REVIEW ARTICLE

Dexamethasone for Covid-19: A Literature Review

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ABSTRACT

SARS-COV2 commonly known as COVID-19 is a disease that has become a global pandemic since the beginning of the year in 2020. Symptoms that are related to COVID-19 are fever, cough, chest pain, weakness, and difficulty breathing. Some cases of patients also experience mild symptoms such as diarrhea, dizziness, nausea, and vomiting. COVID-19 firstly found with pneumonia patients has never been diagnosed in China. Pneumonia or acute respiratory disease is the main disease that supports the indication of COVID-19. The treatment has been given to COVID-19 patients one of which is antibiotics and other drugs as a symptom reliever. Dexamethasone is a corticosteroid drug given to patients with an acute respiratory system. In this article, we will discuss dexamethasone for therapy COVID-19 with some reviews of studies that have been done in patients with acute respiratory systems.

Keywords: COVID-19, Dexamethasone, SARS-COV2

INTRODUCTION

China Health Authority reported cases of pneumonia that occurred in Wuhan City, Hubei, Central China, which was unknown etiologically on 31 December 2019 to the World Health Organization (WHO) (1). COVID-19 declared a global pandemic caused by a coronavirus by WHO on 11 March 2020 (2).

Cytokines produced in the body are used to control and eliminate primary infections in pneumonia patients. Organ dysfunction may occur due to the systemic inflammatory response. To prevent this, balanced and not excessive cytokines are needed. It also reduces the systemic complications of the inflammatory response and does not affect local inflammation (7). Corticosteroids are good inhibitors of inflammation. Corticosteroids are often used in pneumonia patients. Glucocorticoids have the anti-inflammatory effect of inhibiting most pro-inflammatory genes encoding cytokines, inflammatory enzymes, chemokines, and restoring homeostasis (4). Based on cases in COVID-19 patients who are associated with pneumonia, a review is needed regarding corticosteroid treatment, especially Dexamethasone. In this article, we will review the feasibility of dexamethasone for COVID-19 patients based on a study of giving dexamethasone in pneumonia (ARDS) patients.

COVID-19

SARS-CoV-2 or better known as COVID-19 is a family of coronavirus that is divided into two subfamilies, namely Coronavirinae and Toronavirinae. Coronavirinae is divided into four general, namely Alphacoronavirus (Human coronaviruses 229E and NL43), Betacoronavirus (Human coronavirus HKU1, SARS coronavirus, and MERS coronavirus), Gammacoronavirus, and Deltacoronavirus (1). So far, what has been appalling from the coronavirus family are the SARS and MERS. COVID-19 was first reported in a traditional market, Wuhan, Hubei. It was reported early on that a possible link to this viral intermediary was a snake. However, researchers are currently re-examining several animals that are likely to be intermediaries for the COVID-19 virus (5).

SARS-CoV-2, which infects humans, is considered as Betacoronavirus. The results of the phylogenetic analysis of SARS-Cov-2 showed a close association between the virus MERS- CoV (similar to 50%) and two coronaviruses that resemble SARS bats (bat-SL-CoVZXC21 and bat-SL-CoVZC45 ) and are genetically different from SARS-CoV (79% similarity) (4, 6). Other studies have reported an association of this virus with BatCov RatG13. So, these studies can conclude that the original host of the COVID-19 virus, the possibility is the bats (1, 7). The spread of
the COVID-19 disease is very fast from one city to another to another country. COVID-19 attacks more men than women. The mechanism of transmission and replication of the coronavirus can be seen in Figure 1 (8). The fatality rate varies according to the age category. It was reported that the case fatality rate at the age of 70-79 years was around 8%, while at the age of 80 years and over, it was around 14.8%. This fatality rate is related to the pre-existing conditions of comorbidity. Some disease among them are 5.6% cancer, 6.0% hypertension, 6.3% chronic respiratory disease, 7.3% diabetes, and 10.5% cardiovascular disease (9).

Studies that have been conducted report an association of pneumonia and heart disease and often occur in the same patients. Have been reported heart complications in COVID-19 patients. The effects of COVID-19 on the cardiovascular system are the same and different as those of MERS and SARS. The most common comorbidities in COVID-19 patients are Cardiovascular disease. Increase cardiac troponin I (cTnI) result from Heart injury demonstrated has been confirmed in COVID-19 patients. Among COVID-19 patients, cardiovascular disease is the most common comorbid disease. The incidence of heart injury ranged from 7.2%-27.8% and case deaths, and the incidence in ICU patients was 77% and 22.2%. An increase in cTnI levels in a patient will result in a higher risk of cardiovascular disease. CTe has increased significantly in COVID-19 patients who are severe or have died. High cTnI levels were also associated with higher mortality and complications. Patients with high cTnI levels were more likely to have higher NT-proBNP2 levels. These show a link between poor outcomes, heart dysfunction, and heart injury (6).

S. pneumoniae is detected in the myocardium in patients with severe pneumococci, resulting in cardiac injury and local pro-inflammatory response. Pneumonia is a highly pro-inflammatory disease and elevated levels of cytokines including procalcitonin, C-reactive protein (CRP), interleukin-6 (IL-6), interleukin-10 (IL-10), interleukin-1beta (IL-1β), Interleukin-10 (IL-10), tumor necrosis factor-alpha (TNF-α), interleukin-8 (IL-8) which have been detected in COVID-19 patients especially in ICU patients. In infection control, cytokines play an important role, but they can also cause dysfunction and tissue damage so that the virus triggers the increased production of cytokines and a series of immune responses that can contribute to organ dysfunction and the systemic percentage in COVID-19 patients (2).

**Dexamethasone**

Dexamethasone is a synthetic glucocorticoid group. The structure of dexamethasone can be seen in Figure 2. Glucocorticoids are hormones produced by the cortex of the adrenal glands. This drug has analgesic, anti-inflammatory, and anti-allergic effects, and suppresses the immune system.
recommended for skin (erythroderma), blood diseases (idiopathic thrombocytopenic purpura), rheumatic and autoimmune diseases (rheumatoid arthritis, polyarthritis nodosa, systemic lupus erythematosus), respiratory tract diseases (bronchial asthma), tuberculosis meningitis (anti-infective therapy), palliative treatment of neoplastic disease, prophylaxis, and treatment of vomiting and nausea caused by antiemetic treatment and chemotherapy (10).

Figure 2 : Dexametason Structure (2).
REFERENCES


CONCLUSION

Pneumonia is a disease that is often associated with people with COVID-19. Dexamethasone is a synthetic glucocorticoid that has been tested in pneumonia patients. Dexamethasone can decrease length of stay and may decrease the duration of mechanical ventilation in COVID-19 ARDS patients. The complex formation of dexamethasone and amino acids on the active site of the protease was computationally stable and better than other drugs. Dexamethasone can be further investigated for the treatment of COVID-19 by considering the side effects it causes, such as gastric upset and hyperglycemia.

<table>
<thead>
<tr>
<th>Drugs</th>
<th>PDB Code</th>
<th>Number of H-bonds</th>
<th>H-Bond Interaction (residue)</th>
<th>∆G (kcal/mol)</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexamethasone</td>
<td>6LU7</td>
<td>4</td>
<td>Cys145, Cys145, His163, His164</td>
<td>-42.76</td>
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<td>Leu141, Gly13</td>
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<td>Gly143, Glu166</td>
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<td>His163, Glu166, Phe140</td>
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<tr>
<td>Dexamethasone</td>
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<td>Asn142, Cys145, His163, Leu141, Phe140</td>
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<td>(18)</td>
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<td>Oseltamivir</td>
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<tr>
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Table 1 : Drug-Receptor Interaction: Hydrogen Bond and Free Binding Energy


