بسم الله الرحمن الرحيم

SARS, MERS AND COVID-19; the Story Continues

From the beginning of millennium three, coronaviruses (SARS-CoV: 2003, MERS-CoV: 2012 and SARS-CoV-2: 2019) emerged and caused outbreaks producing considerable global health problems. Although these three viruses have similarities especially regarding clinical features, there are key differences between them that limit the relevance of experiences from previous crises (1). SARS-CoV-2 replicates rapidly in respiratory epithelial cells, including the nasal cavity, bronchi, bronchioles, and alveoli. Replication in the upper respiratory tract results in transmission between hosts, while replication in the lower respiratory tract results in the development of lung disease. These three viruses are zoonotic ones which spread from animals and have a person to person transmission ability (2). AKI probably via direct renal cytotoxicity through DDP4 receptors which are largely represented in tubules and glomeruli is more frequent with MERS than the other two ones (3). COVID-19 generally has a less severe clinical picture, and because of higher R0 can spread in the community more easily than MERS and SARS, which has frequently been reported in the nosocomial setting. Allah Kalteh et al., in their report about mortality rate, case fatality rate, and years of potential life lost of these three viruses, showed that knowing this information is critical to characterize the severity and understand the pandemic potential of COVID-19 in the early stage of the epidemic. They confirmed that despite a lower fatality rate and because of the higher transmission rate of COVID-19, it causes a large number of infected patients and more deaths. They also showed that given that COVID-19 has a non-fatal effect on a large number of patients, the estimation of disease burden using the mentioned indices can be an appropriate way for future decision making regarding health policy (4).

Physicians should notice that there are some differences between these three viruses regarding viral spread. The first one is the different viral tropism for the respiratory tract and the second can be different inoculum dose at the time of infection which defines the severity of the disease. Another point is the viral load at the time of symptom onset. In COVID-19, viral load progressively decreases during days but in SARS-CoV recorded highest after 10 days from symptom onset which proves much easier transmission of the virus during the initial mild symptomatic or even asymptomatic period (5, 6). Another important point is intrinsic virulence which is higher in MERS-CoV compared to others. This feature results in more severe clinical symptoms and hospital/ICU admission which reduces community transmission of the virus. Gastrointestinal involvement and diarrhea are more common in SARA especially in the Hong Kong outbreak and GI spread is also shown in MERS-CoV (7). As SARS-CoV can bind to the ACE2 receptor and replicate in the enteric epithelium, it can be the same for SARAV-CoV-2 transmitting via this route (8). There are still many unanswered questions especially regarding its epidemiological features such as mortality and capacity to spread on a pandemic level. In the absence of a vaccine, we should notice that the speed of it spreads will depend on how conscientiously members of the public and hospital workers observe well-established infection prevention and control (IPC) principles—hand hygiene, cough etiquette, social distancing and, in healthcare settings, isolation of affected patients, and appropriate use of personal protective equipment (PPE). Using convalescent healthcare workers for the care of confirmed COVID-19 patients can be very important. Establishing national guidelines and revising them during the time are some of the most important responsibilities for the Ministry of Health and CDC. During the crisis, using telemedicine (9) can decrease the rate of transmission and appropriate use of social media can increase the social information regarding disease, pathogenesis, symptoms, transmission method, diagnosis, and treatment. Primary healthcare programs (e.g. maternal and child health, antenatal, and vaccination programs) during the crisis should cope with the ongoing waves of transmissions and ready for interventions that improve patients outcomes. As there is not an effective treatment for COVID-19, its early diagnosis and appropriate management of patients especially critically ill patients with COVID-19 are the cornerstones of its management (10, 11). Regarding treatment in the absence of a vaccine, it is recommended the first stage to use pharmaceuticals and their combinations (protease inhibitors, interferon compounds, antiviral antibodies) aiming to suppress diverse targets during virus propagation and the second disease stage, it seems crucial and reasonable to rely on the administration of pathogenetic drugs to restrict life-threatening events resulting in marked inflammation, intoxication, hypoxia, and infection (12). In future research, some aspects like microbiota/ microbiome, microRNAs, and mesenchymal stem cells should be considered as some potential

interventions. Future research should be focused on the biological properties of these viruses using virus isolation, reverse genetics, and in vitro and in vivo infection evaluations to help the prevention and control of the emerging crisis. The rapid spread of viruses from natural hosts to humans is largely due to human activities, including modern agricultural practices and urbanization. Therefore, the most important method to prevent viral zoonosis is to maintain the barriers between natural reservoirs and human society. Finally, we hope to be able to identify the most suitable approach to combat this crowned dragon as soon as possible and make this world a healthy place to live again.

References

1- Guarner J. Three Emerging Coronaviruses in Two Decades The Story of SARS, MERS, and Now COVID-19. Am J Clin Pathol April 2020; 153(4): 420-1.

2-Gilbert GL. SARS, MERS and COVID-19-new threats; old lessons. Int J Epidemiol. Int J Epidemiol. 2020;dyaa061..

3- Cha RH, Joh JS, Jeong I, Lee JY, Shin HS, Kim G, et al. Renal complications and their prognosis in Korean patients with Middle East respiratory syndrome-coronavirus from the central MERS-CoV designated hospital. J Korean Med Sci. 2015; 30(12):1807-14.

4- Kalteh EA, Sofizadeh A, Fararooei M, Ghelichi Ghojogh M, Aljalili S, Measures of Mortality in Coronavirus (COVID-19) Compared with SARS and MERS. J Cell Mol Anesth. 2020;5(2):97-101.

5. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, et al. SARS-CoV-2 viral load in upper respiratory specimens of infected patients. N Engl J Med 2020; 382(12):1177-9.

6. Peiris JSM, Chu CM, Cheng VCC, Chan KS, Hung IFN, Poon LLM, et al. Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study. Lancet 2003;361: (9371):1767-72.

7. Booth CM. Clinical features and short-term outcomes of 144 patients with SARS in the Greater Toronto Area. JAMA 2003; 289(21):2801-9.

8. Yeo C, Kaushal S, Yeo D. Enteric involvement of coronaviruses: is faecaleoral transmission of SARS-CoV-2 possible? Lancet Gastroenterol Hepatol. 2020;5(4):335-7.

9. Mahmoodpoor A, Akbarzadeh MA, Sanaie S, Hosseini MS. Role of telehealth in outbreaks-Where the classical healthcare systems fail. Infect Control Hosp Epidemiol. 2020;1-2.

10. Golestani-Eraghi M, Mahmoodpoor A. Early application of prone position for management of Covid-19 patients. J Clin Anesth. 2020; 66:109917.

11. Mahmoodpoor A, Shadvar K, Ghamari A A , Mohammadzadeh Lameh M , Asghari Ardebili R , et al. Management of Critically Ill Patients with COVID-19: What We Learned and What We Do. Anesth Pain Med. 2020; 10(3):e104900.

12. Zhirnov OP. Molecular Targets in the Chemotherapy of Coronavirus Infection. Biochemistry (Mosc). 2020; 85(5):523-30.

Table1, Different characteristics of three types of coronavirus

	SARS-CoV	MERS-CoV	SARS-Cov-2
Phylogenic origin	Clade I, Cluster IIb	Clade II	CladeI, Cluster IIa
Animal reservoir	bat	bat	bat
Receptor	ACE2	Dipeptdyl peptidase	ACE2
Mode of transmission	Droplets spread from bats, which infected civets. Human to human transmission through close contact	Droplets, touching infected camels, or eating their milk or meat. Limited human to human transmission through close contact	Droplets, Touching, or eating an infected. Human-to-human transmission occurs through close contact
Mean incub± period	5-6 days	2-7 days	7-14 days
At-risk	Elderly, med comorbid	Elderly, med comorbid	Elderly, med comorbid
R_0	1.7-1.9	0.7	1.5-3.5
Treatment	No specific	No specific	No specific
Vaccine	no	no	no
ICU admission	23-34%	53-89%	24%
ARDS *	20%	20-30%	18-30%
AKI *	6.7%	40-50%	3%
Mortality (Hospα patient)	3.6-15.7%	30-4-%	10-11%
Overall Fatality	9%	34.4%	2-4%

±: incubation period
α: hospitalized patients
*ARDS: acute respiratory distress syndrome; AKI: acute kidney injury

Ata Mahmoodpoor, MD
Professor of Anesthesiology,
Department of Anesthesiology,
Faculty of Medicine,
Tabriz University of Medical Sciences
Tabriz, Iran
Address: General ICU, Shohada Hospital, El-Goli street, Tabriz, Iran
Email: amahmoodpoor@yahoo.com