OPEN ACCESS Freely available online

Immunotherapy: Open Access

Research Article

Effectiveness of Convalescent Plasma to Treat COVID-19: Systematic Review

Ephrem Awulachewz*, Kuma Diriba, Asrat Anja, Firehiwot Belayneh

Department of Medical Laboratory Science, College of Health Science and Medicine, Dilla University, Ethiopia

ABSTRACT

Background: Currently, coronavirus disease (COVID-19) was reported in more than 204 countries. As of April 10, 2020, a total of 1,605,729 confirmed cases and 95,766 deaths had been reported worldwide. There are no approved specific antiviral agents targeting the novel virus. Convalescent plasma transfusion might be effective against the infection. Food and drug administration (FDA) has also approved the emergency use of investigational COVID-19 convalescent plasma to treat severely ill COVID-19 patients.

Objective: The aim of this study was to systematically review disease outcome and effectiveness of convalescent plasma to treat COVID-19.

Method: We searched literature published in English from December 20 /2019 to April 10/2020 on electronic databases. Using R software we have conducted a systematic analysis, frequency, mean, standard deviation, and chi-square test.

Result: The average age of the participants in the included was 55.7 with a standard deviation of 13.9. The average days of recovery or test negative for the COVID-19 PCR test after convalescent plasma therapy were 9.6 days (95% CI 2- 30 days). About 43% (9/21) had a history of comorbidity. The average date of recovery of patients with co-existing chronic diseases infected by COVID-19 after convalescent plasma therapy was about 12 days relatively prolonged than patients without the co-existing disease (7.6 days). No series adverse effects have been demonstrated in patients who have received convalescent plasma transfusion.

Keywords: COVID-19; Convalescent Plasma; Plasma; SARS CoV 2; Severe Acute Respiratory Syndrome

INTRODUCTION

The Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a novel strain of coronavirus that was first detected in the city of Wuhan, China [1,2]. It was named as coronavirus disease 2019 (COVID-19) by World Health Organization (WHO) [3,4]. The outbreak SARS-CoV-2 was named as a pandemic disease by WHO on March 11, 2020. Currently, the disease was reported in more than 204 countries. As of April 10, 2020, a total of 1,605,729 confirmed cases and 95,766 deaths had been reported worldwide [5]. Currently, due to an alarmingly spreading of the virus worldwide, the incidence and deaths are increasing. However several efforts made to treat COVID-19, there are no approved specific antiviral agents targeting the novel virus, and no vaccines have been fully tested for safety and efficacy while some drugs are still under investigation.

Convalescent plasma (CP) therapy is an immunotherapy that has been applied to the prevention and treatment of many infectious diseases for more than one century. So, the use of convalescent plasma is not a new method rather it was used for poliomyelitis [6], measles [7], mumps [8], and influenza [9], severe acute respiratory syndrome (SARS), several hemorrhagic fevers such as Ebola, and other viral infections treatments [10]. Even more recently during H1N1 influenza virus pandemics in 2009–2010, convalescent serum antibody preparations obtained by apheresis were used to treat individuals with severe H1N1 infection requiring intensive care. This was the baseline lesson for convalescent plasma to treat COVID-19.

Plasma from people who have recovered from COVID-19 may contain antibodies to the virus that causes the disease and might be effective against the infection. Food and drug administration (FDA) has also approved the emergency use of investigational COVID-19 convalescent plasma to treat severely ill COVID-19

***Correspondence to**: Ephrem Awulachewz, Department of Medical Laboratory Science, College of Health Science and Medicine, Dilla University, Ethiopia, Tel: +25149181161; E-mail: efriye@gmail.com

Received: February 05, 2021; **Accepted**: February 19, 2021; **Published**: February 26, 2021

Citation: Awulachewz E, Diriba K, Anja A, Belayneh F (2021) Effectiveness of Convalescent Plasma to Treat COVID-19: Systematic Review. Immunotherapy (Los Angel). 7:170.

patients. The general principle of passive antibody therapy is that it is more effective when used for prophylaxis than for treatment of disease. When used for therapy, the antibody is most effective when administered shortly after the onset of symptoms. So it is required to evaluate the effectiveness of convalescent plasma therapy. So this study planned to conduct systematic analysis of literatures on Convalescent plasma treatment in severely ill COVID-19 patients.

OBJECTIVE

The main aim of this study is to systematically review the effectiveness of convalescent plasma to treat COVID-19.

MATERIAL AND METHODS

Types of participants

The study population of interest was human subjects of any age or sexes who were hospitalized or were in ICU with COVID-19 infection. The intervention of interest was convalescent plasma transfusion. Outcomes of disease progress after Convalescent therapy that was extracted from included studies was used predict the clinical effectiveness of therapy.

Search strategy

We searched literatures published in English from December 20 /2019 to April 10/2020 on electronic data bases PubMed, Cochrane library, EMBASE, Escopus, Hinari, CINAHL, Open Access Journals (OAJ) and Google scholar, for studies conducted trial of convalescent plasma treatment of COVID-19. We simultaneously searched reference lists of all recovered articles for potentially eligible studies. All identified keywords, and mesh terms were combined using the "OR" operator and "AND" operator for searching literatures. Keywords used in the search included were those that explain infection of severe acute respiratory syndrome 2 (SARS CoV 2) (i.e., COVID-19, severe acute respiratory syndrome 2, SARS CoV 2, novel corona virus). Full-text articles were retrieved after review of the title and abstract.

Inclusion and exclusion criteria

Inclusion criteria: All studies published in English from December 20 /2019 to April 10/2020 were included in the review. There was no restriction to study design made.

Data extraction

Data were extracted from included study by two investigator (EA, and KD) using a standardized data extraction form. Then the extracted data were merged together for systematic analysis. Primary outcomes extracted from each study were, the citation details, sample size, number of cases, year of publication, location of study, method of identification of COVID-19. Secondary outcomes for this study included clinical data including the stage of disease, treatment received, co-morbidities, co-infection, and dates of recovery after convalescent plasma transfusion, progress opacities in the lung.

Statistical analysis

The R software was used to conduct systematic analysis, frequency, mean, standard deviation, and chi-square test.

RESULTS

Following the initial search of data bases four eligible studies have been accessed and were reviewed by the authors. Following methodological quality assessment, all 4 articles were eligible and included in this systematic review and meta-analysis. In the included studies the total of 21 patients infected with COVID-19 were obtained convalescent plasma therapy. All 4 papers were published in English.

Of the 4 studies included in the Systematic review and Meta-analysis, all studies reported the detail case report of COVID-19 patients. All patients were severely ill and were put to intensive care unit (ICU). All 4 studies included in the systematic review and Meta-analysis, infections of COVID-19 were examined using PCR which is of high quality diagnostic method. Most of the studies conducted are of higher quality because of method of diagnosis using highly sensitive and specific PCR techniques.

The average age of the participants in the included was 55.7 with standard deviation of 13.9. From a total of 21 patients 12 of them were male. The average days between admissions to start of convalescent plasma therapy was 10 ± 4.5 days and the average days of recovery or test negative for CIVID-19 PCR test after convalescent plasma therapy was 9.6 days (95% CI 2- 30 days). About 43% (9/21) had history of comorbidity and about 24% (5/21) have co-infections, while 19% (4/21) patients are have both history of co-existing disease and co-infections (Figure 1).

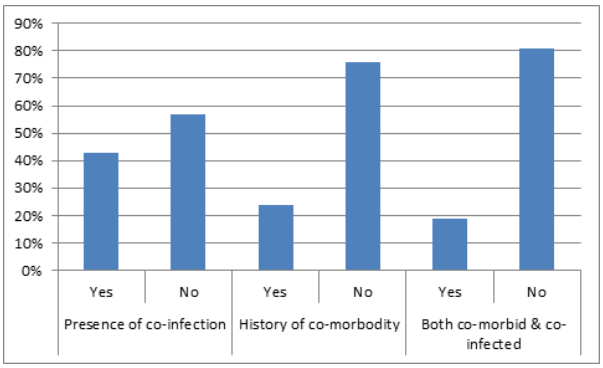

Figure 1: Presence of comorbidity and co-infection in patient with COVID-19

According to data of systematic review and meta-analysis there was significant rate of recovery between patients with co-morbidity and patients without co-morbidity. Patients without co-existing chronic diseases infected by COVID-19 relatively recovered earlier than those who have co-existing disease after convalescent therapy. They test negative for COVID-19 PCR test after an average of 7.6 days. The average date of recovery of patients with co-existing chronic diseases infected by COVID-19 after convalescent plasma therapy was about 12 days. On the other hand patients with COVID-19 infection and who have both co-existing chronic diseases and co-infection relatively have

prolonged time of recovery or require relatively long time to test negative for COVID-19 PCR test.

DISCUSSION

The therapeutic benefits of convalescent plasma transfusion for infectious diseases began in the 20th century. Lesson learnt from proven effectiveness of convalescent plasma as a potential treatment of MERS-CoV, SARS-CoV and H5N1 influenza in the last decades, can hold true that convalescent plasma transfusion can be an important optional treatment in patients with critical clinical disease stage in the absence of specific treatment of COVID-19 infection.

In this review we have demonstrated that there was significant difference of rate of recovery between patients with co-morbidity and patients without co-morbidity. Patients without co-existing chronic diseases infected by COVID-19 relatively recovered earlier than those who have co-existing disease after convalescent therapy.

Majority of complications observed in the study participants were severe acute respiratory distress, pneumorrhagia, cystorrhagia and gastrointestinal bleeding, myocardial damage, and cardiac dysfunction. This could be reason to death in patients infected by COVID-19.

According to data this systemic review to evaluate the clinical effects of convalescent plasma therapy after evidence recovery of patients, partial to persistent absorption of consolidation within the lung, ex-tubation of mechanical ventilation within 1-3 days of CPT showed that convalescent plasma can be a promising treatment option for severe COVID-19 patients.

As a limitation there is no well-designed study conducted to see effectiveness of convalescent plasma transfusion therapy we included systematic analysis of detail case reports of patients who have received convalescent plasma transfusion therapy for COVID-19 and the clinical outcome after transfusion. The other limitation is that this study is a systematic review of case series which does not have control.

CONCLUSION

This study indicated that convalescent plasma transfusion might be a potential treatment for critically ill patients infected with COVID-19 and it can be helpful to reduce the risk of mortality of critically ill patients. We demonstrated no serious adverse reactions associated with the transfusion of convalescent plasma. This review suggests that convalescent plasma from patients who have recovered from COVID-19 infection might be an option to treat patients without causing severe adverse effects. Adequately assessing safety and efficacy of convalescent plasma therapy is essential. So, this study recommends that safety and efficacy of convalescent plasma transfusion in SARS-CoV-2-infected patients should be studied using well-designed clinical trial.

ACKNOWLEDGMENT

None

REFERENCES

1. Misery L, Loser K, Ständer S. Sensitive skin. J Eur Acad Dermatol Venereol. 2016;30:2-8.
2. Stander S. Sensitive skin-a global challenge with upcoming solutions. J Eur Acad Dermatol Venereol. 2016;30:1.
3. Misery L. Sensitive skin. Expert Rev Dermatol. 2013;8:631-637.
4. Yang L, Lyu L, Wu W, Lei D, Tu Y, Xu D, et al. Genome-wide identification of long non-coding RNA and mRNA profiling using RNA sequencing in subjects with sensitive skin. Oncotarget. 2017;8:114894-114910.
5. Pinto P, Rosado C, Parreira˜o C, Rodrigues LM. Is there any barrier impairment in sensitive skin? A quantitative analysis of sensitive skin by mathematical modeling of transepidermal water loss desorption curves. Skin Res Technol. 2011;17:181-185.
6. Misery L, Jean-Decoster C, Mery S, Georgescu V, Sibaud V. A new ten-item questionnaire for assessing sensitive skin: The Sensitive Scale-10. Acta Derm Venereol. 2014;94:635-639.
7. Misery L, Stander S, Szepietowski JC, Reich A, Wallengren J, Evers AW, et al. Definition of sensitive skin: An expert position paper from the special interest group on sensitive skin of the international forum for the study of itch. Acta Derma Venereol. 2017;97:4-6.
8. Marriott M, Holmes J, Peters L, Cooper K, Rowson M, Basketter DA. The complex problem of sensitive skin. Contact Dermatitis. 2005;53:93-99.
9. Chan KTM. Clinical review on sensitive skin: History, epidemiology, pathogenesis and management. J Clin Exp Dermatol Res. 2018;9:453.
10. Misery L, Boussetta S, Nocera T, Perez-Cullell N, Taieb C. Sensitive skin in Europe. J Eur Acad Dermatol Venereol. 2009;23:376-381.