Clinical Synopsis of COVID-19

Evolving and Challenging

Hemanshu Prabhakar
Indu Kapoor
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To the humankind who are navigating through this pandemic with all their strength and hope.

Preface

Coronavirus disease is the latest pandemic that has affected humans. The disease has manifested itself in several forms and is now the focus of research worldwide.

In this book, we have tried covering all clinical aspects of the coronavirus disease. The volume includes topics related to basic sciences, such as the virology and pathophysiology of the disease. Chapters related to the symptomatology of the disease and making diagnosis have been included. Chapters related to the preparation of the healthcare workers to deal with coronavirus disease have also been included. Anesthetic and intensive care management of coronavirus disease victims is of vast importance, and so chapters covering these issues have also been included. As this pandemic has taken many lives across the world, issues have been raised regarding disposal of bodies of the victims. Therefore, a chapter dealing with this issue has been included, which will throw light on ethical aspects. Special considerations have been given in a chapter to patient population such as geriatrics, pediatrics, and pregnant women.

The book will be useful for trainees and clinicians in any field of medicine. It would be very useful for residents and fellows pursuing their courses in emergency medicine, anesthesia, and critical care. Fellows, resident doctors, postgraduates, and even undergraduates would be benefited by this book. With contributions from renowned authors from across the globe, this book would be a ready reckoner in clinical practice of physicians from varied specialities.

New Delhi, India — Hemanshu Prabhakar
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Charu Mahajan is Associate Professor in the Department of Neuroanaesthesiology and Critical Care at All India Institute of Medical Sciences (AIIMS), New Delhi, India. After completing MD in Anesthesia, she completed DM in neuroanesthesia at AIIMS and later joined AIIMS as a faculty member. She has over a decade of research experience and has received various awards for scientific presentations. She has several publications in various national and international journals, edited several books, and authored chapters in many books. She is a reviewer for the Cochrane Collaboration. Dr. Mahajan is also a member of various scientific societies and is a reviewer for several reputable scientific journals.

Hemanshu Prabhakar is a Professor in the Department of Neuroanaesthesiology and Critical Care at All India Institute of Medical Sciences (AIIMS), New Delhi, India. He received his training in neuroanesthesia and completed his PhD in the same institute. He is the first Indian to be awarded the degree of PhD in Neuroanesthesia in the country. He is a recipient of the AIIMS Excellence Award 2012 for his notable contribution to academia and has published over 250 papers in peer-reviewed national and international journals. Dr. Prabhakar is a reviewer for various national and international journals and is also a review author for the Cochrane Collaboration. He has special interest in evidence-based practice of neuroanesthesia. Dr. Prabhakar is a member of various national and international neuroanesthesia societies and is past secretary of the Indian Society of Neuroanesthesia

and Critical Care. He is an invited speaker for various national and international conferences. He is on the editorial board of the *Indian Journal of Palliative Care* and is the past executive editor of the *Journal of Neuroanaesthesiology and Critical Care*. He is the first Indian to publish international books in the speciality of neuroanesthesia. He is an active member of the SNACC (*Society of Neurosciences in Anesthesiology and Critical Care*), NCS (Neurocritical Care Society), and NACCS (Neuroanaesthesia and Critical Care Society of Great Britain and Ireland). He was featured in the Limca Book of Records 2019 for publishing several books on a niche subject.

Introduction: History of Coronavirus Disease Pandemic

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Coronaviruses are group of ribonucleic acid [RNA] viruses that broadly infect vertebrates including humans, birds, bats, snakes, mice, and other wild animals [1]. To our interest, human coronaviruses are divided into four subgroups: alpha, beta, gamma, and delta. There are seven strains of coronavirus that may infect humans. The common human strains that produce mild symptoms include 229E [alpha], NL63 [alpha], OC43 [beta], and HKU1 [beta]. In humans, the common sign and symptoms include cough, sore throat, fever, muscle ache, and difficulty in breathing. Some patients even may present with uncommon symptoms like anosmia, chest pain, and stroke. The severity of these symptoms can vary from very mild to very lethal ones like, Middle East respiratory syndrome [MERS], severe acute respiratory syndrome [SARS], and coronavirus disease [COVID-19].

Virus: Coronaviruses are enveloped viruses who have a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry [2]. The virus size ranges from 26 to 32 kilobases and is one of the largest virus among RNA viruses [3]. On their surface, they have club-shaped spikes, which in electron micrographs form an image reminiscent of the solar corona, from which their name derives [4]. The name of this virus is derived from Latin word "corona," which means "crown or wreath" [5]. This name "coronavirus" was first coined by June Almeida and David Tyrrell who first observed and studied human coronaviruses [6]. In an infected person, the viral spike protein in the virus attaches to host cell receptor, the virus particle is uncoated, and its genome enters the cell cytoplasm. A number of nonstructural proteins coalesce to form a multiprotein replicase-transcriptase complex (RTC). The main replicase-transcriptase protein is the RNA-dependent RNA polymerase (RdRp). The other nonstructural proteins assist in the replication and transcription process. The exoribonuclease nonstructural protein, for instance, provides

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extra fidelity to replication by providing a proofreading function which the RNA-dependent RNA polymerase lacks [7]. In humans, epithelial cells of the respiratory tract are mainly targeted by the coronavirus, while animal coronaviruses generally infect the epithelial cells of the digestive tract [8]. The main route of transmission from one host to another host, depending on the coronavirus species, is by either an aerosol, fomite, or fecal-oral route [9]. SARS coronavirusis transmitted via an aerosol route, [10] binds to the angiotensin-converting enzyme 2 receptor, and infect human epithelial cells of the lungs [11].

History: The family of coronavirus has been around us for a long time. Coronavirus was first identified in 1930, which was responsible for bronchitis in birds caused by infectious bronchitis virus [IBV] [12]. A decade later, in 1940s, two animal coronaviruses, mouse hepatitis virus (MHV) and transmissible gastroenteritis virus (TGEV), were isolated [13]. Researchers discovered evidence of human coronaviruses in the 1960. The virus B814s was isolated from the nose of a boy having common cold [14]. This isolated virus when inoculated into the nose of volunteers caused a cold and was inactivated by ether since it had a lipid envelope [14]. Meanwhile, another novel virus 229E was isolated, and like the virus B814, when inoculated in volunteers, it induced common cold and inactivated by ether [15]. Not only these two viruses were related to each other but were related to IBV also. The National Institutes of Health during the same time isolated another member of this new group of viruses, named OC43 [16]. All these viruses on electron microscope had distinctive club-like spikes [17]. This new group of viruses because of their distinctive morphological appearance is known as coronaviruses [13]. Since then other human coronaviruses were discovered which include SARS-CoV (2003), HCoV NL63 (2004), HCoV HKU1 (2005), MERS-CoV (2012), and SARS-CoV-2 (2019) [18, 19].

MERS-CoV was isolated from a patient in Saudi Arabia in 2012 [20]. It was responsible for 2494 cases and 858 deaths from 27 different countries (case-fatality rate: 34.4%) [21]. SARS-CoV was first recognized in China in 2003. It caused a total of 8422 probable SARS cases, 919 SARS-related deaths (case-fatality rate: 11%), and spread to 32 different countries or regions between November 2002 and August 2003 [22]. SARS-CoV-2 was also first recognized in China. Since December 2019 to date, the SARS-CoV-2 has infected many people around the world and caused significant number of deaths. The number of COVID-19 infected patients is increasing very fast around the world, although there is increase in number of recovered patients as well. The 2019 novel coronavirus lead to global pandemic, after the outbreak of disease from Wuhan, China. This disease is known as coronavirus disease-19 [COVID-19] caused by a virus now known as severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2] [19]. At present there is no vaccine or treatment dedicated to treat COVID-19 patients. Although various drugs have been tested and with some trials are still going on, till date none of the medication has been proved to be beneficial in killing the virus or decreasing the mortality rate in coronavirus infected patients. The list of drugs which have been tried on patients with coronavirus disease includes antimalarial drugs, antiviral drugs like remdesivir, antibiotics like azithromycin, teicoplanin, corticosteroids, antiaging drugs like

doxycycline, antiparasitic drugs like ivermectin, immunoglobulins, and convalescent plasma. However, results with these drugs are not satisfactory. Worldwide scientists are doing research to invent the wonder drug as an antidote to defeat this crisis. At present we are lacking with a good-quality research on this disease. On literature search, most of the articles are either editorials, case reports, correspondences, review article, or case control or observational studies. One can also come across some randomized controlled trials including different interventions or drugs. Till date, none of the studies have shown a satisfactory result with significant clinical benefits to the COVID-19 patients. A well-designed, high-quality randomized clinical trial with good sample size is the need of hour in this pandemic to provide the world a clear direction toward a specific drug or intervention which can be used to treat COVID-19 patients.

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