

Stem cells used in infectious diseases like pneumonia, respiratory infections and Covid-19: A study based on doctor's opinion

Swati Chaudhary^{1,*}, SupritiAgrawal¹

¹Amity Business School, Amity University, Noida, Uttar Pradesh, India

*Corresponding author: Swati Chaudhary, Amity Business School, Amity University, Noida, Uttar Pradesh, India.

E-mail: _chaudharyswati027@gmail.com

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ABSTRACT

Worldwide, infectious diseases have contributed significantly to morbidity and mortality; among the leading causes of death are pneumonia, respiratory infections and Covid-19. Stem cell therapy will be used to treat virus-infected patients in an effective and safe manner. A cross-sectional questionnaire was used to collect data from doctors. Most doctors are aware of the applications of stem cells, but they do not confirm their usage because clinical trials are ongoing. Instead, they show support for using stem cells to treat patients. Stem cells have been hoping to help repair damaged tissues in the respiratory system to promote faster recovery. Stem Cells are being studied in current clinical trials for their efficacy and safety in virus severe pneumonia and respiratory infections. The doctors suggested that stem cells have been used in infectious diseases to improve their health.

Keywords: Infectious diseases, stem cell research, clinical trials, regenerative medicine

INTRODUCTION

Respiratory infections, pneumonia and Covid-19 are the leading causes of death worldwide, and infectious diseases have been a significant contributor to both morbidity and mortality. It is essential to

find novel therapeutic approaches to fight infections and repair infection-related organ and tissue damage due to the rising incidence of infectious illness outbreaks and the lack of efficient treatments. Stem cell therapy is becoming a key treatment for the respiratory diseases. A stem cell is a

type of undifferentiated cell that can divide to produce stem cells and differentiated cells as well as become specialized [1]. According to the National Institutes of Health (NIH) there are possibilities to develop stem cells into many different cell types in the body during early life and growth [2]. Stem cells have been studied by scientists for decades in order to understand how development occurs and to identify novel approaches to treat diseases [3]. To make the mythical concept of regeneration a reality, today's scientists and doctors are working on therapies that will replace cells and tissues that have been lost, damaged, or aged in the human body. A new era in stem cell research has begun according to this research [4].

Many researchers have suggested that stem cell therapy is an ongoing innovation in the treatment of pneumonia caused by viruses such as the current corona virus and other respiratory infectious diseases. Pneumonia is a respiratory infection. It can be caused by viruses, bacteria, and fungi. Pneumonia may cause fluid to fill the tiny air bags in your lungs called alveoli [5]. The COVID-19 disease, which is caused by the new corona virus SARS-CoV-2, can be a consequence of pneumonia [6]. Pneumonia occurs only in the serious cases of the

covid-19. But there are other cases of pneumonia which occur by the bacteria, fungi and microorganism. The most common cause of viral pneumonia, IAV (Influenza Virus) infection, causes significant periodic and pandemic disease and death. Antiviral medicines currently are the main strategy for treating pneumonia caused by influenza. Antiviral drugs, on the other hand, are still unable to heal damage lung cells [7], so the Stem cell helps in the treatment of pneumonia and hopefully they treated the pneumonia that cause by the covid-19. Acute Lung problems (ALIs) or Acute Respiratory Distress Syndrome (ARDS) are also significant cause of pneumonia. Stem cells have proven to have anti - inflammatory properties that can be used for the treatment of ALI/ARDS-like infective and inflammatory lung diseases. The mesenchymal stem cells are used to treatment of pneumonia and infectious lung diseases [8].

Understand the importance of stem cells in the treatment of infectious diseases like as pneumonia, respiratory infections, and Covid-19 in this study, as well as the doctors' opinions on stem cell treatment. Doctors play an important role in our lives. If they respond favorably to a treatment, it

leads to substantial advances in the field and the creation of multiple clinical trials that will benefit medical professionals' in the future in treating patients with respiratory infections. The most recent study on stem cell therapy for influenza disease lung damage may be found here. On the clinicaltrials.gov website, there are presently 17 clinical studies looking at the therapeutic potential of MSCs in COVID-19 patients; the majority of these trials are either recruiting or have not yet begun. The significant majority of the studies recruited individuals with COVID-19 and pneumonia, who were then transplanted intravenously three times with allogeneic bone marrow or umbilical cord derived MSCs [9,10]. According to Chinese scientists they have described a novel approach to the design of vaccines against corona virus (COVID-19) based on human Mesenchymal stem cells that provide a positive and promising antibodies response [11]. Still, though, No specific and effective COVID19 vaccines and medicines are available, in particular in severe cases [12].

MATERIALS AND METHODS

The original survey included 100 doctors from various hospitals and clinics in the Delhi NCR. A questionnaire was used to collect the doctor's opinions on covid-19 stem cell treatment. Twenty of the 100 surveys were rejected due to poor quality. As a result, the final sample size was just 80 participants, representing an 80% response. A semi-structured questionnaire was used to collect demographic information, and a review questionnaire has been used to assess knowledge about COVID-19 and various studies on their cure and treatment measures. The information was gathered and analyzed using both inferential and descriptive statistics.

RESULTS

Demographic Analysis

Five demographic variables gender, age, education, practicing and experience were measured in this survey. The summary of these demographic characteristics is described in Table 1.

According to the demographic analysis, the most of respondents (35 %) are between the ages of 31 and 40, and more than 65 % are females and 35 % are males. 31.25 % of doctor's work in their own clinics, while 23.75 % work in both public hospitals and

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personal clinics. Only 18.75 % work at government hospitals, whereas 26.25 percent work in private hospitals. The majority of doctors (33.75 %) have 10-20 years of experience and the majority of doctors are postgraduates with the MD/MS degree.

The possibility of a pneumonia, respiratory infections and Covid-19 cure and treatment

According to a survey of doctors, 100 % all seem to be aware of COVID-19 and they have knowledge about the stem cell therapy.

From the Table 2 shown that the 90 % doctors are believe that the COVID-19 is preventable with the vaccine. According to the government of India, 5 vaccines are approved for use and 13 vaccines in clinical trials in India. After Covishield, Covaxin, Sputnik V, and Moderna, J&J's vaccine is the fifth COVID-19 vaccine to be available in India. The Janssen vaccine was among the first candidates to be approved by the FDA, and it was believed to have a high efficacy in preventing hospitalization and death in humans due to COVID-19 [14].

According to the above Table 2, 81 % of doctors agree that Covid-19 can be adequately treated with antiviral medicine, while the remaining 19 % do not have trust

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in antiviral treatment. Similarly, the research suggests that effective antiviral medications are also desperately needed; along with vaccinations SARS-CoV-2 antiviral medicines have not been identified in the majority of randomized controlled trials to-date [14]. As illustrated 85 % of respondents consider that COVID-19 patients can be treated with stem cells, while 15 % oppose. Similarly, the study found that transplant of MSCs (stem cells) is really the reliable and successful treatment that may be used as a cure and rapid treatment approach to COVID-19 patients who are critically ill[15].

In the Table 3 shown that doctors perspective on the treatment of pneumonia, respiratory infections and Covid-19 stem cell treatment patients with the stem cell therapy. 36.6 % doctors believe that the stem cell therapy is became the great extent in the pneumonia, respiratory infections and Covid-19 treatment. And 45 % show the moderate extent of the stem cell therapy for COVID-19 treatment. Only 3 % denied the stem cell therapy for the COVID-19 patient. Mostly doctors prefer stem cell treatment is best option for the COVID-19 treatment. But 70 % doctors concern about the effects on stem cell therapy on COVID-

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19 patient. 51 % doctor's revealed that positive response by scientist for the stem cell therapy boosts their confidence. COVID-19 as pneumonia and respiratory infections such as stem cell treatments and their extracellular vesicles, are becoming more widely available, according to a study. These therapies have the ability not just to alleviate inflammation but also to repair lung damage caused by COVID-19. Through their Vesicles, people with COVID-19 can benefit from the immunomodulatory, anti-oxidant, and reparative therapeutic properties of stem cells [16].

To a certain extent, 45 percent of doctors are concerned about the government's plans for stem cell therapies. 20 % of doctors in India are worried about the third wave of COVID-19. In addition, a third wave of COVID-19 is expected to hit India by mid-August, according to Dr. Samiran Panda, Director of Epidemiology and Infectious Diseases at the Indian Council for Medical Research. However, it is expected to be less severe than the second wave [17].

T test

A t-test was conducted with a test value/mean value of 3 to determine the

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doctors' perspectives on the use of stem cells for COVID-19 patients in order to determine whether doctors tend to have either a favorable or negative perspective. The hypothesis as shown below:

H₀: Doctors have neither a favorable nor a negative perspective about the use of stem cells for COVID-19 patients.

H_a: Doctors either have a favorable perspective about the use of stem cells for COVID-19 patients.

According to the Table 4, doctors have a favorable or negative perspective regarding the use of stem cells for COVID-19 patients, with $t(4.41) = 0.850$ $p = 0.001$ which is less than $p < 0.05$. As a result, the alternative hypothesis was accepted. Further descriptive statistics analysis in table no. 4 reveals that doctors have a favorable perspective about stem cell usage for COVID-19 patients ($M = 2.5377$ $SD = 0.1085$), which is on the positive side of the likert scale. Also in 2020, researchers found that adoptive transfer of stem cells along with other therapies had positive clinical effects for a severely ill COVID-19 patient with severe lung inflammation [18].

Table 1. Demographic characteristics data

| | Category | Frequency | Percentage |
|--------------------|---|------------------|-------------------|
| Gender | Male | 30 | 30% |
| | Female | 50 | 50% |
| Age Group | Less than 30 year | 9 | 11.25% |
| | 31-40years | 28 | 35% |
| | 41-50 years | 24 | 30% |
| | Above 50 years | 19 | 23.75% |
| Educational status | Graduate(MBBS) | 17 | 21.25% |
| | Post- Graduate (MD) | 31 | 38.75% |
| | MS | 19 | 23.75% |
| | Diploma after Graduation | 13 | 16.25% |
| Practicing | In Government hospital | 15 | 18.75% |
| | In private Hospital | 21 | 26.25% |
| | In own Clinic | 25 | 31.25% |
| | In both own clinic and private hospital | 19 | 23.75% |
| Experience | Less than 10 years | 21 | 26.25% |
| | 10-20 | 27 | 33.75% |
| | 20-30 | 17 | 21.25% |
| | More than 30 years | 15 | 18.75% |

Table 2. Opinion of the doctors on use vaccine, antiviral medicine and stem cell for the pneumonia, respiratory infections and Covid-19

| Frequency | Yes | No | Total |
|---|------------|------------|--------------|
| Covid-19 is preventable with a commonly available vaccine. | 72(90%) | 08(10%) | 80(100%) |
| Infectious disease effectively treated with antiviral medicines. | 65(81.25%) | 15(18.75%) | 80(100%) |
| Pneumonia, respiratory infections and Covid-19 can be treated with stem cells | 68(85%) | 12(15%) | 80(100%) |

Table 3. Perspective of the doctors

| Perspective of the doctors | Yes, to a significant level. | To a moderate level | To certain level | To a small level. | Definitely not. |
|---|-------------------------------------|----------------------------|-------------------------|--------------------------|------------------------|
| Perspectives of doctors on pneumonia, respiratory infections and Covid-19 stem cell treatment Patients, stem cell therapy will prove to be an effective therapeutic approach. | 21 (36.6%) | 36(45%) | 16(20%) | 4(5%) | 3(3.8%) |
| Doubts about the use of stem cells in infectious treatment | 24(30%) | 29(36.3%) | 13(16.3%) | 12(15%) | 2(2.4%) |
| Concerned about stem cell therapy's beneficial effects | 7(8.8%) | 56(70%) | 12(15%) | 5(6.3%) | Nil |
| The government has taken appropriate steps to promote stem cell research. | 4(5%) | 2(2.5%) | 20(25%) | 43(53.8%) | 11(13.8%) |
| Patients with serious medical conditions are more likely to benefit from stem cell therapy than from antiviral medicines. | 15(18.8%) | 33(41.3%) | 15(18.8%) | 17(21.3%) | Nil |
| Stem cell treatments will become more effective in the future. | 18(22.5%) | 19(23.8%) | 16(20%) | 25(31.3%) | 2(2.5%) |
| The efficacy of COVID-19 stem cell treatment is not fully recognized. | 19(23.8%) | 42(52.5%) | 2(2.5%) | 15(18.8%) | 2(2.5%) |
| When get a positive response from stem cell therapy, it boosts the confidence on its reliability. | 13(16.3%) | 51(63.8%) | 6(7.5%) | 8(10%) | 2(2.5%) |
| Infectious are much concerns diseases in India. | NIL | 19(23.8%) | 16(20%) | 39(48.8%) | 6(7.5%) |
| Evidence is needed to support the use of stem cells in the treatment disease pneumonia, respiratory infections and Covid-19stem cell treatment | 5(6.3%) | 36(45%) | 18(22.5%) | 15(18.8%) | 6(7.5%) |

Table 4. T test

| | N | Mean | Std. Deviation | Std. Error Mean | Df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|--------------|----|--------|----------------|-----------------|----|-----------------|-----------------|---|--------|
| | | | | | | | | Lower | Upper |
| Perspectives | 80 | 2.5377 | .9703 | .1085 | 80 | .001 | 0.850 | 1.8124 | 2.0766 |

DISCUSSION

The treatment of respiratory infectious diseases like pneumonia and corona virus patients with stem cell therapy offered a challenge to physicians of various disciplines because the disease revealed numerous difficulties in the patients. Despite the fact that 85 % of clinicians believed that stem cells should be used in the respiratory diseases. Only one-third of doctors (23 %) believe that stem cell therapies will become more successful in the future. The research on the several patients' world side showed the positive effect of the stem cell to treat in the stem cell. Similarly study in 2020, the patient's inflammatory symptom was still rather severe after 12 days of regular medication, and the probable side effects of corticosteroid were noted in the 65-year-old lady diagnosed with COVID-19. Allogenic hUCMSCs (stem cell) were

subsequently given three times, along with daily injections of thymosin 1 and antibiotics. The majority of test markers and CT pictures revealed that the inflammatory symptom had disappeared as a result of these therapies. Then, if paired with other drugs, adoptive transfer of stem cell promising therapeutic results in a seriously sick COVID-19 patient with significant lung inflammation [19]. Antiviral drugs are also used for treated the patients. Since there are few effective treatments for the viral infections are only treated clinical signs, the approval of the mRNA vaccination approach against COVID-19 provides a way to discovery and the research of new drugs against many infectious diseases or even cancer [20]. According to the study's findings, Indian doctors are interested in stem cell treatment, but they feel that regenerative medications developed from stem cells will be more useful to patients if they are

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offered because according to the study in 2016 the stem cell developed as regenerative medicine [21]. However, stem cells are already being utilized by doctors in several countries to treat patients, as proven by several researches. In the first trial of stem cell therapy in COVID-19, Leng et al. found that providing intravenous clinical grade MSCs to 7 COVID-19 patients improved their functional results and facilitated rehabilitation in China [22]. In clinical studies, stem cells derived from various sources such as the umbilical cord and bone marrow proved efficacy in patients with severe infection [23] and it is now being evaluated in the general population with severe COVID-19 sickness [24]. Individuals infected with SARS-CoV-2, especially those who are extremely ill and are not responding to standard therapy, can benefit from MSCs [25]. Despite the good clinical findings, COVID-19 will be too early to predict MSCs' therapeutic potential. So, further study with a larger patient population is required to prove their efficacy [26].

This study covered all doctors, but the Pulmonologist handled the respiratory condition, there are differences in doctor perspectives, but from this study average

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doctors are suggested the stem cell treatment. As the COVID-19 outbreak spreads and worse, an increasing number of people are being diagnosed with the virus [27]. The issue is that there are now no effective medical therapies or approaches available, particularly for the treatment of seriously and critically ill individuals. MSC treatment, according to study, can decrease immune system activation and increase endogenous healing by enhancing the microenvironment. Mesenchymal Stem Cells (MSCs) may be injected into the human body and then aggregate in the lungs, where they can strengthen lung cell membranes, preserve alveolar epithelial cells, and prevent pulmonary fibrosis [28]. Due to the limited amount of suitable therapies for severe COVID-19, stem cell (hUC-MSC) therapy has proven to be a very successful and hopeful technique of therapeutic application and improvement [29]. The current study has certain limitations. There are several reasons for this, including a smaller than expected group of doctors who completed the questionnaire, which means we don't have a large sample size. As a result of these findings, stem cell therapy, vaccines and antiviral treatments for COVID-19 patients have been given a general outline in the

research [30]. In the future, we'll be able to research clinical trials soon and poll a huge number of doctors from a variety of specialties. This study has limitations, such as the fact that it was done in only the few hospitals and that all physicians, rather than specialists, were surveyed. Furthermore, because pulmonologists handle respiratory diseases, they are more favorable to using stem cells to repair damaged lungs, respiratory disease and serious cases of Covid-19.

CONCLUSION

In conclusion, the opinion of doctors to use the stem cell is positive. In the analysis it's also shown that the 33 % thinks that stem cell treatment is more beneficial than antiviral medicine. The covid-19 therapy is being supported by specialists using stem cells. According to the research t-test, the hypothesis is accepted, and the stem cell therapy is beneficial.

In the last five years, clinical trials on stem cell therapy for respiratory problems have moved at a fast pace. Because of the diversity of pulmonary disorders, registered trials have chosen a broad spectrum of stem/progenitor cells. On clinicaltrials.gov, there are now 17 research

trials researching MSCs' clinical efficacy in COVID-19 patients. The vast majority of these studies is either presently recruiting participants or has not yet started. To treat patients with COVID-19 and pneumonia, the great majority of studies employ allergenic bone marrow or umbilical cord-derived MSCs given intravenously three times. Finally, MSCs and EVs derived from stem cells should be investigated in well-controlled, rationally planned clinical studies based on reliable scientific evidence to treat COVID-19. The COVID-19 outbreak has led to deaths and damaged livelihoods all across the world. As a reason both healthy people and people with illnesses are at risk for COVID-19 The respiratory system is the primary organ affected by pneumonia, Infectious diseases and COVID-19, and its involvement is also the primary cause of mortality in such patients [31]. It's good to know that vaccines are on the way [32]. Anti-vaccine resistance affects global health by giving viruses more time to evolve and spread. It's likely that in the future, immunizations won't be effective against all virus mutations. As a result, overcoming vaccine concern becomes critical [33].

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