

COVID-19: Evaluation, Phylogenetics and Emergence of World Epidemic Disease

Rakesh Kumar Saket^{1*}, Sanjay Dohare², Shikha Koshti³

¹Research Scholar, Department of Biotechnology Barkatullah University, Bhopal (M.P.) India, corresponding author; *: rakeshbt2011@gmail.com

²Faculty, Department of Biotechnology, Govt. Girls P.G. Autonomous College of Excellence, Sagar (M.P.) India

³Faculty, Department of Zoology, Govt. Girls P.G. Autonomous College of Excellence, Sagar (M.P.) India

Abstract

Coronaviruses are a family of viruses that can cause illnesses such as the common cold, severe acute respiratory syndrome (SARS). The discovery of the coronavirus disease 2019 (COVID-19) during a pneumonia outbreak in Wuhan city in China has raised a global public health concern. Respiratory symptoms such as cough and shortness of breath (or tachypnea in children) are present without signs of severe pneumonia. The risk factors for severe presentations are concentrated in patients with chronic kidney disease, Human immune responses to a novel pathogen with both innate and adaptive arms. CoVs are positive-stranded RNA viruses with a crown-like appearance. The COVID-19 outbreak is an unprecedented global public health challenge. In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic.

Keywords: Coronavirus, SARS, RNA, COVID-19, immune responses.

I. INTRODUCTION

Novel coronavirus disease 2019 (COVID-19) is a highly infectious, rapidly spreading viral disease with an alarming case fatality rate up to 5%. The risk factors for severe presentations are concentrated in patients with chronic kidney disease, particularly patients with end-stage renal disease (ESRD) who are dialysis dependent. Ferrey A J and *et al* reported the first US case of a 56-year-old nondiabetic male with ESRD secondary to IgA nephropathy undergoing thrice-weekly maintenance hemodialysis for 3 years, who developed COVID-19 infection. He has hypertension controlled with angiotensin receptor blocker losartan 100 mg/day

and coronary artery disease status-post stent placement. [1]. The first reports of a novel pneumonia (COVID-19) in Wuhan city, Hubei province, China occurred in late December 2019, although retrospective analyses have identified a patient with symptom onset as early as December 1st. Ongoing pandemic of a new human coronavirus, SARS-CoV-2, has generated enormous global concern. China was involved in the initial genome sequencing of the virus. Herein, genomic data reveals about the emergence SARS-CoV-2 and discuss the gaps in our understanding of its origins [2]. Knowledge of virus dynamics and host response are essential for formulating strategies for antiviral treatment, vaccination, and epidemiological control

of COVID-19. The profile of acute antibody response in COVID-19 patients, and provide proposals for the usage of antibody test in clinical practice. A multi-center cross-section study and a single-center follow-up studied were performed to investigate the feature of acute antibody response to SARS-CoV-2. A cohort of 52 COVID-19 suspects and close contacts were enrolled to evaluate the potentiality of the antibody test. This deadly virus caused the world to be in high alert as the death toll and the number of confirmed cases is continuously rising since the first case was reported. The Chinese government warned that the transmission ability of the virus is increasing, and international efforts are needed to overcome this outbreak [3]. Coronavirus (CoV) infections induce respiratory tract illnesses and central nervous system (CNS) diseases. Uanyuan Li aimed to explore the cytokine expression profiles in hospitalized children with CoV-CNS and CoV-respiratory tract infections [4].

II. EMERGENCE OF COVID-19

An acute respiratory disease, caused by a novel coronavirus (SARS-CoV-2, previously known as 2019-nCoV), the coronavirus disease 2019 (COVID-19) has spread throughout China and received worldwide attention. On 30 January 2020, World Health Organization (WHO) officially declared the COVID-19 epidemic as a public health emergency of international concern. The emergence of SARS-CoV-2, since the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002 and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012, marked the third introduction of a highly pathogenic and large-scale epidemic coronavirus into the human population in the twenty-first century [5].

III. PHYLOGENY

CoVs are single-stranded positive-sense RNA viruses with a crown-like appearance under an electron microscope (*coronam* is the Latin term for crown) due to the presence of spike glycoprotein on the envelope. CoVs belong to the subfamily Coronavirinae in the family of Coronaviridae of the

order Nidovirales, and this subfamily includes four genera: Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus. [6]. In genetic terms, Chan *et al.* have proven that the genome of the new HCoV, isolated from a cluster-patient with atypical pneumonia after visiting Wuhan, had 89% nucleotide identity with bat SARS-like-CoVZXC21 and 82% with that of human SARS-CoV [7]. Genomic analysis revealed that SARS-CoV-2 is phylogenetically related to severe acute respiratory syndrome-like (SARS-like) bat viruses, therefore bats could be the possible primary reservoir [8]. The basic reproductive number (R_0) of 2019-nCoV is higher than R_0 of severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV). The amino acid sequence in the Angiotensin-converting enzyme 2 gene (ACE2) receptor responsible for 2019-nCoV binding in farm animals and cats has only a few exchanges compared with the human receptor, suggesting that the species barrier for virus transmission is small [9].

IV. TRANSMISSION

The virus could also be transmitted from human-to-human, and symptomatic people are the most frequent source of COVID-19 spread. As with other respiratory pathogens, including flu and rhinovirus, the transmission is believed to occur through respiratory droplets from coughing and sneezing. Analysis of data related to the spread of SARS-CoV-2 in China seems to indicate that close contact between individuals is necessary. The spread, in fact, is primarily limited to family members, healthcare professionals, and other close contacts. It can also spread if a person touches a surface with the virus on it and then touches his or her mouth, nose or

V. SYMPTOMS

Signs and symptoms of COVID-19 may appear two to 14 days after exposure and can include:

- Fever
- Cough
- Shortness of breath or difficulty breathing
- Tiredness
- Aches
- Runny nose
- Sore throat

VI. EPIDEMIOLOGY

Data provided by the WHO Health Emergency Dashboard (3 April 2020, 23:32 CET) report 976,586 confirmed cases worldwide and 50,492 confirmed deaths in 207 countries.

VII. EVALUATION

Most countries are utilizing some type of clinical and epidemiologic information to determine who should have testing performed. In the India, criteria have been developed for persons under investigation for COVID-19. According to the India CDC, most patients with confirmed COVID-19 have developed fever and symptoms of acute respiratory illness (e.g., cough, difficulty breathing). The WHO recommends collecting specimens from both the upper respiratory tract (naso- and oropharyngeal samples) and lower respiratory tract such as expectorated sputum, endotracheal aspirate, or bronchoalveolar lavage. Two nested RT-PCR assays and two real-time RT-PCR assays were adapted to local Japanese conditions. As of 8 February 2020, the assays developed have successfully detected 25 positive cases of infection in Japan [10]. The analysis of Corona Virus Disease based on a probabilistic model. It involves a technique for classification and prediction by recognizing typical and diagnostically most important CT images features relating to Corona Virus [11]. Detection of IgM and IgG against SARS-CoV-2 is a fast and simple screening method. As an effective supplement to RNA testing,

antibody detection is of epidemiological significance of COVID-19 [12].

VIII. TREATMENT

There is no specific antiviral treatment recommended for COVID-19, and no vaccine is currently available. The treatment is symptomatic, and oxygen therapy represents the major treatment intervention for patients with severe infection. Mechanical ventilation may be necessary in cases of respiratory failure refractory to oxygen therapy, the WHO released a document summarizing WHO guidelines and scientific evidence derived from the treatment of previous epidemics. Special precautions are necessary during intubation. The procedure should be executed by an expert operator who uses personal protective equipment (PPE) such as FFP3 or N95 mask, protective goggles, disposable gown long sleeve raincoat, disposable double socks, and gloves.

IX. DIAGNOSIS

The symptoms of the early stages of the disease are nonspecific. Differential diagnosis should include the possibility of a wide range of infectious and non-infectious such as vasculitis, dermatomyositis are common respiratory disorders.

X. ONGOING TRIAL

Multiple studies globally are investigating the use of broad-spectrum antiviral.

XI. CONCLUSION

The authors are concluded that coronaviruses are a large family of viruses that can cause a range of illnesses from common cold all the way up to more severe diseases, incidences of emerging deadly viral infections have significantly affected human health Novel coronavirus disease 2019 (COVID-19) is a highly infectious, rapidly spreading viral disease with an alarming case fatality rate up to 5%. COVID-19 infection is a rapidly developing field,

and we should expect more infected dialysis patient's case reports and analyses. COVID-19 is a challenge to the existing health systems due to its novelty, rapidity of spread, asymptomatic shedding and variable manifestations.

REFERENCES

1. Ferrey A.J, Choi G, Hanna R.M, Chang , Tantisattamo E, Ivaturi K., Park E, Nguyen L, Wang B, Tonthat S, Rhee C.M, Reddy U, Lau W.L, Huang S.S, Gohil S, Amin A.N, Hsieh L, Cheng T.T, Lee R.A and Kalantar-Zadeh K. 2020. A Case of Novel Coronavirus Disease 19 in a Chronic Hemodialysis Patient Presenting with Gastroenteritis and Developing Severe Pulmonary Disease. *American Journal of Nephrology* DOI: 10.1159/000507417.
2. Yong-Zhen Zhang & Edward C. Holmes. 2020, A Genomic Perspective on the Origin and Emergence of SARS CoV-2. *Leading Edge Commentary*.
3. Nourah S. Al Takarli. 2020. Emergence of COVID-19 Infection: What Is Known and What Is to Be Expected – Narrative Review Article. *Dubai Medical Journal*. DOI: 10.1159/000506678.
4. Yuanyuan Li, Haipeng Li, Ruyan Fan , Bo We, Jian Zhang , Xiaoying Cao, Chengwu Wang, Zhanyi Song , Shuochi Li, Xiaojie Li Xinjun Lv , Xiaowang Qu, Renbin Huang and Wenpei Liu. 2016. Coronavirus Infections in the Central Nervous System and Respiratory Tract Show Distinct Features in Hospitalized Children. *Intervirolgy*. D OI: 10.1159/000453066.
5. Yan-Rong Guo, Qing-Dong Cao, Zhong-Si Hong, Yuan-Yang Tan, Shou-Deng Chen, Hong-Jun Jin, Kai-Sen. Tan, De-Yun Wang, and Yan Yan. 2020, The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak – an update on the status. *Military Medical Research*. 7: 11.
6. Chen Y, Liu Q, Guo D. 2020, Emerging coronaviruses: Genome structure, replication, and pathogenesis. *J. Med. Virol.* Apr; 92(4):418-423.
7. Jiumen Sung, Wan Tin He, Lifang wang, Alexander Lai, Xiang Ji, Xiofeng Zhai, Gairu Li, Marc A and Jin Tian. 2020. COVID-19: Epidemiology, Evolution, and Cross-Disciplinary Perspectives. *Trends in Molecular Medicine*.
8. Muhammad Adnam Shereen, Shuliman Khan, Abeer Kazmi, Nadia Bahir and Rabeea Sddique. 2020. COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. *Journal of Advance Research*: Pages 91-98.
9. Chan JF, Kok KH, Zhu Z, Chu H, To KK, Yuan S, Yuen KY. 2020, Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan. *Emerg Microbes Infect.* 2020; 9(1):221-236.
10. Kazuya Shirato, Naganori Nao, Harutaka Katano, Ikuyo Takayama, Shinji Saito, Fumihiro Kato., Hiroshi, Katoh, Masafumi Sakata, Yuichiro Nakatsu, Yoshio Mori, Tsutomu Kageyama, Shutoku Matsuyama and Makoto Takeda. 2020, Development of Genetic Diagnostic Methods for Novel Coronavirus 2019 (nCoV-2019) in Japan. *Japanese Journal of Infectious Diseases*.
11. Ahmed Abdullah Farid, Gamal Ibrahim Selim, and Hatem Awad A. Khate. 2020, A Novel Approach of CT Images Feature Analysis and Prediction to Screen for Corona Virus Disease (COVID-19). *International Journal of Scientific & Engineering Research Volume 11*.
12. Zhe Du, Fengxue Zhu, fuzheng Gou, Bo Yang and Tianbing Wang. 2020. Detection of antibodies against SARS-CoV-2 in patients with COVID-19. *Journal of Medical Virology*.