
COVID-19: Few Facts & Figures

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Abstract

Human civilization is under the dark shadow of COVID-19 coronavirus which is a unique virus. The nucleus of this disease is supposed to originate in the Wuhan province of China from where the disease started to take a grip across the nations. The present paper highlights some facts and figures on COVID-19 along with a list of drugs that may serve as a lifeline in the present situation. Some home remedial measures have also been highlighted in the paper synchronizing with the concept “PREVENTION IS BETTER THAN CURE”.

Keywords: COVID-19, Disease, Coronavirus, Remedies, Prevention

Introduction

Novel Coronavirus disease (COVID-19) is an infectious disease which is caused by a new virus (Lu H et al., 2020). This disease had first shown its emergence in the city of Wuhan, Hubei Province in the Mainland China in early December 2019, and was hence known as Novel coronavirus disease nCoV (COVID-19) caused by the novel lineage B beta coronavirus known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) having a series of atypical pneumonia cases. Initially, tentatively named 2019 novel Coronavirus (2019-nCoV), the virus has now been named

SARS-CoV-2 (Fig. 1a & 1b.) by the International Committee on Taxonomy of Viruses (ICTV)(Gorbalenya et al., 2020).

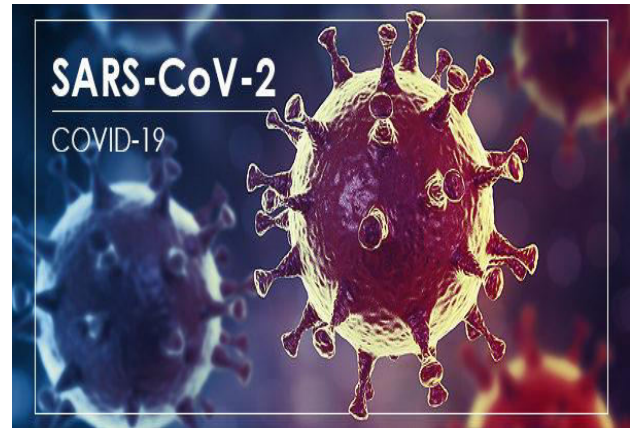


Fig. 1a. Novel Coronavirus SARS-CoV-2

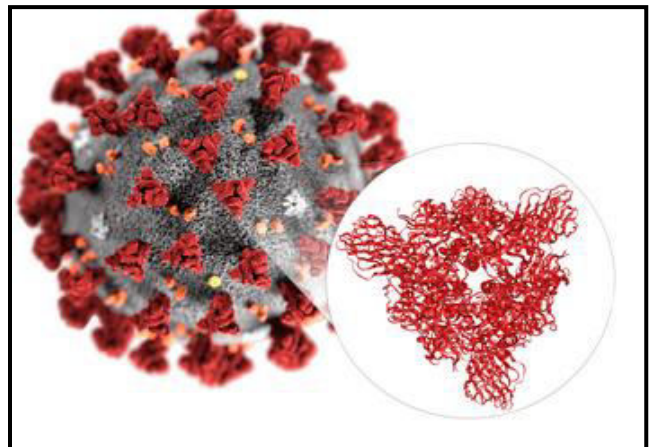


Fig. 1b. 3D structure of SARS-CoV-2

Source: <https://www.certtest.es/news/certtestSource:https://www.gatan.com>

Starting from Wuhan, the viral infection has spread rapidly worldwide, leaving almost no country untouched (LiQ et al., 2020; Chen et al., 2020; Huang et al., 2020; Wang C et al., 2020; Holshue et

al., 2020). Fig. 2 represents the major areas in China with positive cases of the COVID-19 virus during the outbreak (as of 28th January).

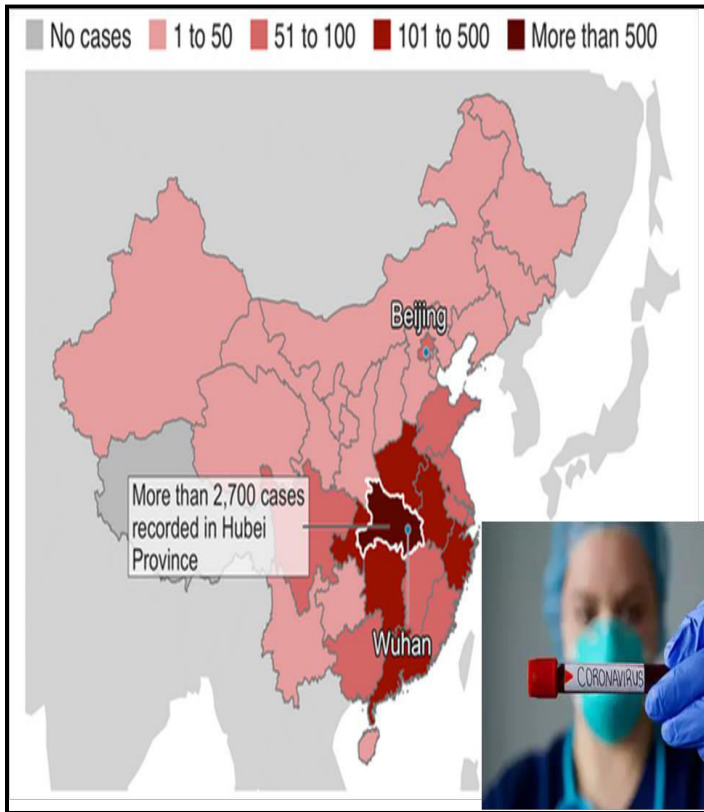


Fig. 2. Emergence of Coronavirus in China, with the number of positive cases

Source: China National Health Commission, BBC Research
28 Jan 2020

As of April 8th, 2020, 2019-nCoV has resulted in more than **1.4 million** confirmed cases and over **86,000** deaths worldwide, affecting more than 209 countries/regions and has become a global pandemic (WHO). After February 26th the epidemic disease COVID-19, has crossed international boundaries, and severely affected countries like US (430k), Spain (150k), Italy (140k), Germany (110k), France (82k), Iran (67k), and UK(60k) (<https://www.who.int>, <https://www.worldometers.info/coronavirus/>) and many more, surpassing the number of affected persons compared to that of Mainland China. The disease causes respiratory illness (like

the flu) with preliminary symptoms of cough, fever, and in severe cases, difficulty in breathing. Early studies have documented a possible link between fish and animal market to be a leading cause towards most of the possible coronavirus infection from animal to humans, but human to human infection of SARS-CoV-2 is mainly spread through contact and droplet transmission (Gorbalenya et al., 2020; Wang C et al., 2020; Carlos et al., 2020). The clinical spectrum of COVID-19 ranged from asymptomatic or mild respiratory infection to uncontrollable pneumonia with acute respiratory distress syndrome or multiorgan failure, which is fatal (Guan et al., 2020; Huang et al., 2020; Wang C et al., 2020). Most patients infected with SARS-CoV-2 exhibited symptoms of fever, cough, myalgia, fatigue and shortness of breath (Young et al., 2020). Coronavirus disease spreads primarily through contact with an infected person when they cough or sneeze, where, water droplets are the mode of transmission. It can further spread through contact of a person with a virus contaminated surface or object and touching their eyes, nose, or mouth. Wang D et al. have reported 41% of patients showing hospital related transmission of the virus (Wang D et al., 2020). Some of the researches have also pin-pointed that asymptomatic carriers have also contributed immensely towards growing infection ratio globally (Zhao et al., 2020; Biscayart et al., 2020).

Since the outbreak of this disease in the city of Wuhan, it has grown exponentially, due to which it was classified as a pandemic by the World Health Organization (WHO) on March 11, 2020. In

addition to the number of patients affected, the increasing death toll among patients, has raised concerns regarding infection transmission from patients tested positive for the disease, to the healthcare workers (HCWs) and the medical fraternity, towards the best known practices for personal protective equipment (PPE) use in a resource and information constrained environment (Workman et al., 2020).

The possibility of a person being infected by SARS-CoV-2 can be confirmed with laboratory-based testing methods for possible accurate diagnosis. Thus, testing for SARS-CoV-2 RNA has become the standard protocol for COVID-19 diagnosis (Li Q et al.,2020). In India the disease has spread rapidly in the majority of the states, which have quite a few patients who have a past history of travel to virus infected countries. In addition to this, due to multiple mode of transmissions, the number of COVID-19 patients is increasing at an alarming rate. However, proper testing for COVID-19 infection is essential to rule out the common cold and flu symptoms, before treatment. Quite a number of false negative results have been reported earlier, according to Li et al. which has resulted in a failure to quarantine the infected persons. Being unchecked, this has largely contributed towards viral transmission locally (Li Z et al.,2020). In India, reports of coronavirus infection started showing up at a fast pace and due to unavailability and insufficiency of test kit, it was criticized for not testing at the prescribed rates. Finally, on March 18 the first COVID-19 testing kit was developed by a Pune-based diagnostic firm Mylab's research and

development. Minal Dakhve Bhosale and her team, from Mylab, prepared the coronavirus testing kit called Patho Detect, in just six weeks. This test can effectively diagnose, whether a patient is COVID-19 positive or negative in two and a half hours, while the imported testing kits take almost six-seven hours. Mylab laboratories have been registered as the first Indian company to have the validation for its Covid-19 diagnostic test kits, also known as the Reverse Transcription Polymerase Chain Reaction (RT-PCR) tests by the Drug Controller of India, after validation from the National Institute of Virology.

Materials and Methods

This is a first order analysis on COVID-19 collected from the research contributions of various workers, whose details are highlighted in the reference section. The authors have attempted to collect secondary data and stitch them in a systematic manner to present a comprehensive view of this disease, whose remedy is yet to be discovered.

Results and Discussion

COVID-19 is spread through transmission, i.e. from people to people. A small droplet from the nose or mouth of a person with COVID-19 can affect millions together in contact. The unaffected person becomes prone to this disease by personal contact or by contact through contaminated surfaces including paper, cardboard, steel, glass, wood, etc. In other words, it is highly contagious and can cause life threats if unattended. COVID-19 is a virus, and hence the antibody treatment is not feasible or sufficient in this case. Being a novel strain, the success in finding out a possible treatment is still

keeping the scientists and medical practitioners on their toes. The most effective ways to protect the body are, frequently washing hands with soap and water (preferably for 20 seconds), cover the cough with the bend of the elbow or tissue, and to maintain a distance of at least 1 meter (3 feet) from people who are coughing or sneezing or wear a protective mask covering nose and mouth. According to WHO, above 209 Countries and Territories around the world have reported more than 1.4 million confirmed cases of the coronavirus COVID-19 that had originated from Wuhan, China, and a death toll of over 86,000 as of April 8th, 2020. A comparative graph is represented in Fig. 3 which shows the rise in the number of new cases in each day. Fig. 4 represents the total number of Coronavirus cases, recoveries and deaths, worldwide (updated 8th April 2020).

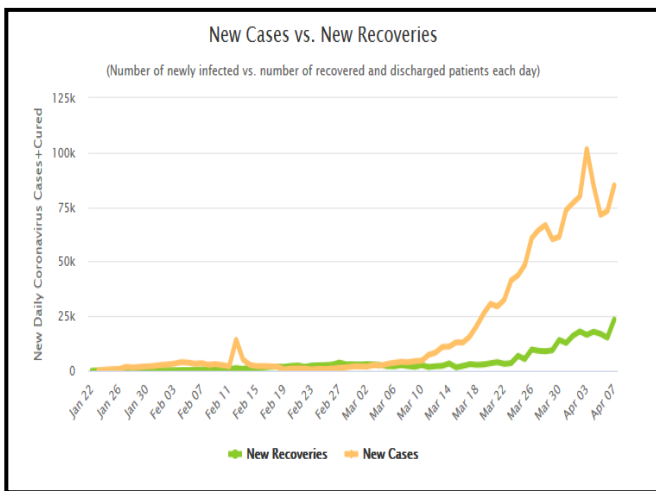


Fig. 3. Graphical representation of the number of newly affected patients vs. number of recovery patients

Source: **Worldometer** - www.worldometers.info

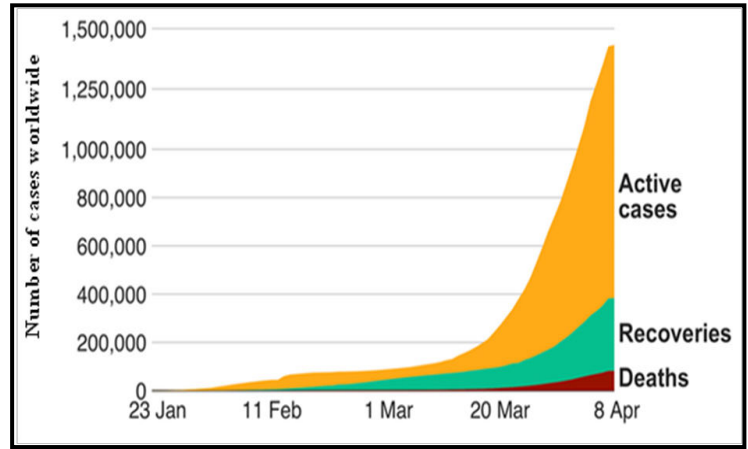


Fig. 4. Coronavirus cases, recoveries and deaths, worldwide

Source: John Hopkins University, 8th April 2020

Scientists worldwide are trying to take the initiative in pioneering a medication and/ or a vaccine, and possible medication strategy, for this pandemic disease. On this track the U.S. has come up with 3 types of vaccines for coronavirus (Table 1).

Table 1. Types of vaccine in U.S.

Sl No.	Name of Vaccine	Location
1.	Moderna's mRNA-1273	Kaiser Permanente Washington Health Research Institute in Seattle
2.	Regeneron's REGN3048-3051	Regeneron Pharmaceuticals of Tarrytown, New York
3.	Inovio's INO-4800	Inovio Pharmaceuticals of Plymouth Meeting, Pennsylvania

Source: <https://www.nbcnews.com/health/health-care/here-are-3-drugs-development-fight-coronavirus-2-vaccines-one-n1163191>

Besides, different companies in the world are also involved in the making of vaccines (Table 2) (Published: April 5, 2020).

Table. 2. Companies in the World involved in making of vaccine

Sl No.	Company Name	Vaccine name	Phase treatment
1.	BioNTech SE and Pfizer Inc.	BNT162	Preclinical
2.	CytoDyn Inc	Leronlimab	Phase 2 clinical trial
3.	Gilead Sciences Inc.	Remdesivir	Phase 3 clinical trials
4.	Regeneron Pharmaceuticals and Sanofi	Kevzara	Phase 2/3 clinical trial
5.	Roche Holding AG	Actemra	Phase 3

Source: <https://www.marketwatch.com/story/these-nine-companies-are-working-on-coronavirus-treatments-or-vaccines-heres-where-things-stand-2020-03-06>

A longevity biotech company in Japan, named Gero, established by a team of scientists and entrepreneurs having vast experience in the area of life sciences and specialization in AI-driven (artificial intelligence) drug discovery, have used its AI basics to identify the anti-COVID-19 drugs.

Some of their drugs have been familiar for decades and approved in many countries for human or veterinary use, some of them have even confirmed the potency against SARS-CoV and SARS-CoV-2 viruses, while others were not much effective. Some drugs are listed in Table 3 which are formulated in different countries and considered to be effective against COVID-19.

Table 3. List of drugs against COVID-19

Name of drugs	Types of drugs and treatment	Approved in countries
Niclosamide	Oral anthelmintic drug used to treat parasitic infections in millions of people worldwide	Italy, the United States (now withdrawn), France, and some other countries
Nitazoxanide	Broad-spectrum antiparasitic and broad-spectrum antiviral prescription drug that is used in medicine for the treatment of various helminthic, protozoal, and viral infections	U.S., India, Mexico and some other countries
Ixazomib	Prescription medicine used in combination with the medicines REVLIMID® (lenalidomide) and dexamethasone to treat multiple myeloma in patients who have received at least one prior treatment for their multiple myeloma	U.S., EU and some other countries

Source: <https://www.expresscomputer.in/news/covid-19/ai-finds-9-potential-coronavirus-covid-19-drugs-that-can-be-used-on-humans-immediately/51446/>

Scientists are evaluating the possibility of using two anti-malarial drugs, Hydroxychloroquine and Chloroquine, in the treatment of COVID-19, which may prove to be useful for prevention and treatment of people with infections. Chloroquine has been effective to inhibit the growth of the novel

coronavirus under laboratory conditions, and also been applied in China to treat critically ill patients. Another drug Avigan is already approved in China for treating symptoms of COVID-19. Avigan has been earlier used in Japan as a candidate anti-influenza drug, which had been developed decades earlier by the Fujifilm subsidiary Toyama Chemical, and has been approved for possible treatment of SARS CoV-2. Following this, a critical step involving clinical trials, which is likely to conclude by the end of June may provide a light of hope in this treatment. Although there has not been any documented data in support of Avigan's effectiveness as a Covid-19 treatment, on March 17, Zhang Xinmin, a Chinese official at China's Ministry of Science and Technology, has confirmed Favipiravir to be the generic version of Avigan, which has proved to be effective in the treatment of Covid-19 patients at the hospitals in Wuhan and Shenzhen. Japan now finds it safe to use Avigan as a prescription medicine for COVID-19 treatment(<https://www.wired.com/story/japan-is-racing-to-test-a-drug-to-treat-covid-19/>). However, Japan's government is waiting for of its own clinical trials before utilizing the drug on a mass scale. Many countries are now relying on this medicine along with Indonesia and have joined the race to try their fortune.

Home Remedies for COVID-19

Some home remedial measures may provide protection from respiratory infections or may reduce the duration of symptoms

(a) Zinc is effective in reducing the length of certain viral infections, thus taking lozenges,

syrups, and tablets containing zinc, might help in prevention of infection. The NIH (The National Institutes of Health) notes that the body needs zinc to create white blood cells that fight infections.

(b) For respiratory infection, Vitamin D is beneficial. Deficiency of which causes respiratory diseases like tuberculosis and pneumonia. Thus, Vitamin D levels can be checked for disease prevention to some extent.

(c) In a Chinese hospital, during the outbreak of COVID-19, Vitamin C was put into a phase 2 clinical trial where, researchers have proposed that being an antioxidant, Vitamin C may reduce lung inflammation.

Testing laboratories in India and other countries

In diagnostic laboratories, Real Time Reverse Transcription Polymerase Chain Reaction (RT-PCR) test (detects the presence of viral RNA in human samples) is used for COVID-19. The Indian Council of Medical Research (ICMR) has given the permission to conduct the test in 176 labs that includes 47 private labs. The U.S. Govt. Authority of Food and Drug Administration (FDA) has authorized 20 manufacturers and kits for diagnostic testing for COVID-19. Genetic and microbial testing firm, Bione has introduced a Rapid COVID-19 at-home testing kit that exhibits accurate results within minutes. This kit is approved by the Indian Council of Medical Research (ICMR) however it will be available after proper quality checks and affirmations. This company can supply about 20,000 kits per week and can make manufacturing

facilities in the coming months to sufficiently cater to the high demand. The price of the testing kit is varied between INR 2000-3000/- which depends on the global supply.

The first Indian molecular diagnostic company named Mylab Discovery, in Pune (Maharashtra) has received the approval for supplying coronavirus (COVID-19) test kit known as Mylab PathoDetect Covid-19 shown in Fig. 5 (a, b) which is called Reverse Transcription Polymerase Chain Reaction (RT-PCR) tests. It has also been approved by the Indian FDA / Central Drugs Standard Control Organization (CDSCO) for uses in commercial purpose, and will be available for approximately INR1200.



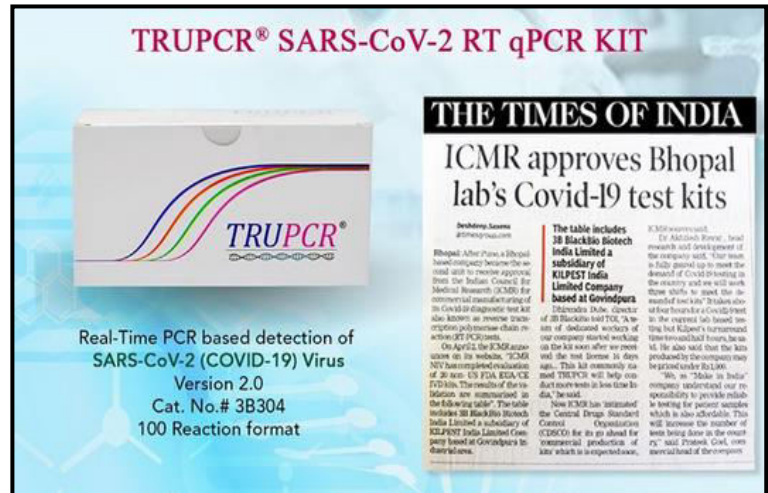
Fig. 5 (a & b) PathoDetect™ CoVID-19 detection kit by MyLab Discovery, Pune (India)

Source: <https://mylabdiscoverysolutions.com/covid-19/>

In India, the 2nd approved company is 3B BlackBio Biotech which is located in Bhopal. They have received the ICMR approval for their COVID-19 Real-Time PCR detection kit on April 02, 2020. 3B Black bio Biotech (I) Ltd. a branch of KILPEST India Ltd. The kit named TRUPCR® SARS CoV-2 Real-Time PCR test kit (Fig. 6) is a molecular detection test which screens and detects COVID-19

specific genes effectively and works on any Realtime PCR instrument available in the lab, and hence does not require any new or closed systems.

Fig.6. TRUPCR® SARS CoV-2 Real-Time PCR test kit



Source: <https://www.3blackbio.com/trupcr-product.html>

Different companies in the World have received approvals for antibody based rapid test kits. Among them most of the companies are from China, namely Hangzhou Biotest Biotech, Getein Biotech, AmonMed Biotechnology Co., Beijing Tigsun Diagnostics Co. Ltd., Hunan Lituo Biotechnology Co., Vivacheck Lab and Wondfo, Biomaxima (in Poland), Sensing Self Ltd based in Singapore and CTK Biotech and BioMednomics are from the U.S. Cranfield University has engaged its researchers in developing a new test to detect SARS-CoV-2 in the wastewater of communities infected with the virus. As faecal contamination with the said virus is reported by researchers (<https://www.nature.com/articles/s41575-020-0295-7>), the wastewater-based (WBE) approach may provide an effective and quick way to predict the

possible spread of novel coronavirus pneumonia (COVID-19) by banking on biomarkers in faeces and urine samples from suffering patients or disease carriers entering into the sewage system. This employs Rapid test kits made up of paper-based devices to be used on-site at wastewater treatment plants to rule out potential COVID-19 carriers in local areas.

It has been reported that, in addition to seasonal influenza, pathogens of pneumonia are also found in adenovirus, human bocavirus, human metapneumovirus, parainfluenza virus 1/2/3, rhinovirus and respiratory syncytial virus A/B. Study using molecular methods, and the role of these viruses in causing pneumonia has achieved significant acclamations. SARS-CoV-2 has been reported to be a positive-sense, single-stranded RNA virus belonging to the genus Beta coronavirus (Chan et al., 2020; Lu R et al., 2020; Zhu et al., 2020). Based on the documentations of genomic investigations by Jiang et al. (2020) and Zhou et al. (2020) it can be evaluated that the presence of bats and live animals in the Wuhan seafood market, may have been the causative agent for SARS-CoV-2 through bats or bat droppings which had contaminated the market and surrounding regions (Jiang et al., 2020 and Zhou et al., 2020). COVID-19 virus being airborne and having small particle size can travel extensively as aerosols and hence it is mandatory to use specific PPE to protect against inhaled transmission. N95 respirators qualify for the same as they are air purifying respirators and protect against droplet or airborne transmission. Their filtering efficiency is satisfactory as set forth

by the National Institute for Occupational Safety and Health (NIOSH) N95 standard, which filter large droplets and penetrating aerosols 0.3µm in diameter with 95% efficiency. The typical infection is specified by respiratory problems, which indicates droplet transmission being the major route. However, reports of gastrointestinal problems in some patients with SARS-CoV-2 infection along with the presence of viral RNA or live virus infection in their faeces, reflects another possibility of faecal–oral transmission (Hindson, 2020). Although the exact mechanism of SARS-CoV-2 interaction with the gastrointestinal tract is unknown, SARS-CoV-2 is believed to use ACE2 mRNA as a viral receptor, which is expressed in the gastrointestinal system. Clinical specimens from over 73 hospitalized patients with SARS-CoV-2 infection were examined by gastroenterology researchers. Among them, 39 patients tested positive for SARS-CoV-2 RNA in stool samples, but 17 patients were found to be positive for SARS-CoV-2 in stool samples, although being negative in their respiratory samples or nasal swabs (Xu, et al., 2020). Additionally, waste-water-based epidemiology (WBE) approach may be an effective tool to detect local area contamination of novel coronavirus pneumonia (COVID-19) in waste waters, using biomarkers of faeces and urine. Paper based Rapid testing kits can be used on-site wastewater treatment plants to determine the spread of contamination and possible carriers of this disease (Kang et al., 2020). According to Dr Zhugen Yang, Lecturer in Sensor Technology at Cranfield Water Science Institute, for those people who are

unknown of the fact, that they may be carriers or are infected, this type of analytical device can help in the rapid screening, quarantine, prevention and cure (Cranfield University, 31 March 2020). If monitored at local and individual levels at an early stage, possible restrictions for contacts and socializing may be done which may reduce pathogen spread to further populations. The WHO declared the COVID-19 outbreak as a public health emergency of international concern, after H1N1(2009), polio(2014), Ebola in West Africa (2014), Zika(2016) and Ebola in the Democratic Republic of Congo(2019). Thus, health workers, governments and local people need to co-operate at a global level to prevent the spread (Yoo, 2020). Most of the global business and the travel industry has been affected by this pandemic setback. As a result of the disease transmission, the majority of the world is undergoing a lock down period to prevent mass gatherings and travel. The United States and most of Europe have enacted travel bans and put major cities on lockdown to slowdown the spread of coronavirus. Similarly, Japan and other countries, including India, have closed schools and cancelled many sporting events, to avert further disease transmission. Not only many positive cases are reported every-day, but thousands of people with travel history from the affected areas or those who have tested positive for COVID -19 but are asymptomatic, have been kept under quarantine and isolation to avoid further risk of contamination. The local government has ensured stay at home safety measures by creating awareness among people, to avoid contact with affected persons, washing hands

with soap and water and sanitization of hands with alcohol-based sanitizers. The concept of 'Social distancing' has also been in practice so as to fight the battle against the Coronavirus. As limited knowledge about this novel virus is available, it remains advisable to implement infection control measures to prevent the spread of SARS- CoV-2 via human-to-human transmission. Strict monitoring of the situation and patients in isolation and quarantine can help in controlling the spread of the disease, resulting in the number of deaths. Clinical trials of vaccines and drugs are still awaited, and the need of the hour is to support the health care workers and the Government to get over from this pandemic. The more we remain indoors and confined, the better it would be.

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