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Review and Meta-analysis

A Review of Candidate Therapies for Beta Coronavirus a Molecular Research

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Coronavirus disease 2019 (COVID-19) is an infectious illness caused by the coronavirus 2 that causes severe acute respiratory illness (SARS-CoV-2). The first instance of this virus was reported on November 17th, 2019 in Wuhan, China. The COVID-19 outbreak is evidenced with devastating consequences such as 34.9% rate of mortality in 27 countries. The metastasizing of COVID-19 all over the world is alarmed to cause significant losses of human life, and for this there is no specific vaccination or therapy for COVID-19 in particular. The therapies suggested at this time are adapted from the treatments of Severe Acute Respiratory Syndrome (SARV-CoV). For instance, the development for a particular therapy or vaccination for COVID-19 is an urgent requirement. The pattern of study is based on investigating the research papers for the period of 2012-2020, identifying all the potential aspects of medical research contributing for the development of treatment against diverse families of coronavirus. By analyzing this approach, this study is aimed to provide a directed approach for developing appropriate therapy for COVID-19.

Introduction

The molecular structure of coronavirus is an RNA virus incorporating about 27-32 KB positive-sense-single- stranded RNA [1]. The family origin of coronavirus is linked to Coronaviridae family that includes coronavirus diversification as alpha, beta, delta and gamma [2, 3]. Classification of COVID-19 with respect to diversity of coronavirus origin was studies and investigated by taking sputum samples of oropharyngeal and nasopharyngeal swab, followed by real-time RT-PCR (Reverse Transcriptase-Polymerase Chain Reaction), virus isolation, construction of next generation sequencing (NGS) library of viral genome with full-length, followed by sequencing analysis and finally examined with transmission electron microscopy identified that new coronavirus SARS-CoV-2 (identified from COVID-19 disease, evidenced in Wuhan, China) as betacoronavirus [1].Moreover, the investigations for identifying the similarities and differences of SARS-CoV-2 with SARS- CoV and MERS-CoV, it was found with not extreme differences with respect to demographic characteristics, radiological and laboratory findings for MERS-CoV and SARS-CoV [4]. Therefore this paper examines the various approaches for treatment of SARS-CoV and MERS-CoV predicting a directive approach for developing COVID-19 vaccination.

Methods

This research is designed by carrying out thorough investigation of the previous researches for the period of 2012-2020, identifying the pathogenic investigation for coronavirus, and the analysis of antiviral treatments developed for coronavirus treatment during 2012 and 2015 coronavirus outbreak. For investigating the origin of SARS-CoV-2, the previous studies found the origin for MERS and SARS were evaluated.

Collected Data and its Analysis

Origin of Coronavirus

MERS-CoV is enlisted in the zoonotic category found with origin from animals determining the main cause of its spread from physical contact with an infected animal [5, 6]. In general, MERS-CoV was identified with its origin to dromedary camels [7], yet some other investigations found that genome of this virus is identified with its origin in bats that is suspected to be transmitted from bats (animal reservoir) to camels (intermediate host) [5, 8]. The first identification of this virus was found in 2002 (identified as SARS), having its origin from bats (animal reservoir) and then to palm civets (as intermediate hosts) [4]. Then it was observed in 2012 in Saudi Arabia and in 2015 in Korea, and in the current time in 2019, in Wuhan [4]. For instance, SARS-CoV-2 is similar to MERS-CoV and SARS-CoV for demographical aspects and originating from bats, yet the intermediate host is still unknown [4].

Transmission Mode

The transmission mode for MERS-CoV was reported mainly with human-to-human interaction [8-10]. Moreover another study reported that 83% of the transmissions were observed with human-to-human contact, whereas 44% of cases were spread with nosocomial transmission [11], and the secondary mode (household contacts) of transmission is 4% [12]. For SARS-CoV-2 the investigations have identified a greater prevalence of virus replication, and hence causing considerably higher rate of its spread as compared to MERS-CoV and SARS-CoV [4].

Causes of Infection

Investigations identified that obesity, diabetes, cardiac malfunctioning, immune-compromised state, pulmonary disease as the risk factors of coronavirus [13, 14]. Also, the asymptomatic healthcare workers are observed with viral shedding at a delayed pace taking about 5 weeks, where not wearing masks or gloves potentially increases the chances of viral infection in the healthcare workers [15]. Moreover the people lying under old age group, and conditions involving comorbid situation are vulnerable to cause higher rate of coronavirus infection [16]. Also, diabetes mellitus (DM) and MERS-CoV were observed with a possible relationship as in 2012 outbreak, DM patients were found at increased risk for MERS-CoV severity [17-21] – whereas 2015 outbreak showed that coronavirus patients having lesser rate of DM, hence identifying an unclear relationship of DM with coronavirus infection [22-24].

Analyzing Experimental Cases for Therapies and Vaccination

A research examined the severity level of MERS-CoV, by selecting 17 patients during 2015 Korea outbreak – there was the use of enzyme-linked immunosorbent assay for measuring levels of cytokine and chemokine serum by analyzing serial serums' samples [23]. The period of 18 days was the effervescence median time, indicating severe cases with extreme infiltrates of chest within one week of infection, and dyspnea was observed as soon as the first week of infection ended, gradually indicating visible symbols as second week of infection is started [23]. The group of patients with severe illness was found with with higher level as, whereas the and (serum levels) were observed with increment in the second week, such as versus and versus. This experiment implemented IFN-α, and found no impact on the mild cases [23]. On the other hand, another study indentified the severity of disease by chest radiography [25]. Such as the diagram shows severe infection (A), and infection at mild level (B): (Figure 1).

Figure 1. Chest Radiograph [25].

Another study identified the therapy with combining ribavirin and IFN-α2a is observed with increasing the survival expectancy of severe cases (versus) [26]. Another study examined the deficiency of IFN-β1a, is expected to increase the severity of MERS-CoV infection, whereas ribarivin combination with IFN-α2ais effective for treating MERS-CoV infection [16]. Also, the prophylactic and therapeutic interventions include monoclonal human antibodies targeting [27-29]. Moreover interferon treatment in vitro is a proposed treatment, including the encoding of elements for a greater number of genes allowing open-boundary evasions to the host's immune system, until high titers are established [30].

Also, virus shedding, viral loads in lung tissues, hosts' gene expression with regulation, cytokines production and were observed during MERS-CoV infection [31]. Moreover another study examined that detectable antibodies found in the dead patients, the co-detection of antibodies with viral RNA can be utilized for developing therapeutics and vaccines [32]. Also, the role of IFN-I was examined, and demonstrated for clearing the virus and sustaining the survival of host during the infection – the study identified that virus replication and IFN-I response are critical aspects to identify the treatment and therapy for acute viral infections [33].

In conclusion, the current pandemic urges the important concern for realizing the pathogen capability for establishing and inducing infection in human with accordant clinical manifestations [34]. The natural response of the immune system for MERS-CoV and SARS-CoV evasion and lung pathology development according to viral attack are significant aspects to analyze the pathogenesis investigation of SARS-CoV-2 in humans.Since the laboratory features, radiology tests, and demogprahic characterstics of SARS-CoV-2 is similar to other coronaviruses [4], therefore(RT-PCR) can be consideredan efficient technique for estimating the rate of fatality by SARS-CoV-2 infection – moreover improving intensive care unit (ICU) services, timely monitoring for virus-specific antibodies neutralization, avoidance for complications are successful measures for recovery until an antiviral treatment is not proposed [35]. Other than this, IFN-α2a or IFN-α combination with ribarivin, the role of IFN-I, and avoiding the deficiency of IFN-β1a are appropriate approaches can be tested against SARS- CoV-2 treatment [16, 23, 33].

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Conflict of Interest

The authors declare no conflict of information for this research.

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