

Short Communications

SARS-CoV-2: Current Perspective on Control, Prevention, and Therapeutic Promise

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Received 12 May 2020

Accepted 4 July 2020

Published 19 July 2020

Production and Hosting by
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Editor-in-Chief:

Prof. Mohammad A. M. Ibnouf

Abstract

Background: The novel coronavirus disease (COVID-19) outbreak has halted activities throughout the globe because of its rapid spread. COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) a β -coronavirus first detected in China. SARS-CoV-2 has been implicated to be transmitted via direct contact, fomite, respiratory droplets, and possibly aerosol. The spread of the disease is complicated due to the slow onset of symptoms and asymptomatic infected patients.

Methods: This narrative communication summarizes the recent researches sourced using sensitive search strategies to identify COVID-19 current perspectives on the control, prevention, and therapeutic promise.

Result: Several strategies and multiple control measures have been implemented around the globe to contain COVID-19. Considering the exponential spread of the pandemic, several scientists and physicians have been racing to discover possible therapeutics and vaccines for COVID-19. There are clinical trials to investigate the vaccine designed to protect against the infection and also to substantiate the claim made for BCG protection against COVID-19. Although, there is currently no universally approved medication to treat SARS-CoV-2, there have been random reports of existing medications ameliorating the infection, and these regimens are still under clinical trial. There is also the potential therapeutic prospect of rhinotherapy to fight SARS-CoV-2 judging from its success in fighting upper respiratory tract viral infection.

Conclusion: The information provided in this communication gives a reliable intellectual grounding regarding the current perspective on COVID-19 control, progress made in the development of vaccines and therapeutic regimen, and where future research in this area should be focused.

Keywords: COVID-19; SARS-CoV-2; control; WHO; respiratory; cases; tract

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1. Introduction

1.1. SARS-CoV-2

Coronavirus disease 2019 (COVID-19) is a novel strain of coronaviruses (CoV) and was first identified amidst an investigation that led into an outbreak in Wuhan City, Hubei Province, China in late December 2019. COVID-19 was initially called 2019-nCoV, however, it was renamed as SARS-CoV-2 by the World Health Organization (WHO) on February 12, 2020. Due to its exponential spread, SARS-CoV-2 was labelled as a Public Health Emergency of International Concern by the International Health Regulations Committee of the WHO on January 30, 2020. SARS-CoV-2 is a β -coronavirus which is a single-stranded positive-sense RNA virus belonging to a group within the subgenus *S arbecovirus*, Orthocoronavirinae subfamily [1, 2].

The symptoms of SARS-CoV-2 infection may include: fever, shortness of breath, tiredness, dry cough, aches and pain, sore throat, and few may experience diarrhea, nausea, or a runny nose [3]. People with underlying medical conditions and the elderly have a higher risk of developing severe disease and death [3]. While some carriers could be asymptomatic, they are contagious as the onset of symptoms ranges between one and 14 days, or even more [4]. SARS-CoV-2 is thought to be transmitted through direct contact, fomite, fecal, and respiratory droplets [5]. Recently, there have been emerging suggestions that SARS-CoV-2 can exist as an aerosol under very limited conditions as the virus particles on droplets of mucus or saliva could be suspended in the air for a few seconds, and that anyone passing through that pathogenic cloud could be vulnerable to the infection. The result of experimental procedure evaluating SARS-CoV-2 and SARS-CoV-1 stability in aerosols and other surfaces indicates that fomite and aerosol transmission of SARS-CoV-2 are possible, as SARS-CoV-2 could remain viable and virulent in aerosols for hours and on surfaces for days, and this is comparable to the transmission of SARS-CoV-1 [5].

As of June 10, 2020, according to the WHO COVID-19 Situation Report-141, a total of 7,039,918 cases were confirmed and a total of 404,396 deaths had resulted from the COVID-19 pandemic globally [6]. Africa accounts for about 2.8% (198,553) of the total confirmed cases (7,039,918) and 1.3% (5,372) of the total confirmed deaths (404,396) [6]. Based on the analysis of Gilbert *et al.* [7], Algeria, Egypt, and South Africa were identified to have the highest importation risk and moderate to high capacity in outbreak responsiveness; and nations like Nigeria, Sudan, Ethiopia, Ghana, Angola, Tanzania, and Kenya to have the variable capacity in outbreak responsiveness and high vulnerability. Congruent to this analysis [6] is also a high prevalence of COVID-19 cases recorded in countries with highest importation risk like South Africa (50,879), Egypt (35,444), Morocco (8,302), and Algeria (10,265); and not a corresponding high vulnerability in countries like Nigeria (12,801), Ethiopia (2,156), Sudan (6,244), Angola (92), Tanzania (509), Ghana (9,910), and Kenya (2,862) [6]. However, a nation's vulnerability is not dependent on certain indicators but it is a function of its willingness to observe and apply stringent control measures key to containing the spread of this pandemic.

2. Control and prevention

The fight against COVID-19 has to be a concerted effort by all. COVID-19 spreads rapidly and there is sustained local transmission making it impossible to isolate all cases; this calls for the use of mitigation measures to be put in place with the objective of slowing down the spread of the virus within a country or a region. These measures include: the banning of mass gathering events such as sporting, political, social, and large religious gatherings, and closure of schools, targeted at avoiding the multiplication of cases that will overburden healthcare systems. The WHO therefore recommends: frequent washing of hands with soap for 20 sec; maintaining physical distancing of at least 1 m or 3 ft ; avoidance of touching eyes, nose, and mouth; regular practice of respiratory hygiene of using a handkerchief or tissue paper when sneezing or coughing or otherwise a flexing or bending the elbow; seeking medical care early in the event of symptom manifestation; and staying informed and following advice given by the healthcare professionals [8]. In the WHO recommendation, there is, therefore, an emphasis on hygiene as a major means of breaking transmission of COVID-19. COVID-19 outbreak is overwhelming nations, hence, the need for the application of stringent multiple control measures by other countries struggling to contain the pandemic as was implemented by China [8]. Xifeng, Xiaolin, and Xuchu [9] outlined six key lessons the international community could learn from China in halting the spread of SARS-CoV-2; they include: speed and accuracy in the identification and detection of COVID-19 carriers; making the right decisions for the right people at the right time and at the right place; big data and information technology are important to avoid a rebound; appraising medical resources and response systems; enforcement of precautionary measures in schools, businesses, government offices, homes, and communities can control the trajectory of this epidemic; and keeping the public well-informed. Preparedness is key to mitigating the effect of COVID-19 at national and local levels.

A human clinical trial to evaluate an investigational vaccine mRNA-1273 designed to protect against SARS-CoV-2 is ongoing at the Kaiser Permanente Washington Health Research Institute (KPWHRI) [10]. Recently, a body of evidence has emerged about the possibility of using BCG (*Bacillus Calmette-Guerin*) vaccine given to counter TB as protection against COVID-19. A correlation study of 178 countries has shown that nations with BCG vaccination program have fewer COVID-19 cases in comparison to where BCG programs are no longer deployed [11]. Moorlag *et al.* (2019) reported that BCG vaccine induces heterologous immunity against other infections including viral infections [12], and previous research had also provided evidence that BCG vaccine reduced respiratory tract infections in adolescents [13]. However, the WHO does not yet recommend BCG vaccination for the prevention of COVID-19 and is presently testing the theory with human clinical trials on selected cohorts concerning the success theory of BCG vaccination to forestall COVID-19 [14]. Also, randomized controlled clinical trials are currently ongoing in the Netherlands and Australia to substantiate the use of BCG for COVID-19 prevention (NCT04327206, NCT04328441). Indeed, a safe and potent vaccine to protect against SARS-CoV-2 infection will be a very important step toward fighting the spread of this contagion.

3. Therapeutic prospects

Of note, the COVID-19 broke out in China and spread in Iran, Italy, and the rest of Europe during the winter season. Viruses have a temperature range in which they can survive for some time, and this range is dependent on their outer layer envelope. Wang *et al.* [15] investigated how air temperature and humidity influence COVID-19 transmission, and their findings suggest that high temperature and high humidity remarkably reduces the transmission of COVID-19 influenza. Park *et al.* [16] stressed that experiences from SARS and MERS epidemics and treatment of other endemic and epidemic respiratory viruses could provide some guidance on the treatment strategies that may be helpful to COVID-19 patients. The WHO laboratory work shows that heat at 56°C kills the SARS coronavirus at around 10,000 units per 15 min. This could pave way for a potential therapeutic prospect of warm steam inhalation/heated humidified air delivery/rhinotherapy, which has been traditionally and clinically proven to be potent against viral upper respiratory tract infections [17–19].

Moreover, there is currently no universally approved medication by any regulatory agency for the treatment of COVID-19. The prevention of COVID-19 infection remains the mainstay of containment of the pandemic. Infected people may need supportive care to help them survive the illness. Several companies and research groups are currently developing or testing certain drugs against the virus that causes COVID-19. Clinical trials are currently ongoing for existing drugs like Remdesivir, Hydroxychloroquine or Chloroquine, and Favipiravir [20, 21]. WHO instituted *Solidarity trial* to help find potent therapy for COVID-19 and will compare four therapeutic alternatives against the standard of care to determine their relative effectiveness against COVID-19 [22]. The human clinical trial aims to rapidly ascertain whether any of the prescriptions slow disease progression or improve survival and will enroll patients in multiple countries. The treatment options selected for the study are Remdesivir; Lopinavir/Ritonavir; Lopinavir/Ritonavir with Interferon beta-1a; and Hydroxychloroquine [22]. As of June 3, 2020, over 3,500 patients have been recruited in over 400 hospitals in 35 countries for human clinical trials [22].

4. Conclusion

In over six months that COVID-19 has ravaged the world, over seven million people have been affected with more than 404,396 deaths and still counting. Global economy, government, and business activities have been seriously affected by this pandemic as various countries have implemented stringent control measures to contain its spread. However, there is hope as there are potential therapeutic promises, and real commitment globally to control its spread, identify and design efficacious vaccine and therapeutics that will enable us to win SARS-CoV-2 infection war.

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