mortality. The United States is ranked fifth among 189 countries on comparison of death per 1 million population calculated as [(total number of deaths/number of cases)*1000000].

US COVID-19 Average Daily Case Rate in Last 7 Days, by State/Territory (cases per 100K)

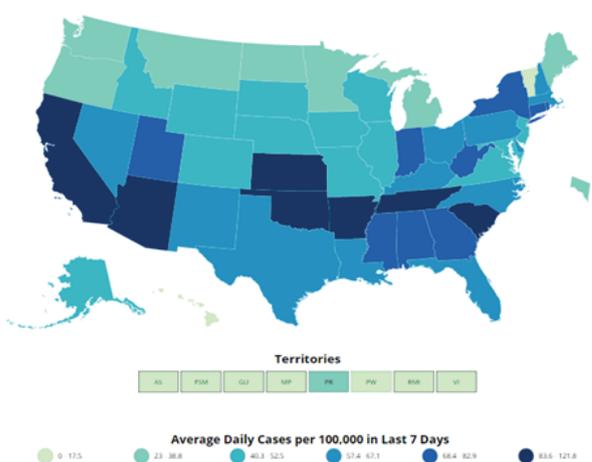


Figure 1. US death from Coronavirus by Age [29]

U.S. Deaths from Coronavirus by Age Group as Percentage of Total Deaths (Feb. 1 – June 17, 2020)

Age group	COVID-19 Deaths	Total Deaths	Percentage of Deaths Due to COVID
Under 1 year	8	6,157	0.1%
1-4 years	5	1,196	0.4%
5-14 years	13	1,755	0.7%
15-24 years	125	10,968	1.1%
25-34 years	699	23,273	3.0%
35-44 years	1,780	33,377	5.3%
45-54 years	4,976	63,186	7.9%
55-64 years	12,307	148,510	8.3%
65-74 years	21,462	228,135	9.4%
75-84 years	27,529	283,801	9.7%
85 years and over	34,435	360,298	9.6%
All Ages	103,339	1,160,656	8.9%

Source: CDC

U.S. Deaths from Coronavirus by Age Group (Feb. 1 – June 17, 2020)

Age group	COVID-19 Deaths	Percentage of COVID Deaths
Under 1 year	8	0.008%
1-4 years	5	0.005%
5-14 years	13	0.013%
15-24 years	125	0.121%
25-34 years	699	0.676%
35-44 years	1,780	1.722%
45-54 years	4,976	4.815%
55-64 years	12,307	11.909%
65-74 years	21,462	20.769%
75-84 years	27,529	26.640%
85 years and over	34,435	33.322%
All Ages	103,339	100.000%

Source: CDC

Figure 2. US death from Coronavirus by Age [29]

There are various factors such as testing rate, ethnicity, occupation, age, comorbidities, and immunocompromised states which intensify and add to the deaths caused by COVID-19.

Patients age above 65 years have a five times higher rate of hospitalization and ninety times higher rate of death due to COVID-19. 20.7% of death above the age of 65 years is due to COVID-19, which rounds up to about 9% of total deaths of people above 65 years irrespective of their COVID status. The Infection Fatality Rate (IFR) is about 5.9% for patients above the age of 65 years [29].

Patients with diabetes mellitus have a 7.3% mortality rate due to COVID-19 which is more than 3 times that of the overall population. Patients with diabetes tend to succumb more to complications of COVID causing death [30,31,32].

Preexisting cardiovascular diseases have increased the risk of death in COVID-19 patients and COVID-19 by itself can cause cardiovascular emergencies like myocardial injury, arrhythmia, acute coronary syndrome, venous thromboembolism and cardiac drug interaction [33].

Coronavirus infects the lungs and hence a patient with a preexisting chronic lung disease like asthma, COPD, lung malignancy, TB, bronchitis or pneumonia are at a higher risk of severe complications and worsening conditions due to COVID-19 [34,35,37]. Smoking and vaping cause damage to the lung parenchyma resulting in inflammation. Tobacco causes damage to the respiratory mucosa and cilia making it fragile and more susceptible to COVID-19 infection [34,35,38].

Immunocompromised conditions include having a blood or bone marrow transplant, HIV with a low CD4 cell count or not on HIV treatment, having a solid organ transplant, prolonged use of corticosteroids, or use of other immune weakening medicines. These patients cannot fight against the virus with as much efficiency as that of normal people hence posing them for a risk of severe infection [39,40].

Pregnant women are at an increased risk for severe illness from COVID-19 compared to non-pregnant women. Additionally, there may be an increased risk of adverse pregnancy outcomes, such as preterm birth, C-section, low birth weight, and NICU admissions among pregnant people with COVID-19 [41].

Due to fluctuating data available regarding COVID-19, death and mortality data include: provisional count of deaths in the United States due to COVID-19, deaths from all causes and percent of expected deaths (i.e., number of deaths received

over number of deaths expected based on data from previous years), pneumonia deaths (excluding pneumonia deaths involving influenza), pneumonia deaths involving COVID-19, influenza deaths, and deaths involving pneumonia, influenza, or COVID-19 [36]. Calculating excess deaths can provide information about the burden of mortality potentially related to the COVID-19 pandemic, including deaths that are directly or indirectly attributed to COVID-19. Excess deaths are the difference between the observed numbers of deaths in specific time periods and expected numbers of deaths in the same time periods.

The trends in the mortality due to COVID-19 are predicted to decrease in the next four months which indicates that the number of total COVID-19 deaths is likely to reach approximately 567,195 by 1st April, 2021.

COVID-19 originating from Wuhan, China has spread to 213 countries as of now. With approximately 86 million confirmed cases and a death toll of 1,859,000 worldwide, this deadly disease has become one of the fastest spreading pandemics in recent history [43]. Infection fatality rate (IFR) reflects the true severity of the disease; it is calculated by dividing the number of deaths caused by the disease, by the total number of infected individuals and multiplying the result by 100. To calculate the IFR, one has to first calculate the true number of individuals affected by the disease. To find the difference between confirmed cases and the actual number of cases in the population, random serological sampling has to be done. In New York City, when random serological sampling of 15,103 people was conducted, almost 20% of the tested individuals had antibodies against COVID-19. The estimated number of actual coronavirus cases was calculated to be 1.7 million, which was 10 times more than the number of confirmed cases. The IFR calculated based on statistics of New York City was 1.4% [51]. Various studies report COVID-19 IFR to be between 0.5% - 1.0% [44,45,46]. This means that for every thousand people affected by the disease, almost 5-10 deaths occur.

Studies show that males develop a more severe disease when infected with COVID-19 as compared to females [47]. The gender differences in morbidity and mortality can be explained by the modulation of ACE2 receptors by estrogen in female patients [48]. According to the data provided by the New York City Health, 61.8% of the patients dying of coronavirus were males [52]. People with comorbidities such as hypertension, cardiovascular disease, diabetes, coexisting infections, and malignancy are at an increased risk of contracting the virus

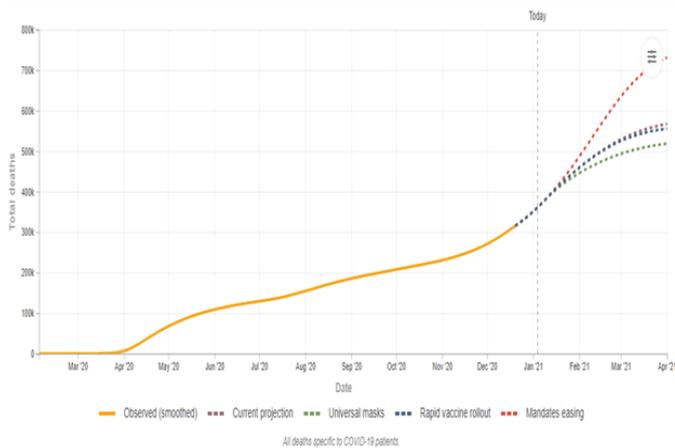


Figure 3. Deaths specific to COVID-19 patients [42]

[50, 59]. Obesity is noted to be one of the important preventable and treatable comorbidities in hospitalized patients [49]. Elderly patients have a higher mortality rate, predominately because of the weaker immune system and an increased incidence of comorbidities. According to the report published by the Chinese CCDC released on February 17, 2020, the death rates significantly increased with the age of the patients. The death rate in patients' age 70-79 years was 8.0% as compared to 14.8% in patients' age 80+ years [52, 60].

COVID-19 mortality globally

The WHO has divided the world based on geography into 6 different regions. Based on the weekly reports by the WHO, the number of deaths in the African region has increased during the months of December 2020 and January 2021. During November 2020, the African region reported 800-1000 deaths per week; the figure has now increased to more than 3000 deaths per week during the month of December 2020. Seventy two percent of the new cases are reported by South Africa, which is the most affected country in the region. Nigeria, Algeria and Namibia also report a higher number of cases compared to before. The total number of confirmed cases in the region has reached 1,978,166, while the total number of deaths reported in the region is 44,038 as of 4th of January 2021 [53,54]. The vulnerable population of Sub-Saharan Africa has been severely affected by the disease. A report suggests that health care activities like vaccination of children have dropped by 50%-80% in 2020 compared to 2019 [55]. The medical emergency has taken away the emphasis that was placed on preventive healthcare measures such as control of malaria and meningitis outbreaks. It has also resulted in limited access to maternal health care services. All these issues have resulted in increased overall morbidity and mortality in the region [56].

The region of the Americas includes countries of both North and South American continents. This region has 50% of all the global confirmed cases. The United States of America is the most affected country in the world with the number of confirmed cases reaching 20 million. It has a cumulative death toll of approximately 347,555. The restoration of day-to-day activities like the reopening of schools and recreational places, poses a threat to the health of the citizens, as the United States of America is the only country with the highest number of new cases and deaths per day. The number of new cases per day had been gradually increasing gradually during the winter months. Countries like Peru, Colombia, and Argentina are experiencing increasing trends in the incidence of the disease and associated deaths after a period of stabilization. The number of deaths in the region, recorded in November 2020

was between 20 to 25 thousand deaths per week, which has now increased and approached 30,000 deaths per week. The total numbers of confirmed cases in the region are 36,674,670, while the total numbers of deaths reported in the region are 876,031 as of 4 January 2021 [53,54]. In a study conducted by Alejandro et al. it is estimated that Latin America is expected to lose approximately 111,725 patients with cancer to COVID-19 (range, 87,116-143,154 patients) within 60 days of the start of the outbreak [57].

The eastern Mediterranean region includes countries such as Saudi Arabia, Iran and Iraq, and Pakistan. Most of these countries lack healthcare facilities and have below-average literacy rates, but governmental reforms such as public awareness campaigns and the strict lockdown have resulted in the slow transmission of the disease. The number of deaths reported in November 2020 exceeded 6000 deaths per week, which has now declined to almost 3500 deaths per week. Iran, Morocco, and Pakistan reported the highest number of cases during the last week of December 2020. It was expected that countries like Pakistan, with poor healthcare infrastructure, would collapse under the pressure posed by the pandemic, but the timely implementation of governmental policies has resulted in decreased transmission and hence a lower mortality rate [61]. The total numbers of confirmed cases in the region are 5,000,203, while the total numbers of deaths reported in the region are 122,472 as of 4 January 2020 [53,54].

The European region is reporting an increase in the new confirmed cases over the past several weeks. Social Interactions and softening of governmental policies resulted in a second peak in countries like Spain and France. The number of deaths per week was highest in March and April reaching around 30,000; these numbers then decreased and have been below 5000 in July and August. During the winter months of October to December, these numbers have once again increased and is now approaching more than 35,000. The total numbers of confirmed cases in the region are 27,059,283, while the total numbers of deaths reported in the region are 591,792 as of 4 January 2021 [53,54]. A gradient of mortality is seen in Europe with higher mortality in the west and lower mortality is recorded in the eastern half. A retrospective analysis conducted by Ramon et al. suggests that the mortality in Europe is associated with a democracy index, type of political system, corruption index, and the time taken to implement the political reforms [58].

The Southeast Asian region reported a continuous increase in the number of new cases and deaths per week during the months June to September; these numbers have been continuously declining during the past several months. India has reported 156,627 new cases in the last week (27 December 2020). India, Indonesia and Bangladesh are amongst the leading countries in this region. Most of the aged people (above 65 years) in South East Asia live in houses shared by their children and grandchildren and hence are at an increased risk. The total numbers of confirmed cases in the region are 5,000,203, while the total numbers of deaths reported in the region are 184,941 as of 4 January 2021 [53,54]. The mortality rates in South East Asian countries are lower than those in western countries are. Several factors described in a study by Vijay et al. have played an important role in maintaining this discrepancy. A lower mortality rate in India is attributed to the population characteristics including the low percentage of elderly people, lower prevalence of obesity, previous immunity due to repeated respiratory infections, mass BCG vaccination, and genetic variability. Early lockdown, mutations in the virus, humid climate, and use of hydroxychloroquine are also thought to be responsible [62].

Table 3. Cumulative Cases and Deaths as of 27 December 2020. Reported by the World Health Organization. [53]

Region	Cumulative Cases	Cumulative Deaths
Africa	1,831,227	40,299
Americas	34,403,371	840,247
Eastern Mediterranean	4,823,157	119,004
Europe	25,271,220	554,716
South East Asia	11,842,422	180,737
Western Pacific	1,059,751	19,558

The Western Pacific region includes countries like Japan and the Philippines. There has been an increase in the number of new cases in the past several weeks, which is accompanied by an increase in the number of deaths. The total numbers of confirmed cases in the region are 1,119,437, while the total numbers of deaths reported in the region are 20,373 as of 2 September 2020 [53,54]. A study conducted by Sachiko et al. reports that the mortality in Japan is positively correlated with population density, percentage of the elderly population, and maximum absolute humidity [63].

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