

Novel Coronavirus 2019: A Recent Update

**Mohammad Mukim^{1, 2*}, Pawan Kumar Mahawar¹, Pratishtha Sharma¹,
Abhay Sharma¹, Supriya Roy³**

¹Kota College of Pharmacy, Kota, Rajasthan-India-324003

²Dr. A.P.J Abdul Kalam University, Indore (M.P.) India – 452016

³Amity University, Gomti Nagar, Lucknow, Uttar Pradesh, India- 226010

Abstract. Since last year of December 2019, a virus Severe Acute Respiratory Syndrome coronavirus (SARS-CoV-2), has been identified in Wuhan, China, 2019 Novel Coronavirus (COVID-19) Disease is a very scary disease. This disease is a challenge for human as its cure is still need to be discovered. These virus have effected all over the world's country like America, Brazil, Turkey, China, Italy, Iran, India, Canada and Russia etc., this virus first time reported in relation to the Huainan Seafood Wholesale Market (South China Seafood City Food Market) in Wuhan, China. This market gained media attention after being identified as a point of origin of the 2019–2020 coronavirus pandemic. Severe Acute Respiratory Syndrome coronavirus have the common sign & symptoms like pneumonia and show symptoms of fever, headache, joint pain, common cold, chills, shortness of breath, cough severe pneumonia, dyspnea, and renal insufficiency. The detection of 2019- SCoV-like viruses in tiny size, live wild mammals in a market indicates a route of inters species spreading, although the natural loch is not known. This theory assembles a study of the molecular biology fundamental of these infectious agents, with particular prominence on the nature and identify of viral receptors, viral RNA synthesis, and the molecular interactions governing viral assembly.

Keywords: Coronavirus, Pneumonia Transmission, Virus, Viral RNA.

Abstrak. Dipenghujung akhir tahun Desember 2019, sebuah virus yang dinamakan Sindrom Pernafasan Akut (SARS-CoV-2), telah diidentifikasi di Wuhan, Cina, Coronavirus 2019 (COVID-19) adalah penyakit yang sangat menakutkan. Penyakit ini merupakan tantangan bagi manusia dikarenakan terapi antivirus yang masih belum ditemukan. Virus ini telah mempengaruhi seluruh negara di dunia seperti Amerika, Brasil, Turki, Cina, Italia, Iran, India, Kanada dan Rusia serta berbagai Negara lainnya. Virus ini pertama kali dilaporkan terjadi di Pasar Grosir Makanan Laut Huainan di Wuhan, Cina. Pasar ini mendapat perhatian media setelah diidentifikasi sebagai titik asal pandemi coronavirus 2019-2020. Infeksi virus corona memiliki tanda & gejala yang sama seperti pneumonia dan menunjukkan gejala demam, sakit kepala, nyeri sendi, pilek, menggigil, sesak napas, batuk pneumonia berat, dispnea, dan insufisiensi ginjal. Deteksi virus seperti 2019-SCoV dalam ukuran kecil, mamalia liar yang dijual di pasar menunjukkan rute asal penyebaran meskipun tidak diketahui secara pasti. Beberapa teori mengumpulkan studi tentang biologi molekuler yang mendasar dari agen infeksius ini, bagaimana sifat dan identifikasi reseptor virus, sintesis RNA virus, dan interaksi molekuler yang mengatur perakitan daur hidup virus.

Kata Kunci: Virus Corona, Pneumonia Transmisi, Virus, RNA Virus

Received 26 May 2020 | Revised 23 June 2020 | Accepted 24 June 2020.

*Corresponding author at: Kota College of Pharmacy, Kota, Rajasthan-India-324003

E-mail address: mukim.life@gmail.com

1. Introduction

Novel Coronavirus is an enveloped, non-segmented, positive-sense single-stranded RNA virus genomes. It contains 26-32 kilo bases. Corona means “crown” in Latin, therefore the virus is named as corona virus due to its appearance. It contain many protein including phosphorylated nucleocapsid(N) protein, spike glycoprotein trimmer (S) protein, membrane (M) protein (a type III transmembrane glycoprotein), envelope (E) protein, hemagglutinin-esterase (HE). N protein, is buried inside phospholipid bilayers and covered by two different types of spike proteins: (S) that can be found in all CoVs, and the HE that exists in some CoVs. The family Coronaviridae includes a large number of viruses, found in fish, birds and mammals [1], [2].

There are approximately 30 acknowledge CoVs that contaminate mammals, poultry, and other animals. Alpha and Beta CoVs cause infections in humans. Metamorphic analyses have shown that bats and rodents are the gene sources of most α CoVs and β CoVs, while avian species are the gene sources of most δ CoVs and γ CoVs. CoVs have repeatedly crossed species snag and some have emerged as important human pathogens. The viruses (SARS-CoV & MERS-CoV) have originated from bats and then jumped into another amplification mammalian host. The Himalayan palm civet (*Paguma larvata*) for SARS-CoV and the dromedary camel (*Camelus dromedarius*) for Middle East respiratory syndrome Corona Virus (MERS-CoV), before crossing species barriers to infect human [3].

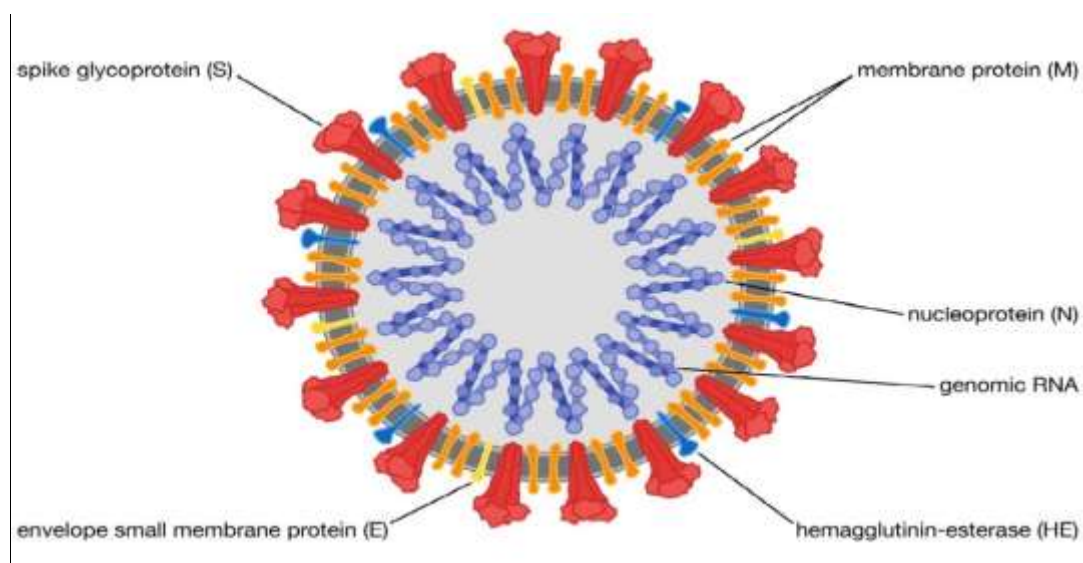


Figure 1 Structure of Novel Coronavirus [3]

2. History

During the end of 2019 and the beginning of 2020, many human cases of novel coronavirus infection were reported in relation to the Huainan Seafood Wholesale Market (South China Seafood City Food Market) in Wuhan, China. At 9 o'clock, January 7, 2020, the virus was identified as a novel coronavirus and officially named by the WHO as Covid-19 [4]. On January 13, 16 and 21 respectively, Thailand, Japan and Korea confirmed cases was detected of a human infection with 2019-nCoV from China. On January 22, 2020, a total of 314 confirmed cases have been reported, and 6 patients were died in China. [5]. Severe acute respiratory syndrome CoV (SARS-CoV) which emerged in China in 2002–2003 to cause a large-scale epidemic [3] and resulted in 8,096 people infected with 774 deaths (fatality rate of 9.6%) [6]. Middle East respiratory syndrome CoV (MERS-CoV) which has caused a persistent epidemic in the Arabian Peninsula since 2012 [7, 8] and killed 858 people out of the 2,494 infected (fatality rate of 34.4%) [6]. Before December 2019, 6 CoVs were known to infect human, including 2 α CoV (HCoV-229E and HKU-NL63) and 4 β CoV (HCoV-OC43 [lineage A], HCoV-HKU1 [lineage A], SARS-CoV [lineage B] and MERS-CoV [lineage C] [3].

3. Total Cases All Over World

According to the WHO this scenario shows about the Novel Corona Virus effect till 26th May, 2020 [9].

- **Confirmed Cases:** 5370375
- **Total Deaths :** 344454
- **Total Countries:** 216

Table 1. Infected World Regions Name by Novel Coronavirus (COVID-19)

No	World Regions Name	Confirmed Cases
1	Americas	2,454,452
2	Europe	2,025,176
3	Eastern Mediterranean	427,832
4	South-East Asia	203,733
5	Western Pacific	175,426
6	Africa	83,044

4. Transmission of Corona virus

Novel coronavirus can be transmitted through droplets of different sizes: droplet particles size is $>5-10 \mu\text{m}$ in diameter they are referred to as respiratory droplets. Droplet particles size $<5\mu\text{m}$ in diameter, they are referred to as droplet nuclei. According to current evidence, COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes. Transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on the infected person (e.g., stethoscope or thermometer). Airborne transmission is different from droplet transmission as it refers to the presence of microbes within droplet nuclei, which are generally considered to be particles $<5\mu\text{m}$ in diameter, can remain in the air for long periods of time and be transmitted to others over distances greater than 1 m. There is some evidence that COVID-19 infection may lead to intestinal infection and be present in faeces. However, to date only one study has cultured the COVID-19 virus from a single stool specimen. There have been no reports of faecal-oral transmission of the COVID-19 virus to date [6].

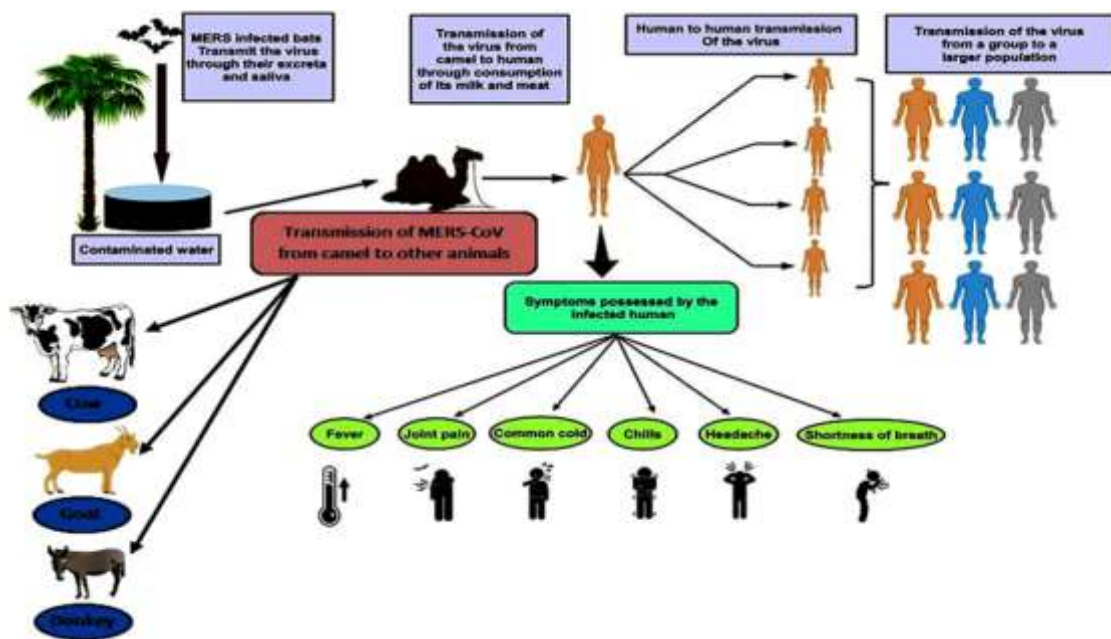


Figure 2 Transmission of Corona Virus [10]

5. Sign and Symptoms of Corona Virus Infection

Most common symptoms: Fever, Dry cough, Tiredness, Shortness of breath

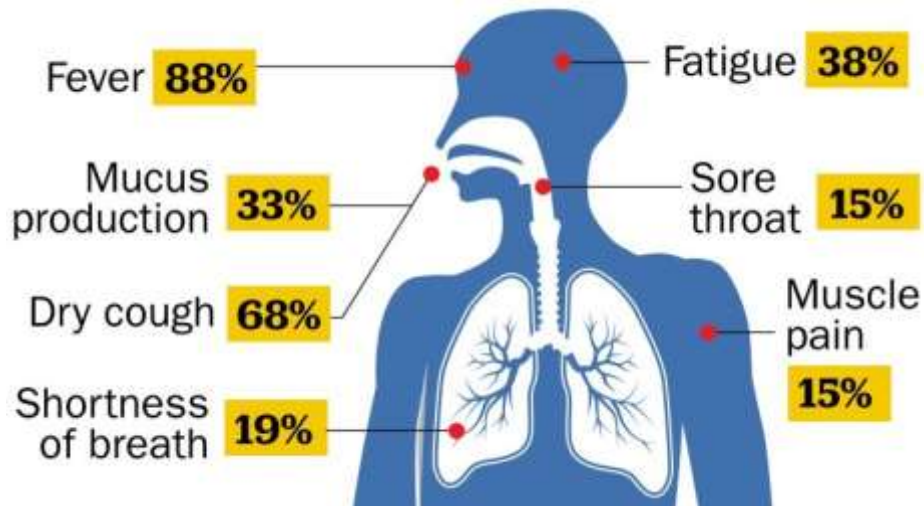


Figure 3 Graphical Sign & Symptoms [6]

Less common symptoms: Aches and Pains, Sore throat, Diarrhea, Conjunctivitis, Headache.

Serious symptoms: Difficulty breathing or shortness of breath, chest pain or pressure loss of speech or movement. Seek immediate medical attention if you have serious symptoms. Always call before visiting your doctor or health facility. People with mild symptoms who are otherwise healthy should manage their symptoms at home. On average it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days.

6. Genomic characterization of 2019 n human corona virus

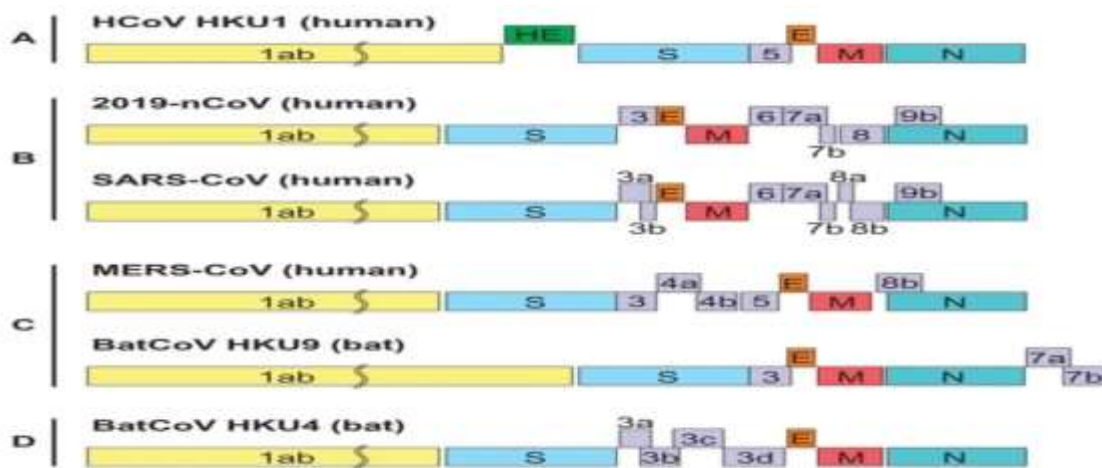


Figure 4 Beta Coronavirus Genome Organization [3] [11]

Coronavirus genome comprises of 5' un translated region (5UTR) including 5' leader sequence, open reading frame (ORF) 1a/b (yellow box) encoding non-structural proteins (NSP) for replication, structural proteins including envelop (orange box), membrane (red) and nucleoprotein (cyan box), accessory proteins (purple boxes) [11].

7. Diagnosis

7.1 Quantitative RT-PCR Assay

A typical 20 mL monoplex RT-PCR assay contained 5 µL of 4X master reaction mixture (TaqMan Fast Virus 1-Step Master Mix, Thermo Fisher), 0.5 µmol/L of forward primer, 0.5 µmol/L of reverse primer, 0.25 µmol/L of probe, and 4 µl of RNA sample. RT-PCR reactions were conducted by a thermal cycler (ViiA7 Real-Time PCR system, Thermo Fisher) with the following conditions: reverse transcription at 50°C for 5 min, inactivation of reverse transcriptase at 95°C for 20 s, 40 cycles of PCR amplification (Denaturing at 95°C for 5 s; Annealing/Extending at 60°C for 30 s). The time for each RT-PCR run was about 1 h and 15 min [12], [13].

7.2 Western blot

Producer cells (spike-transfected 293T) were lysed in 1%SDS, 150mM NaCl, 50mM Tris-HCl, 5mM EDTA and clarified by centrifugation at 14000xG for 20 minutes. Pseudotyped particles were concentrated from builder cell lysates that were overlaid a 10% OptiPrep cushion in PBS (Sigma) and centrifuged at 20,000× g for 2 hours at 4 °C. Lysates and concentrated particles were analyzed for FLAG, GAPDH and/or VSV-m expression on 10% Bis-Tris PAGE gel [14].

7.3 Analysis of RNA

For electrophoretic analysis virion RNA was denatured in glyoxal and dimethylsulfoxide, and electrophoresed on 1% agarose gels in a vertical slab apparatus of 10 cm× 14 cm × 3 mm dimensions using the method of McMASTER and CARMICHAEL. Gels were dehydrated in two successive 30 minutes baths of 100 per cent methanol, compressed by blotting to a thickness of < 1 mm, and exposed to X-Omat film. For T1-oligonucleotide fingerprint analysis virion genomic RNA species were isolated by rate zonal sedimentation on preformed linear gradients of 30 to 15 per cent (w/w) sucrose containing 0.1 percent SDS, 0.02 M Tris-hydrochloride, pH 7.4, 0.1 M NaCl, and 0.001 M EDTA, for 1.5 hours at 110,000 g in a Sorvall 650 rotor, at 25 °C. Fractions (0.2 rot) were collected and the distribution of radioactivity was determined by Cerenkov radiation. RNA was precipitated at -20°C for 16 hours by adding 2 volumes of 100 percent ethanol and 0.1 volume of 2 M sodium acetate. RNA was digested to completion with RNase T1 and electrophoresed in two

dimensions on polyacrylamide gels according to the method of DEWECHTER and FIERS as modified [15].

7.4 Cell Culture and Cell Lines

Human hepatocellular carcinoma cells Huh-7, Huh-7.5 cells and sub clones were maintained in Dulbecco's modified Eagle medium (Invitrogen, Karlsruhe, Germany) supplemented with 10% fetal bovine serum, 2 mM L-glutamine, 1% (v/v) nonessential amino acids, 100 U/ml penicillin, and 100 µg/ml streptomycin. Cells harboring small hairpin RNA (shRNA) were kept in the presence of 5 µg/mL blasticidin. The Huh-7.5-CypAKD cell line, Huh-7D, Huh-7 Lunet cells were described. Cell viabilities were determined by CellTiter- Glo Luminescent Cell Viability Assay [16].

7.5 Inhibitory Effect of Compound

HCoV-229E viruses expressing Renilla luciferase (LUC) or Green Fluorescent Protein (GFP) reporter genes were used to examine the inhibitory effect of compounds. Generally, Huh-7.5 cells were infected with MOI=0.1 and incubated for two days in the presence of increasing concentrations of inhibitor in the culture medium. Viral replication was determined by measuring Renilla luciferase activity or GFP fluorescence.

7.6 Antiviral Assay

Antiviral activities of the candidate compounds were examined using CRFK cells infected with different concentrations of FIPV with two biological and three technical replicates. The CRFK cells were seeded at 1×10^5 cells/mL (100 µl/well) onto a 96-well plate for the immunoperoxidase monolayer assay (IPMA), and at 5×10^4 cells/well into a 24-well plate for qPCR-based detection of the virus. The inhibitory activities of each compound at all the tested concentrations were compared with ribavirin, a broad-spectrum antiviral drug, and lopinavir, an HIV-protease inhibitor, as positive control drugs, for 24 h. A set of wells designated as negative control, consisting of no inhibitor with 1% DMSO control, no virus control, and no inhibitor or virus control, was included in each experiment. Three conditions were generated for each tested compound [17].

7.7 Transmission Electron Microscopy

Supernatant from human airway epithelial cell cultures that showed cytopathic effects was collected, inactivated with 2% paraformaldehyde for at least 2 hours, and ultracentrifuged to sediment virus particles. The enriched supernatant was negatively stained on film-coated grids for examination. Human airway epithelial cells showing cytopathic effects were collected and fixed with 2% paraformaldehyde–2.5% glutaraldehyde and were then fixed with 1% osmium tetroxide dehydrated with grade ethanol embedded with PON812 resin. Sections (80 nm) were shear from

resin block and smear with uranyl acetate and lead citrate, one by one. The negative stained grids and ultrathin sections were observed under transmission electron microscopy [16].

7.8 Chest Radiography

In the early stage of pneumonia cases, chest images show multiple small patchy shadows World Journal of Pediatrics 13 and interstitial changes, remarkable in the lung periphery. Severe cases can further develop to bilateral multiple ground-glass opacity, infiltrating shadows, and pulmonary consolidation, with infrequent pleural effusion. Chest CT scan pulmonary lesions are shown more clearly by CT, including ground-glass opacity and segmental consolidation in bilateral lungs, especially in the lung periphery. In children with severe infection, multiple lobar lesions may be present in both lungs [16].

8. Precaution/ Alternative Treatment of Novel Coronavirus

8.1 Immunosuppressant Drug

Cyclophilins and FK506-binding (FKBPs) proteins as cellular interaction partners of the viral Nsp1 protein and the cyclophilin-binding immunosuppressive drug cyclosporin A (CsA) as a replication inhibitor of the various human and animal CoVs including SARS-CoV, NL63, 229E and Feline CoV. CsA derivatives Alisporivir (ALV), NIM811 and further compounds inhibit replication of NL63 and that Cyclophilin A is an essential cellular molecule required for virus replication [17].

8.2 Antiviral Therapy

There are no effective antiviral drugs for children at present. Interferon- α 2b nebulization can be applied, and the recommended usage is as follows:

- i. Interferon- α 2b nebulization 100,000–200,000 IU/kg for mild cases, and 200,000–400,000 IU/kg for severe cases, two times/day for 5–7 days.
- ii. Lopinavir/Litonavir (200 mg/50 mg) The recommended doses: weight 7–15 kg, 12 mg/3 mg/kg; weight 15–40 kg, 10 mg/2.5 mg/kg; weight > 40 kg, 400 mg/100 mg as adult each time, twice a day for 1–2 weeks. Although, the efficacy, treatment course and safety of the above drugs remain to be determined.
- iii. Ribavirin, Oseltamivir, Favipiravir, Remdesivir, This drugs also used for the alternative Treatment of covid-19.

8.3 Immunomodulating Therapy

- i. Intravenous methylprednisolone (1–2 mg/kg/day) is recommended for 3–5 days, but not for long-term use.

- ii. Intravenous immunoglobulin can be used in severe cases when indicated, but its efficacy needs further evaluation. The recommended dose is 1.0 g/kg/day for 2 days, or 400 mg/kg/day for 5 days [18].

9. Prevention and Treatment According to the WHO

- a. The virus does not resolve in the air but on the ground, so it is not transmitted through the air.
- b. When the virus falls on the surface of the metal, it will live for 12 hours, so hands should be washed with soap and water well.
- c. When it falls on the textile for a period of 9 hours, the Corona virus remains so washing clothes or exposure to sunlight for two hours is enough to kill it.
- d. The virus lives on the hands for about 10 minutes, so sticking to an alcohol sterilizer in the pocket will do the trick of prevention.
- e. If the virus is exposed to a temperature of 27° C, then it will die, because it does not live in hot areas.
- f. Drinking hot water and exposure to sunlight activates resistance to the virus, so you should avoid ice cream and prevents them from leaking into lungs.
- g. Gargling with warm, salt water kills the tonsils' germs and prevents them from leaking into the lungs. [19], [20]

10. Discussion

COVID-19 is very dangerous disease for the human being. This virus is spreading very quickly through the contact like handshakes, sneezes etc. This disease is pandemic and whole world is suffering from it. Cure of this disease is still not known therefore social distancing is employed in countries. The disease not only drastically affected in human health but also affected financials. According to the WHO guidelines, here we mention the prevention and control. This review brief about the structure of virus, prevention and control methods, number of the patients and total deaths caused by the novel corona. This review may also be helpful in the diagnosis of the patients and prevention of other human beings.

11. Conclusions

A review of the "Novel corona virus 2019: a recent update" have been beneficial for the patients and human beings. In this, the study of novel coronavirus updates the precaution and general

knowledge of the novel corona virus and here guidelines according to the WHO has been added and basic thinks are available for the cure and prevention of the Novel corona virus.

Acknowledgment

The authors are grateful for Kota College of Pharmacy, Kota, Rajasthan, Dr. A.P.J Abdul Kalam University, Indore (M.P.), Amity University, Gomti Nagar, Lucknow, Uttar Pradesh, India.

REFERENCE

- [1] JS. Kahn, K. McIntosh, “History and recent advances in coronavirus discovery”, *Pediatr. Infect Dis J*, vol. 24, no.11, p. 223-227, 2005.
- [2] AR. Fehr, S. Perlman, “Coronaviruses: an overview of their replication and pathogenesis”, *Methods Mol Biol*, 1282, p. 1-23, 2015.
- [3] Jasper, FWC., Kin-HK, “Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan”, *Emerging Microbes & Infections*, vol. 9, p. 221-235, 2020.
- [4] WHO. Laboratory testing of human suspected cases of novel coronavirus (nCoV) infection. [Online]. Available from WHO, <https://apps.who.int/iris/bitstream/handle/10665/330374/WHO-2019-nCoV-laboratory>. [Accessed: May 19, 2020]
- [5] WHO. Novel Coronavirus (2019-nCoV) situation report. [Online]. Available from WHO, <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200122-sitrep-2-2019-ncov>. [Accessed: May 19, 2020]
- [6] Worldometer. Covid-19 corona virus outbreak. [Online]. Available from Worldmeter, <https://www.worldometers.info/coronavirus/>. [Accessed: May 19, 2020]
- [7] VC. Cheng, SK. Lau, PC. Woo, “Severe acute respiratory syndrome coronavirus as an agent of emerging and reemerging infection”, *Clin Microbiol Rev*, vol. 20, no. 4, p. 660–694, 2007.
- [8] Chan JF., SK. Lau, “Middle East respiratory syndrome coronavirus: another zoonotic beta coronavirus causing SARS-like disease”, *Clin Microbiol Rev*, vol.28, no. 2, p.465–522, 2015.
- [9] WHO. National Health Commission of the People’s Republic of China: Novel Coronavirus (COVID-19). [Online]. Available from WHO, <https://experience.arcgis.com/experience/685d0ace521648f8a5beeee1b9125cd> . [Accessed: May 19, 2020]
- [10] S. Skariyachan, “Recent aspects on the pathogenesis mechanism animal models and novel therapeutic intervention for MERS-CoV infection’, *Front Microbiol*, vol. 10, p. 569, 2019.
- [11] L. Geng, F. Yaohuao, L. Yanni, “Coronavirus Infections and Immune Responses”, *Journal of Medical Virology*, vol. 44, p. 2-20, 2020.
- [12] KW. Daniel, Pan. ChuYang, “Molecular Diagnosis of a Novel Coronavirus (2019-nCoV) Causing an Outbreak of Pneumonia”, *American Association for Clinical Chemistry*, vol. 2, p.22-26, 2020.
- [13] C. Victor, B. Tobias, “Diagnostic detection of Wuhan coronavirus 2019 by real-time. RT-PCR”, *Euro surveill*, vol. 2, p.1-13, 2020.
- [14] L. Michael, M. Vincent, “Functional assessment of cell entry and receptor usage for lineage B β -coronaviruses, including 2019-nCoV”, *Nature microbiology*, vol. 10, p. 1-26, 2020.
- [15] W. Lapps, DA. Brian, “Oligonucleotide Fingerprints of Antigenically Related Bovine Coronavirus and Human Coronavirus 0C43”, *Archives of Virology*, vol. 86, p. 101–108, 1985.
- [16] Z. Na, Z. Dingyu, “A Novel Coronavirus from Patients with Pneumonia in China, 2019”, *The new England journal of medicine*, vol. 328, p. 727-733, 2020.

- [17] M. Yue, Z. Yu, “Interaction of cyclophilin a and human coronavirus 229E N protein is essential for virus replication”, *Journal Antiviral Res*, vol. 10, p. 34-45, 2020.
- [18] C. ZhiMin, F. Jun, “Diagnosis and treatment recommendations for pediatric respiratory infection caused by the 2019 novel coronavirus” *World Journal of Pediatrics*, vol. 13, p. 334-337, 2020.
- [19] Unicef. Coronavirus disease (COVID-19): What parents should know How to protect yourself and your children. [Online]. Available from Unicef, <https://www.unicef.org/bulgaria/en/stories/coronavirus-disease-covid-19-what-parents-should-know> . [Accessed: May 20, 2020]
- [20] Y. Zhang, “First antiviral drug approved to fight novel coronavirus”, *China daily*, vol.43, no. 2, p. 1,2020.