

COVID-19 Epidemic and Pattern of Global Distribution

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Abstract : The coronavirus disease (COVID-19) is a highly contagious viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which originated in Wuhan, China, and spread around the world. We have understudied the epidemiological and geographical pattern of distribution of COVID-19 in five different continents of global spread. An online sample of distribution was successfully recruited from America, Africa, Oceania, Asia, and Europe. The epidemiological curve and pattern of geographical distribution as of 9th and 10th April 2020 were also reviewed and results show that European countries like France, Spain, Italy, the UK and the United States of America indicate an epidemic progression relative to the same curve detected in China in January and February 2020. European countries record more cases since the outbreak of the resulted deadly COVID-19, followed by Asia and America. We call for a vital need for countries to develop effective vaccines and therapeutic combinations to cope with this viral outbreak globally.

Keywords: COVID-19, Epidemiological Curve, Viral Outbreak, Vaccines, Therapeutic

I. Introduction

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. The disease was first reported in December 2019 in Wuhan, and has since spread globally, causing the ongoing 2019–20 coronavirus pandemic [2, 3]. The outbreak of coronavirus (COVID-19) was announced by the World Health Organization (WHO) to be a public health emergency of international concern (PHEIC) on 30 January 2020, and a pandemic on 11 March 2020[3]. Fever, cough and shortness of breath are typical symptoms [4]. Other signs can include fatigue, abdominal pain, vomiting, sore throat, odor loss and pain in the abdomen [4,5,6]. Generally, the incubation period is about five days but can range from two to fourteen days [4,7]. Although most cases give rise to mild symptoms, some progression to viral pneumonia and multi-organ failure [2, 8]. More than 2.06 million cases were registered across 210 countries and territories as of 16 April 2020, [9] resulting in more than 137,000 deaths. About 512,000 people recovered. [6] The virus is transmitted mainly through close contact between people, often through small droplets formed while coughing, sneezing, or talking [11,12,13]. Although these droplets are formed when breathing out, they often fall to the ground or surfaces instead of being contagious over broad distances [11, 14, and 15]. Infections can also occur through by touching contaminated fomites and then the face [11,12]. People may also become infected by touching an unclean surface and then their face [11,12]. The virus can survive on surfaces for up to 72 hours [16]. According to (6), SARS-CoV-2 can survive on surfaces for about 72 hours. Coronavirus is most infectious Coronavirus is most contagious during the first three days after inception onset of symptoms, although it may be possible to spread before symptoms appear and at later stages of the disease [17] although spread may be possible before symptoms appear and in later stages of the disease [17]. The usual method of diagnosis is by real-time reverse transcription-polymerase chain reaction (rRT-PCR) from a nasopharyngeal swab [18]. The infection can also be diagnosed from a combination of symptoms, risk factors and a chest CT scan showing features of pneumonia [19,20]. Recommended methods to prevent infection include regular hand washing, maintaining physical distance from others (especially from those with symptoms), covering coughs and sneezes with a tissue or inner elbow and keeping unwashed hands away from the face [21,22]. The standard diagnostic method is the reverse transcription-polymerase chain reaction (rRT-PCR) from a nasopharyngeal swab [18] in real time. A combination of symptoms, risk factors and a chest CT scan showing pneumonia features can also

diagnose the infection [19,20]. Recommended methods for preventing infection include frequent hand washing, maintaining a physical distance from others (especially those with symptoms), covering coughs and sneezes with a tissue or inner elbow and holding unwashed hands away from the face [21,22]. According to (23) the use of facial masks is recommended for suspected persons and their care givers. The general public's guidelines for the use of masks differ, with some authorities advising against their use, others advising their use and others requiring their use [25,26,27]. There is currently no COVID-19 vaccine or effective antiviral therapy. Management includes treating symptoms, providing support, isolation and experimental measures [24].

II. Data Collection

An organized data collection was acquired from the European Centre for Disease Prevention and Control (ECDC) on the COVID-19 database as of the present dated 9th April 2020. The data collected included detailed studies related to dispersal cases of COVID-19 by continents, (except china), epidemiological curves and maps showing the pattern of Geographical distribution and a collective number of reported cases per 100,000 population of COVID-19 cases-worldwide. This data also specified the precise region, the places of reported cases, number of deaths and the number of the person infected with this deadly nCov-19 within the last fourteen (14) days.

III. Epidemiological Curves

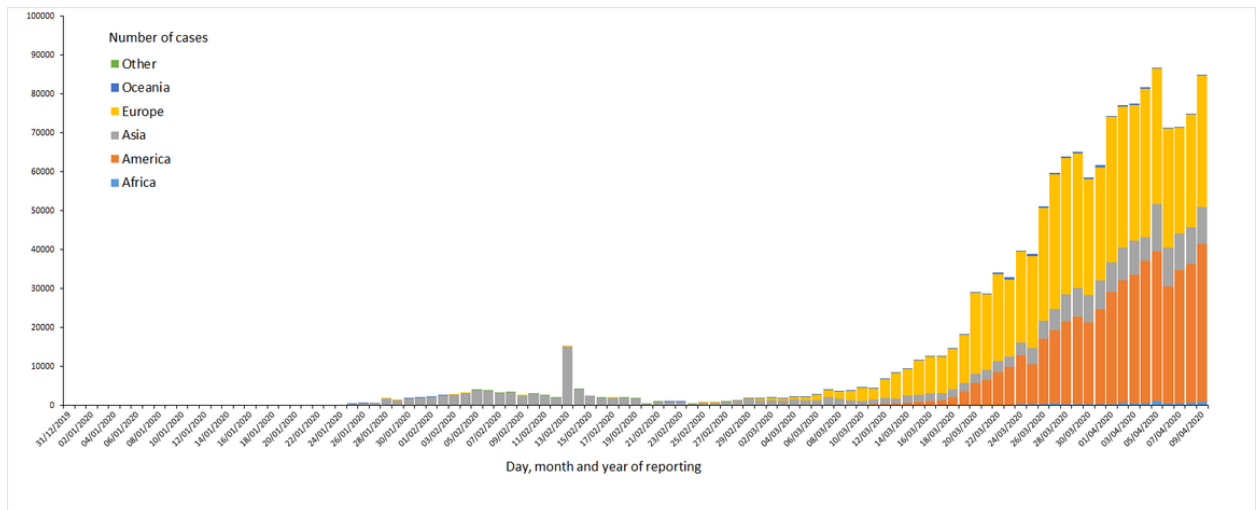


Figure 1. Distribution of cases of COVID-19 by continent (according to the relevant case definition and testing strategies in the affected countries) as of 9th April 2020 [31]

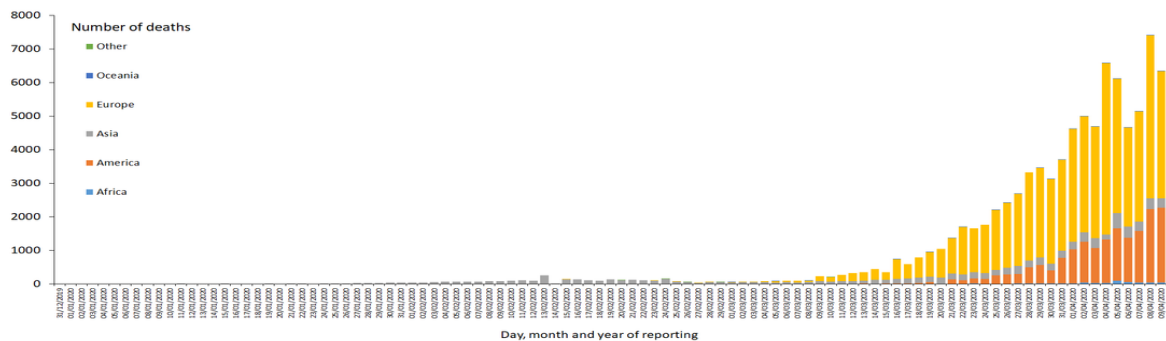


Figure 2. Distribution of cases of COVID-19 deaths worldwide, by continent as of 9th April 2020 [31]

IV. Geographic Distribution of COVID-19

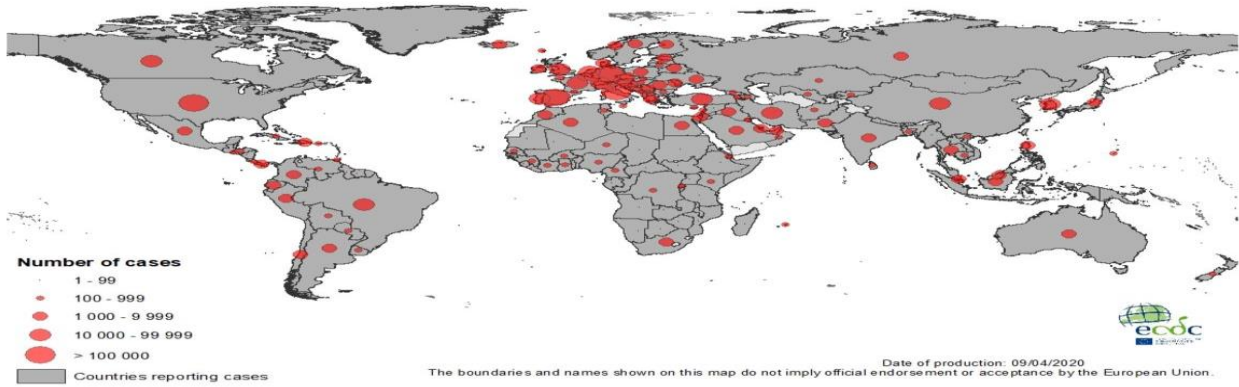


Figure 3. Geographical distribution of COVID-19 cases-worldwide as of 9th April 2020 [31].

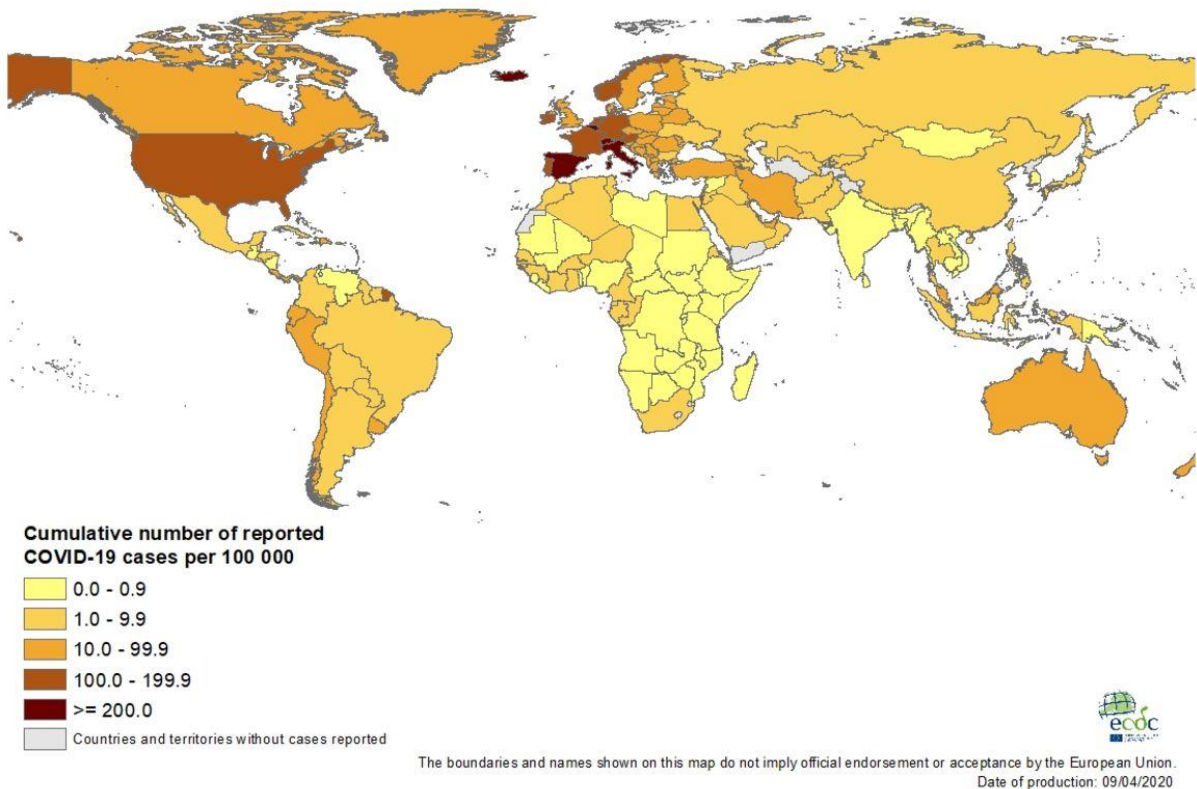


Figure 4. Geographic distribution of a cumulative number of reported COVID-19 cases per 100,000 population, worldwide as of 9th April 2020 [31].

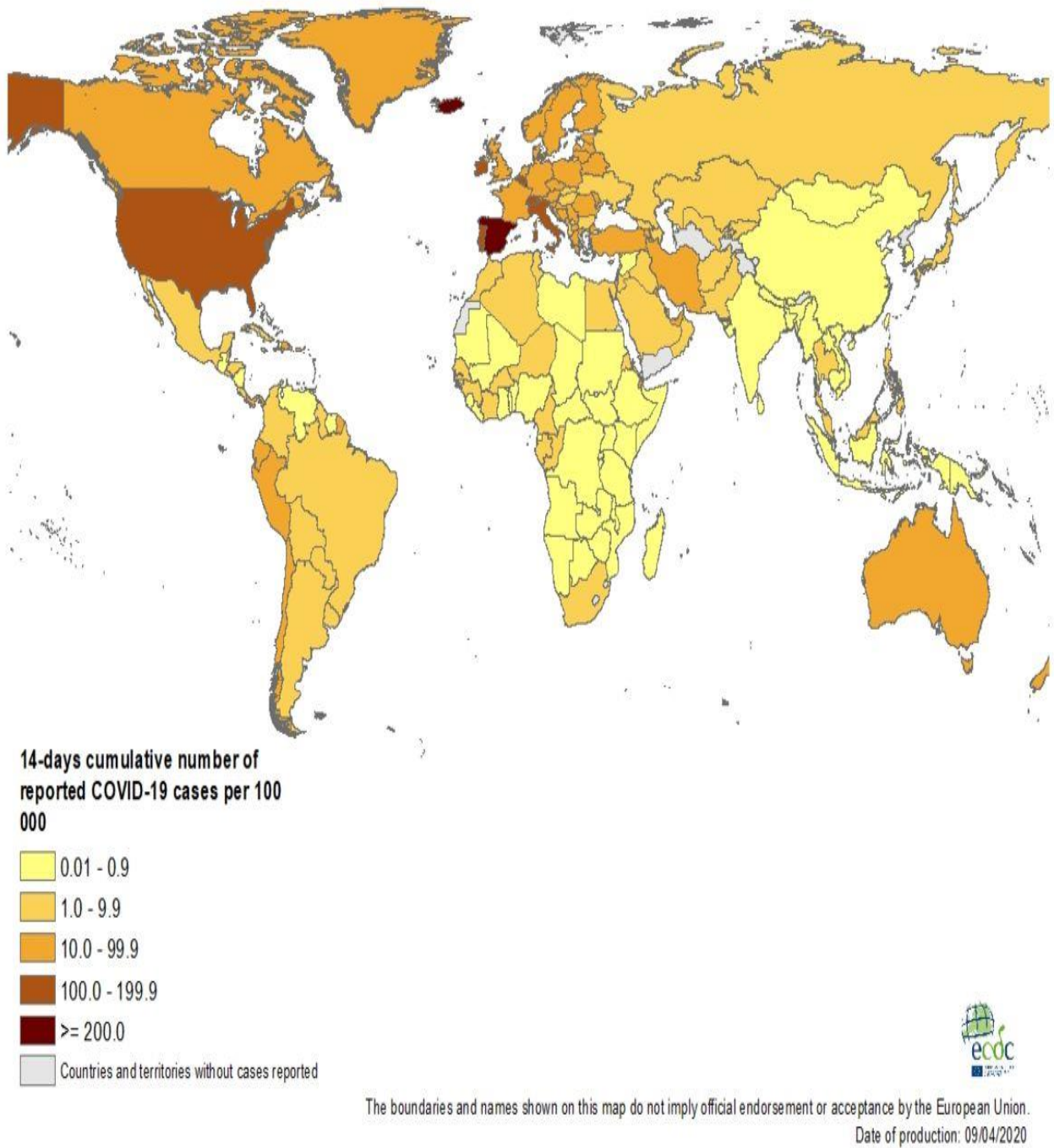


Figure 5. Geographic distribution of the 14-day cumulative number of reported COVID-19 cases per 100,000 populations, worldwide as of 9th April 2020.

Table 1. COVID-19 Report as of 9th April 2020 [31].

Region	Places reporting cases	Sum of Cases	Sum of Deaths	Confirmed cases in the last 15 days
Africa	Algeria	1572	205	1308
Africa	Angola	19	2	17
Africa	Benin	26	1	21
Africa	Botswana	7	1	7
Africa	Burkina Faso	414	23	300
Africa	Burundi	3	0	3
Africa	Cameroon	730	10	658
Africa	Cape Verde	7	1	3
Africa	Central African Republic	10	0	6
Africa	Chad	10	0	7
Africa	Congo	60	5	56
Africa	Cote divoire	384	3	304
Africa	Democratic_Republic_of_the_congo	183	20	138
Africa	Djibouti	135	0	123
Africa	Egypt	1560	103	1118
Africa	Equatorial Guinea	18	0	7
Africa	Eritrea	33	0	29
Africa	Eswatini	12	0	8
Africa	Ethiopia	55	2	43
Africa	Gabon	33	1	27
Africa	Gambia	4	1	1
Africa	Ghana	313	6	245
Africa	Guinea	164	0	160
Africa	Guinee Bissau	33	0	33
Africa	Kenya	179	6	154
Africa	Liberia	31	4	28
Africa	Libya	21	1	20
Africa	Madagascar	93	0	74
Africa	Malawi	8	1	8
Africa	Mali	59	7	57
Africa	Mauritania	6	1	4
Africa	Mauritius	273	7	225
Africa	Morocco	1275	93	1050
Africa	Mozambique	17	0	12

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Africa	Namibia	16	0	12
Africa	Niger	342	11	335
Africa	Nigeria	276	6	225
Africa	Rwanda	110	0	69
Africa	Sao Tome and Principe	4	0	4
Africa	Senegal	244	2	145
Africa	Seychelles	11	0	4
Africa	Sierra Leone	7	0	7
Africa	Somalia	8	0	7
Africa	South Africa	1845	18	1136
Africa	South Sudan	2	0	2
Africa	Sudan	14	2	11
Africa	Togo	70	3	47
Africa	Tunisia	623	23	450
Africa	Uganda	53	0	39
Africa	United Republic of Tanzania	25	1	13
Africa	Zambia	39	1	27
Africa	Zimbabwe	11	2	8
Africa	Anguilla	3	0	3
America	Antigua and Barbuda	15	0	12
America	Argentina	1795	65	1293
America	Aruba	77	0	58
America	Bahamas	40	7	35
America	Barbados	63	3	45
America	Belize	8	1	6
America	Bermuda	39	3	33
America	Bolivia	264	18	225
America	Bonaire, Saint Eustatius and Saba	2	0	2
America	Brazil	15927	800	13494
America	British Virgin Islands	3	0	3
America	Canada	19274	435	15889
America	Cayman Islands	45	1	42
America	Chile	5546	48	4404
America	Colombia	2054	55	1584
America	Costa Rica	502	2	301
America	Cuba	457	12	400
America	Curacao	14	1	8

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America	Dominica	15	0	8
America	Dominican Republic	2111	108	1719
America	Ecuador	4450	242	3239
America	El Salvador	103	5	90
America	Falkland Islands (Malvinas)	5	0	5
America	Greenland	11	0	6
America	Grenada	12	0	11
America	Guatemala	87	3	63
America	Guyana	37	6	32
America	Haiti	27	1	19
America	Honduras	343	23	291
America	Jamaica	63	4	38
America	Mexico	3181	174	2706
America	Montserrat	9	0	8
America	Nicaragua	6	1	4
America	Panama	2528	63	1940
America	Paraguay	124	5	83
America	Peru	4342	121	3784
America	Puerto Rico	620	24	620
America	Saint kitts and Nevis	11	0	9
America	Saint Lucia	14	0	11
America	Saint Vincent and the Grenadines	8	0	7
America	Saint Maarten	40	8	38
America	Suriname	10	1	2
America	Trinidad and Tobago	107	8	47
America	Turks and Caicos Islands	8	1	7
America	United States of America	432132	14817	362938
America	United States Virgin Islands	45	1	28
America	Uruguay	456	7	239
America	Venezuela	167	8	61
Asia	Afghanistan	423	14	348
Asia	Bahrain	4823	5	404
Asia	Bangladesh	218	20	179
Asia	Bhutan	5	0	2
Asia	Brunei Darussalam	135	1	28
Asia	Cambodia	118	0	22

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Asia	China	82870	3339	1137
Asia	India	5734	166	5085
Asia	Indonesia	2956	240	2166
Asia	Iran	64586	3993	37569
Asia	Iraq	1202	69	856
Asia	Israel	9404	71	7035
Asia	Japan	4257	81	2989
Asia	Jordan	358	6	205
Asia	Kazakhstan	759	7	671
Asia	Kuwait	855	1	660
Asia	Kyrgyzstan	280	4	236
Asia	Laos	15	0	13
Asia	Lebanon	575	19	242
Asia	Malaysia	4119	65	2323
Asia	Maldives	19	0	6
Asia	Mongolia	16	0	6
Asia	Myanmar	22	3	19
Asia	Nepal	9	0	6
Asia	Oman	419	2	320
Asia	Pakistan	4322	63	3265
Asia	Palestine	263	1	201
Asia	Philippines	3870	182	3234
Asia	Qatar	2210	6	1673
Asia	Saudi Arabia	2932	41	2032
Asia	Singapore	1623	6	1055
Asia	South Korea	10423	204	1182
Asia	Sri Lanka	189	7	87
Asia	Syria	19	2	18
Asia	Taiwan	379	5	144
Asia	Thailand	2423	32	1378
Asia	Timor Leste	1	0	0
Asia	Turkey	38226	812	35793
Asia	United Arab Emirates	2659	12	2326
Asia	Uzbekistan	555	3	490
Asia	Vietnam	251	0	103
Europe	Albania	400	22	254
Europe	Andorra	564	23	376

Europe	Armenia	881	9	591
Europe	Austria	12969	273	7081
Europe	Azerbaijan	822	8	729
Europe	Belarus	1066	13	980
Europe	Belgium	23403	2240	18466
Europe	Bosnia and Herzegovina	816	35	635
Europe	Bulgaria	593	24	351
Europe	Croatia	1343	19	925
Europe	Cyprus	526	14	394
Europe	Czech Republic	5312	99	3658
Europe	Denmark	5402	218	3678
Europe	Estonia	1185	24	781
Europe	Faroe Island	184	0	52
Europe	Finland	2487	40	1607
Europe	France	82048	10869	56815
Europe	Georgia	211	3	138
Europe	Germany	108202	2107	71694
Europe	Gibraltar	120	0	94
Europe	Greece	1884	83	1063
Europe	Guernsey	181	5	151
Europe	Holy see	8	0	7
Europe	Hungary	980	66	719
Europe	Iceland	1616	6	879
Europe	Ireland	6224	235	4660
Europe	Isle of Man	158	1	135
Europe	Italy	139422	17669	65036
Europe	Jersey	170	3	152
Europe	Kosovo	184	5	113
Europe	Latvia	577	2	356
Europe	Liechtenstein	79	1	28
Europe	Lithuania	912	15	638
Europe	Luxembourg	3034	46	1701
Europe	Malta	299	1	170
Europe	Moldova	1174	27	1025
Europe	Monaco	81	2	50
Europe	Montenegro	2492	196	53

Europe	Netherlands	20549	2248	14137
Europe	North Macedonia	617	30	440
Europe	Norway	6010	80	3094
Europe	Poland	5205	159	4154
Europe	Portugal	13141	380	10146
Europe	Romania	4761	209	3855
Europe	Russia	8672	63	8014
Europe	San Marino	308	34	100
Europe	Serbia	2666	65	2363
Europe	Slovakia	682	2	466
Europe	Slovenia	1091	40	563
Europe	Spain	4146690	14555	99080
Europe	Sweden	8419	687	5909
Europe	Switzerland	22710	705	12996
Europe	Ukraine	1668	52	1555
Europe	United Kingdom	60733	7097	51204
Oceania	Australia	6052	50	3252
Oceania	Fiji	15	0	10
Oceania	French Polynesia	51	0	26
Oceania	Guam	125	4	88
Oceania	New Caledonia	18	0	4
Oceania	New Zealand	992	1	730
Oceania	Northern Mariana Islands	11	2	11
Oceania	Papua New Guinea	2	0	1
Other	Cases on an international conveyance Japan	2	0	1
	Total	1476819	87816	1008770

Source: [ecdc.europa.edu/en/geographical-distribution-2019-ncov-cases](https://ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases).

V. Discussion

From the epidemiological curve as shown in fig 1, fig 2 and pattern of geographical distribution as shown in fig 3, fig 4 and fig 5 shows that countries in Europe like United Kingdom (UK), France, Spain, and Italy specifies an epidemic progression in relative to the same curve detected in China in January and February 2020. China recorded its highest case and from the curve, it can be deduced that the increase in China and by 13th February reduced gradually till the 2nd of March 2020. European countries record more cases since the outbreak of the resulted deadly COVID-19, followed by America and Asia. The epidemic curve increase in the number of infected persons in Europe is also a source of worry with two-thirds of COVID-19 daily deaths stemming from the region. Spain and Italy's numbers jumped at a shocking rate in the past two weeks of March, continuing to rise in April to reach 18,279 deaths, 143,626 cases, 28,470 has recovered in Italy, while France has 12,210 deaths, 86,334 confirmed cases, 21,254 recovered from the COVID-19 and Spain has 15,483 deaths, 157,022 cases, 55,668 has recovered, the United States of America has recorded 469,121 confirmed cases, 26,448 has recovered and 16,676 deaths and globally we have 1.6 million coronavirus cases, 100,000 deaths and 365,795 has recovered from the deadly COVID-19 as of 10th April 2020. Asia, on the other hand, was blamable for more than 60 percent of

coronavirus-related deaths at the start of March but has subsequently achieved to contain the spread of the virus and experienced very little deaths in recent weeks, for instant Iran has recorded 66,220 confirmed cases, 32,319 has recovered and 4,110 deaths cases compared with global figures. South America, Africa, other and the Middle East reported fewer deaths in the past two weeks relative to other regions, creating up single-figure percentage facts of the world's total coronavirus deaths count.

VI. Epidemiology and Pathogenesis

All ages are susceptible. Infection is transmitted through large droplets produced during coughing or sneezing by symptom inpatients but can also occur from asymptomatic people and before the onset of symptoms [32]. Studies have shown higher viral loads in the nasal cavity as related to the throat with no difference in viral burden between symptomatic and asymptomatic people [33]. Patients can be infectious for as long as the symptoms last and even on clinical recovery. These infected droplets can spread 1–2 meters and deposit on surfaces. The virus can remain viable on surfaces for four days in favorable atmospheric conditions but are destroyed in less than a minute by common disinfectants like sodium hypochlorite, hydrogen peroxide, etc. [35]. Infection is developed either by inhalation of these droplets or touching surfaces contaminated by them and then touching the nose, mouth, and eyes. The virus is also present in the stool and contamination of the water supply and subsequent transmission via aerosolization/ fimo oral route is also hypothesized [34]. As per current information, transplacental transmission from pregnant women to their fetus has not been described [36]. However, neonatal disease due to post-natal transmission is described [36]. The incubation period varies from 2 to 14 days [median 5 days]. Studies have identified angiotensin receptor 2 (ACE2) as the receptor through which the virus enters the respiratory mucosa [37]. The basic case reproduction rate (BCR) is estimated to range from 2 to 6.47 in various modeling studies [37].

VII. Treatment

While waiting for the vaccine, no specific treatment has been recommended for this emerging coronavirus infection except for meticulous supportive care [39]. Antiviral treatment for 2019-nCoV infection has not been proven to be effective. All patients need to be treated in isolation. Currently, as described, the approach to this disease is to control the source of infection; use of personal safety precaution to reduce the risk of transmission; and early diagnosis, isolation, and supportive treatments for affected patients [40]. World Health Organization (WHO) [33] recommends when intravenous fluids are used, it should be used cautiously because aggressive fluid resuscitation may lead to volume overload including respiratory failure. Empiric antimicrobials should be given to treat all likely pathogens causing severe infection based on the clinical diagnosis (community-acquired pneumonia or sepsis), local epidemiology and susceptibility data, and treatment guidelines; therapy should be de-escalated on the basis of microbiology results and clinical judgment. WHO does not advocate routine use of systemic corticosteroids for the treatment of viral pneumonia or ARDS outside of clinical trials unless they are indicated for another reason. In the management of septic shock, WHO advocates vasopressor (i.e. norepinephrine, epinephrine, vasopressin, and dopamine) administration when shock persists during or after fluid resuscitation. According to WHO the best prevention measure is cleaning hands with soap and water or using alcohol-based hand wash very frequently [41]. As a precautionary measure frequent touching the face, mouth, eyes, and nose should be avoided.

VIII. Conclusion

As the COVID-19 outbreak expands globally, the awareness of its ravaging effect has become obvious. Also, the understanding of this disease has increased, as fundamental information in the viral infection continues to emerge. However, more evidence is needed, particularly for public health and clinical interventions to successfully prevent and treat infections. Even during a pandemic, obtaining rigorous, reliable data is not an interruption, rather it is crucial for accurately measuring the extent and severity of the disease and assessing the effectiveness of the response. The current focus on the transmission of COVID-19 infection all over the world may probably distract public attention from the psychosocial consequences of the epidemic in the affected individuals and the general population. Already, more than ninety percent of confirmed cases are reported globally. We frankly hope that

countries like Italy, Spain, the UK, France, Nigeria and the United States of America and other countries overwhelmed the spread of this epidemic as fast as possible.

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