

COVID -19 (by SARS-CoV-2) an Endemic to Pandemic : A Review

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ABSTRACT

On 31 December 2019, WHO was informed about a cluster of cases of pneumonia in Wuhan City, China. SARS-CoV-2 found a new virus responsible for such an outbreak of respiratory illness known as COVID-19. The pathogen responsible for the outbreak of this disease belongs to a large family of coronaviruses. Such family also includes the viruses that cause severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS).

In this review paper, the source of COVID-19 pandemic & Mutation of SARS-CoV-2 Viruses discussed in detail to understand the disease caused by them. Hence, the present study is mainly aimed to understand symptoms of COVID-19 disease with Prevention & controlling measures.

The main objective of this study is to collect and analyze the Worldwide deaths & rate of infections since the outbreak with Epidemiological curves & Geographic distribution. The current study also give emphasis on the global preparedness to deal with this Pandemic & efforts done by Nations to develop effective vaccines against COVID-19.

Keywords: Coronavirus, Pandemic, Covid-19, SARS-CoV-2, SARS, MERS

1. INTRODUCTION

An outbreak of unusual respiratory disease, in Wuhan, China, is caused due to infection by a novel coronavirus. Coronaviruses didn't pop up for the first time. They are a large family of viruses that have been around since long. Before this outbreak, coronaviruses were only thought to cause mild respiratory infections in people. This virus has likely circulated for some time in animals and further crosses over into people. That's what scientists think had happened here. When scientists found out that coronavirus was making people sick in 2019, they named it as a novel coronavirus.

That novel virus was initially named as 2019-nCoV by WHO(1–3). WHO renamed the disease again as coronavirus disease 2019 (COVID-19) on Feb 11, 2020(4). International Committee for Coronavirus Study Group (CSG) posted on *bioRxiv* and suggested a new name for 2019-nCoV as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).The new name was given on

the basis of a phylogenetic analysis of related coronaviruses(5). The new name SARS-CoV-2 is not found appropriate & consistent with the name of disease COVID-19. SARS-CoV-2 is characterised mainly by their genome sequence as the naturally occurring viruses are different from all other SARS-like or SARS related coronaviruses. Naming 2019-nCoV as SARS-CoV-2 is found somewhere misleading, hence such virus with international concern deserves a unique name.

2019-nCoV is still evolving and very difficult to predict the outcome of this disease. It was predicted by experts that 2019-nCoV may evolve to a low pathogenic but highly transmissible coronavirus. Like the virus that causes seasonal influenza, coronavirus might return every winter (6). SARS-CoV-2 has caused adverse effects on sociality and economic development in countries around the globe. There is panic with the thought of its re-occurrence. Travellers might not want to visit any country with this epidemic and due to sporadic cases of SARS. On the basis of special clinical, virological, and epidemiological characteristics and the uncertainty of the novel coronavirus, scientists renaming SARS-CoV-2 as human coronavirus 2019 (HCoV-19).

Cross-species transmission of this disease is yet not well understood, and no specific approach to stop this zoonotic transmission has been established. SARS-related coronaviruses might continue to re-emerge. The same has happened in the transmission of Middle East respiratory syndrome related coronavirus, in which multiple spillover found from camels to humans and resulting in human infections. The currently known virus, 2019-nCoV is most closely related to SARS and related viruses that circulate in bats. These bats can also infect other animals that can pass the virus to humans. Scientists & experts suspect that the animal carrying 2019-nCoV spread the virus to humans at a live seafood and wild animal market in Wuhan. The first cases of 2019-nCoV were documented in December 2019 (7). Researchers believe that the name of SARS-CoV-2 by them is just to facilitate the scientific exchange in International Committee on Taxonomy of Viruses. The use of name SARS-CoV-2 is a natural extension of the taxonomic practice for viruses in various SARS species. When the virus gets in your body, it comes into contact with the mucous membranes that line your nose and mouth. Doctors have identified that it's a respiratory disease that reaches into the respiratory tract and to the lungs further. SARS-CoV-2, the virus that causes COVID-19, is part of the coronavirus family (8-11). To understand the round shape of virus with crown (as tentacles) and nano scale size of SARS-CoV-2, Scanning & Transmission electron microscopy imaging of Covid-19 respectively are added in study(12,13). **Fig. 1 & 2**

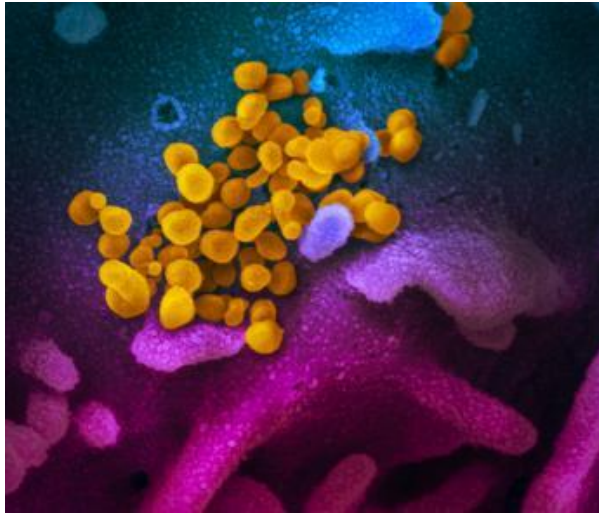


Fig. 1. Scanning electron microscope image of SARS-CoV-2 (yellow) also named as 2019-nCoV virus that causes COVID-19. Isolated from a patient in the U.S., emerging from the surface of cells (blue/pink) cultured in the RML lab(12).

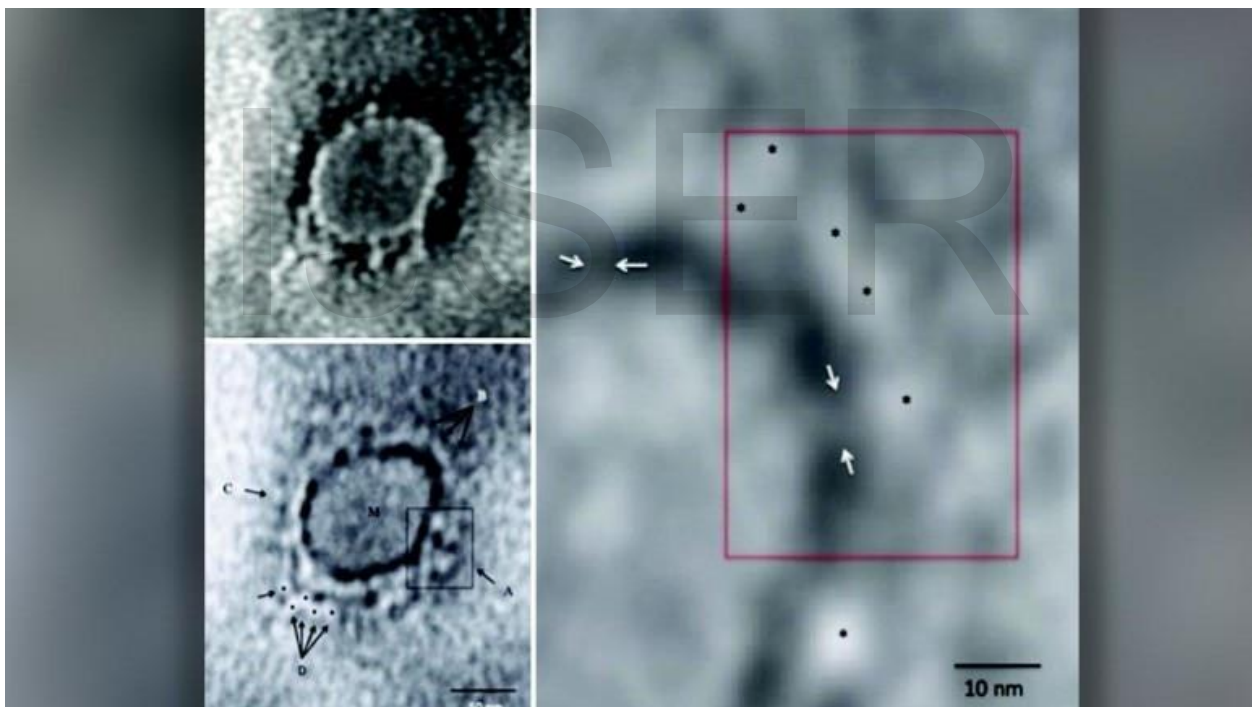


Fig.2. Transmission electron microscopy imaging of Covid-19 | Photo from Indian Journal of Medical Research (13)

2. MUTATION IN VIRUSES

Viruses have all their genetic material in RNA (ribonucleic acid). RNA has some similarities to DNA, but they aren't the same. When viruses infect you, they attach to your cells, enter inside them, and make copies of their RNA, which further spread and make you sick. If there's any

copying mistake, the RNA gets changed. Scientists call those changes mutations. These changes generally happen randomly and also by accident. This is generally happens to viruses as they multiply and spread.

As such changes are random and they make little to no difference in a person's health. Some times they may cause disease. So the new virus isn't exactly the same that circulated last year. Such change in virus can make it to infect people. All viruses, including coronaviruses, may change over the period of time. Scientists and doctors call it a slightly different versions of a virus new strains(14-15).

3. STUDY ABOUT COMMON SYMPTOMS OF COVID-19

COVID-19 is a respiratory condition caused by a coronavirus. Generally people with mild symptoms recover on their own. But according to studies carried out, about 1 in 6 people will have severe problems. The risk is higher if you are older or have another health problems like diabetes or high blood pressure. Generally Signs of COVID-19 usually begin 2-14 days after a person has been infected. A study on more than 55,000 people with illness carried out in China showed the range of symptoms with COVID-19 are:

- Fever: 88% of cases
- Dry cough: 68% of cases
- Fatigue: 38% of cases
- Coughing up thick phlegm from the lungs: 33% of cases
- Shortness of breath(trouble breathing): 19% of cases
- Bone or joint pain: 15% of cases
- Sore throat: 14% of cases
- Headache: 14% of cases
- Chills: 11% of cases
- Nausea or vomiting: 5% of cases
- Stuffy nose: 5% of cases
- Diarrhea: 4% of cases
- Coughing up blood: 1% of cases
- Swollen eyes: 1% of cases

4. TRANSMISSION OF COVID-19

The basic outlines of disease transmission have not been upended by COVID-19. The Centers for Disease Control and Prevention (CDC) have said that SARS-CoV-2, a respiratory virus is mainly transmitted between people through "respiratory droplets" .The large droplets of virus-laden mucus are the primary mode of transmission. It is guided as CDC's advice to maintain at least a 6-foot distance from other person. The large droplets which are bigger than about 0.0002 inches, or 5 microns, in size may fall to the ground within a distance of 6 feet from the infected person. This mode of transmission can be further categorized symptomatic, Pre-symptomatic transmission and Asymptomatic transmission .

4.1.SYMPTOMATIC TRANSMISSION

Such transmission is done by symptomatic people to others who are in close contact through respiratory droplets, by direct contact with infected persons, or by contact with contaminated objects and surfaces(16-17).This is supported by detailed experiences shared by provided evidence that shedding of the COVID-19 virus is highest in upper respiratory tract (nose and throat) early in the course of the disease(18-20). That is, within the first 3 days from onset of symptoms(19-20).

4.2.PRE-SYMPTOMATIC TRANSMISSION

The incubation period for COVID-19, which is the time between exposure to the virus (becoming infected) and symptom onset, is on average 5-6 days, however can be up to 14 days. During this period, also known as the “presymptomatic” period, some infected persons can be contagious. A small number of case reports and studies, pre-symptomatic transmission has been documented through contact tracing efforts and enhanced investigation of clusters of confirmed cases (21-26). This is supported by data suggesting that some people can test positive for COVID-19 from 1-3 days before they develop symptoms(25).

4.3.ASYMPTOMATIC TRANSMISSION

An asymptomatic laboratory-confirmed case is a person infected with COVID-19 who does not develop symptoms. Asymptomatic transmission refers to transmission of the virus from a person, who does not develop symptoms. There are few reports of laboratory-confirmed cases who are truly asymptomatic, and to date, there has been no documented asymptomatic transmission. This does not exclude the possibility that it may occur. Asymptomatic cases have been reported as part of contact tracing efforts in some countries. Some people get infected with the coronavirus but don't have any symptoms.

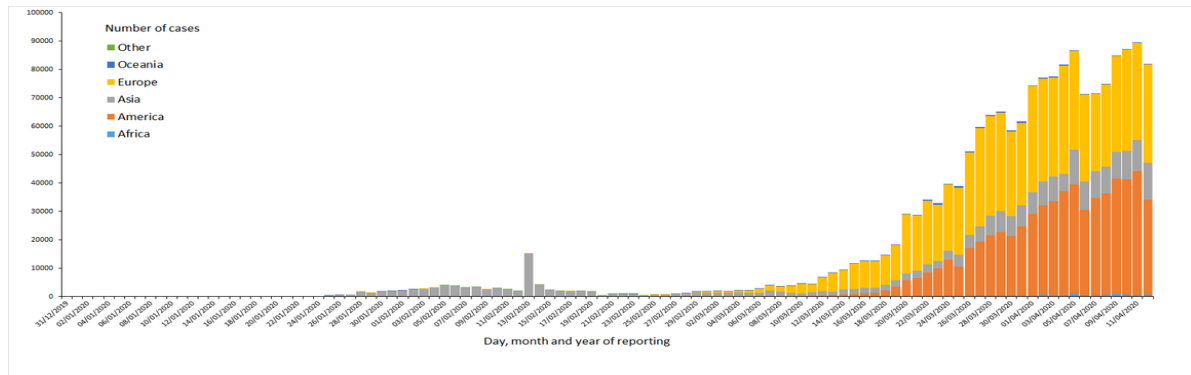
5. WORLDWIDE DEATHS & RATE OF INFECTIONS FROM DEC.2019-APRIL 2020:

In China, SARS-CoV-2 had caused 71 331 human infections and 1775 deaths by Feb 17, 2020. So far the novel coronavirus, which results in the Covid-19 disease, has killed over 103,000 people that is one in 75,000 humans and infected over 1,699,000 globally that is one in 4,000 humans. Total population recovered globally are 342,000 that is one in 22,000 humans as of now by 10th April 2020. Since 31 December 2019 and as of 12 April 2020, **1 734 913 cases** of COVID-19 (in accordance with the applied case definitions and testing strategies in the affected countries) have been reported, including **108 192 deaths**. Fig. 3 & 4

5.1.EPIDEMIOLOGICAL CURVES

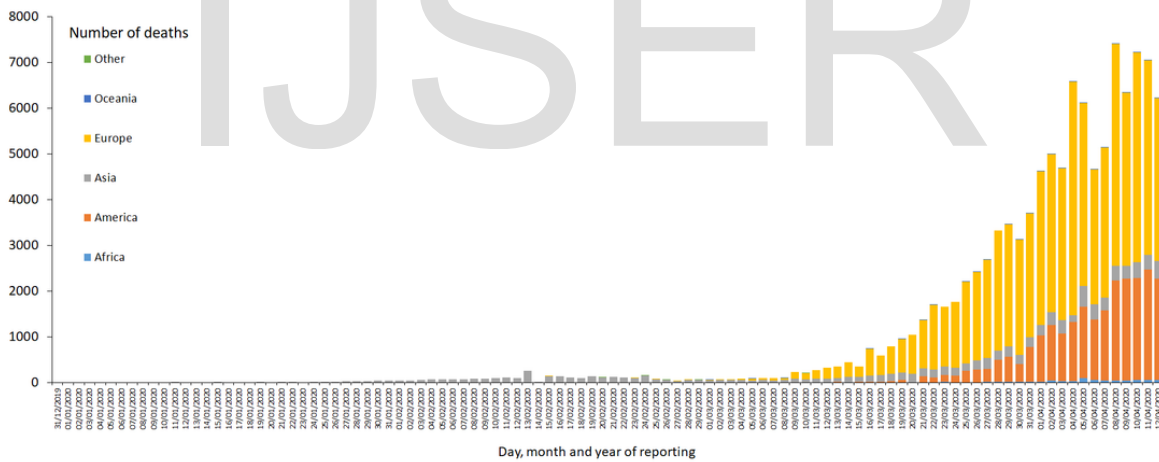
The histograms in Fig. 3 & 4 are based on the available information at the time of publication, originating from several sources. Data completeness depends on the availability of information from the affected areas. The data is interpreted as globally available with due caution as the outbreak is evolving rapidly (27).

Fig.3.Distribution of COVID-19 cases worldwide, as of 12April 2020



Distribution of cases of COVID-19 by continent (according to the applied case definition and testing strategies in the affected countries)

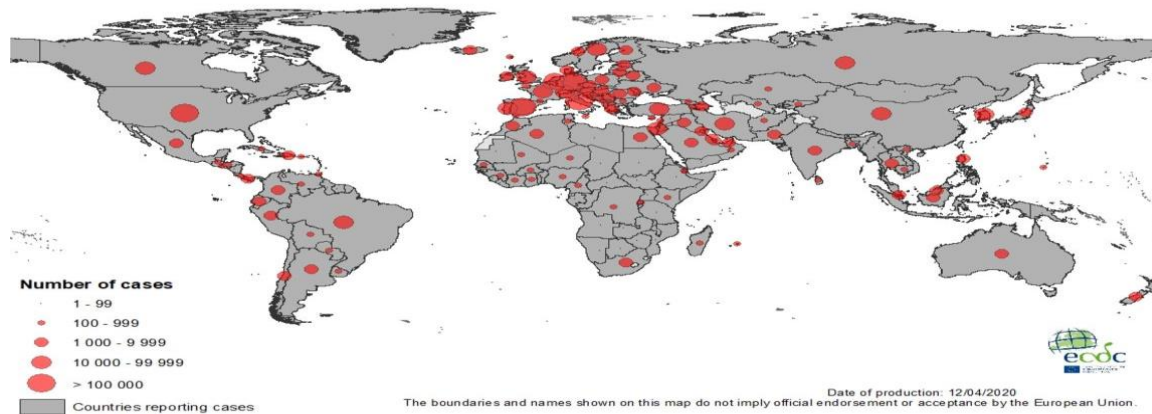
Fig.4.Distribution of COVID-19 deaths, worldwide, as of 12April 2020



Distribution of cases of COVID-19 deaths worldwide

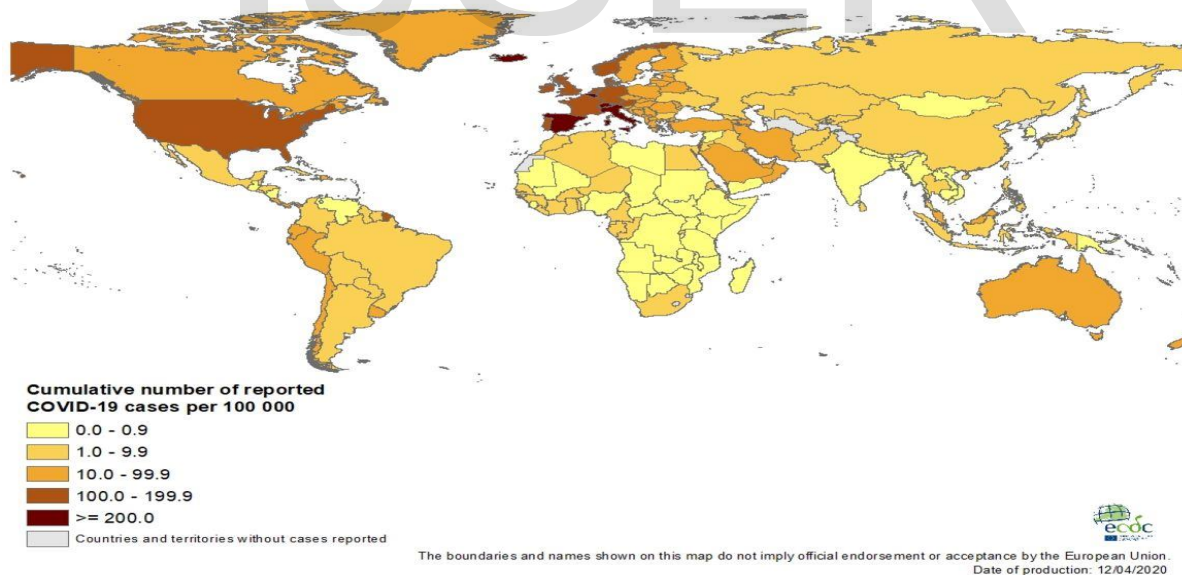
5.2.GEOGRAPHIC DISTRIBUTION OF COVID-19 Fig. 5 & 6

Fig.5.Geographic distribution of COVID-19 cases worldwide, as of 12April 2020



Geographical distribution of COVID-19 cases – worldwide(*The boundaries and names indicated on this map do not imply official endorsement or acceptance by the European Union.*)

Fig.6.Geographic distribution of cumulative number of reported COVID-19 cases per 100 000 population, worldwide, as of 12April 2020



Geographic distribution of cumulative number of reported COVID-19 cases per 100 000 population, worldwide

6. PREVENTION OF COVID-19

China CDC also published a guideline to spread awareness among the general population for prevention and control of COVID-19. Guideline include wear face masks, proper hand washing habits, preventive measures required to be taken at different locations (e.g., at home, on public transportation, and in public space), disinfection methods, and medical observation at home (28-30). But few general guidelines to be followed by all the individuals as Prevention & controlling measures like:

6.1. WASH YOUR HANDS FREQUENTLY AND CAREFULLY

Use warm water and soap to wash your hands for 20 seconds. Use hand sanitizer when you cannot wash your hands properly. Rewash your hands several times a day.

6.2. AVOID TOUCHING YOUR FACE

SARS-CoV-2 can live on hard surfaces for up to 72 hours. Avoid touching your face, mouth, nose and eyes. Also avoid biting your fingernails. This can give SARS-CoV-2 a chance to go into your body.

6.3. STOP SHAKING HANDS AND HUGGING PEOPLE:

Avoid touching other people. Skin to skin contact can pass SARS-CoV-2 from one person to another.

6.4. DON'T SHARE PERSONAL ITEMS

6.5. COVER YOUR MOUTH AND NOSE WHEN YOU COUGH AND SNEEZE

SARS-CoV-2 is found in high amounts in the nose and mouth. That can be easily carried by air droplets to other people when someone cough or sneeze. It can also land on hard surfaces and stay there for up to 3 days.

6.6. CLEAN AND DISINFECT SURFACES

6.7. SOCIAL DISTANCING

SARS-CoV-2 virus, is found in high amounts in your spit (sputum). This can happen even if you do not have symptoms. Keep a distance of 6 feet from other people. One can transmit the virus by speaking to someone in close contact.

6.8. DO NOT GATHER IN GROUPS

6.9. AVOID EATING OR DRINKING IN PUBLIC PLACES

6.10. WASH FRESH GROCERIES

Soak all raw, whole fruits and vegetables in a solution of food-grade hydrogen peroxide, white vinegar or vegetable antibacterial wash to clean. Wash your hands before and after handling.

6.11. WEAR A MASK

The Centers for Disease Control and Prevention (CDC) recommends that everyone wear a cloth face mask in public settings where social distancing may be difficult. These masks can help prevent people who are asymptomatic or undiagnosed from transmitting SARS-CoV-2 when they breathe, talk, sneeze, or cough. This, in turn, slows the spread of the virus (28).

6.12. SELF-QUARANTINE IF SICK

Consult the doctor if you have any COVID-19 symptoms. Stay at home until you recover completely. Avoid to be with your loved ones even if you live in the same home. Wear a mask and wash your hands as much as possible.(29)

7. CONTROLLING MEASURES FOR COVID-19

Environmental, personnel cleaning and disinfection procedures must be followed consistently and correctly for COVID-19. But now most of nations are also following certain controlling measures in three phases, such as:

7.1. READINESS MODE PHASE: This mode includes awareness, disease-specific education and targeted communications. Identify, isolate and care for patients early, providing optimized care for infected patients. Identify and reduce transmission from the animal source.

7.2. ACTIVE RISK REDUCTION MODE PHASE: This mode is implemented when the outbreak has reached the duty station with some community. This includes management of medical resources and reduction of corona footprints. Interrupt human-to-human transmission including reducing secondary infections among close contacts and health care workers, preventing transmission amplification events, and preventing further spread.

7.3. EMERGENCY MODE: In this mode, full implementation of risk management and medical response measures is required. Currently the critical importance to world health is to get the availability and deployment of effective vaccines against COVID-19. Address crucial unknowns regarding clinical severity, extent of transmission and infection, treatment options, and accelerate the development of diagnostics, therapeutics and vaccines. Communicate critical risk and event information to all communities and counter misinformation. Minimize social and economic impact through multisectoral partnerships.

8.ABBREVIATIONS

CDC:Center for Disease Control

MERS:Middle East Respiratory Syndrome

SARS:Severe Acute Respiratory Syndrome

WHO:World Health Organization

9. CONCLUSION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the Coronavirus turn an Endemic to a pandemic within the period of three months. Now this became a global challenge. SARS-CoV-2 pandemic is described as a disease that affects the entire world. In this situation, there is a specific outbreak of global concern.

This study shows a holistic picture of the current research in response to the outbreak of COVID-19. Current study exploring the epidemiology, causes, prevention and control of the novel coronavirus. Studies in this domain are trying to spread awareness & take certain precautions to minimize the impact of this outbreak & spread of the COVID-19. This can be achieved by a combination of public health measures, such as rapid identification, diagnosis and management of the cases. Infection prevention and control in health care settings, implementation of health measures for travelers, awareness-raising in the population and risk communication are followed globally.

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