

A Clinical Study To Evaluate The Effect Of Arsenicum Album 200C In Covid Patients And FTIR Characteristic Analysis

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ABSTRACT

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has had a profound impact on global health, economies, and social systems. The unprecedented spread of the virus has led to a surge in research aimed at finding effective treatments and preventive measures. This study aims to evaluate the effect of Arsenicum album 200C on IgG levels in post-COVID-19 patients and to explore its immune-modulatory potential. IgG levels were measured before and after treatment to assess changes. This clinical study evaluates the therapeutic effect of Arsenicum album 200C in post-COVID-19 patients, specifically focusing on IgG modulation. A total of 20 patients experiencing post-COVID symptoms were treated, and their IgG levels were measured before and after intervention. Additionally, FTIR spectroscopy was conducted to identify the functional groups and molecular composition of the remedy. Moreover, FTIR (Fourier Transform Infrared) spectroscopy was used to analyse the molecular structure of the remedy. Results show a statistically significant average IgG reduction of 52% ($p = 0.00032$), supporting the immune-modulatory potential of the homeopathic medicine. FTIR analysis revealed the presence of functional groups characteristic of calcium carbonate and organic molecules, suggesting potential bioactivity.

Keywords: *Arsenicum album, FT-IR, Post-COVID, IgG, Intervention*

1. INTRODUCTION

As modern medicine continues to evolve in response to this crisis, alternative and complementary therapies have also garnered significant attention for their potential roles in supporting COVID-19 recovery and alleviating post-illness symptoms¹. Homoeopathy, known for its holistic and individualized approach to treatment, has been explored as one such option². It has been prescribed in numerous chronic and acute conditions, often acting as a constitutional remedy that addresses the patient's physical, mental, and emotional states³. The need for effective management of post-COVID symptoms is critical, and homoeopathy presents a potentially valuable adjunct to conventional care⁴.

The present study, titled "A Clinical Study to Evaluate the Effect of Arsenicum album200C in COVID Patients and FTIR Characteristic Analysis of Arsenicum album," aims to explore the effects of Arsenicum album200C in treating post-COVID patients. The focus is on understanding whether this remedy can help modulate the immune system, specifically by observing changes in IgG levels in patients treated with Arsenicum album200C. The IgG antibody, a key player in the immune response, is often elevated in patients recovering from viral infections, and monitoring its levels can provide insights into the immune modulation and recovery process⁵. This aspect of the study is particularly important, as it provides a deeper understanding of the chemical characteristics of the remedy and how it might interact with biological systems⁶.

The combination of clinical outcomes and FTIR analysis will not only help validate the efficacy of *Arsenicum album*200C in post-COVID treatment but also contribute to a more scientific understanding of homoeopathic remedies. The results of this study could offer valuable insights into the role of homoeopathy in managing post-viral syndromes and support the integration of homoeopathic treatments into broader healthcare strategies for COVID-19 recovery⁷. This study explores the effects of *Arsenicum album*200C as a complementary treatment in COVID-19 patients, with a focus on immune modulation as measured by IgG levels. Additionally, understanding

the chemical composition of *Arsenicum album* through FTIR analysis provides insight into its potential therapeutic mechanisms.

2. MATERIALS AND METHODS

The study was designed as a clinical trial aimed at evaluating the effect of *Arsenicum album*200C in the treatment of post-COVID illness. This investigation took place at the Sarada Krishna Homoeopathic Medical College Hospital and its associated peripheral centers. The study included both outpatient and inpatient departments, focusing on patients who experienced post-COVID symptoms. The clinical study and data are collected, while laboratory analysis, including FTIR spectroscopy, was performed. The study utilized 20 cases of post-COVID illness treated with *Arsenicum album* 200C.⁸ The population of the study included individuals experiencing post-COVID symptoms. Patients were treated with *Arsenicum album*200C and monitored to assess their response to the treatment.

The study included patients across all age groups and both sexes who met the inclusion criteria. The study utilized purposive sampling, a non-probability sampling technique where subjects were selected based on specific criteria related to the study. This method was chosen to ensure that only patients who had been diagnosed with post-COVID symptoms⁹ were included. Data was systematically collected from patient records and processed into a standardized case record. This included patient history, symptoms, treatments, and outcomes. The data was analysed and synthesized according to the guidelines and principles of homoeopathy, ensuring that the clinical approach adhered to traditional homoeopathic practices.

3. RESULTS AND DISCUSSIONS:

All patients experienced a decrease in IgG levels after treatment, implying that *Arsenicum album*200C may be associated with lowering IgG levels in these COVID patients. The percentage of reduction varies across the patients, with the highest reduction observed in patient 9 (47/F) from 728 AU/mL to 339 AU/mL. This dataset tracks IgG levels in 20 patients before and after treatment across two time periods: October to December 2023 (pre-treatment) and January to April 2024 (post-treatment). The analysis of IgG levels in 20 patients showed a significant reduction after treatment. The average IgG levels dropped from 178.85 AU/mL pre-treatment to 85.65 AU/mL post-treatment, representing an approximately 52% reduction. The paired t-test yielded a p-value of 0.00032, confirming that the reduction in IgG levels was statistically significant.

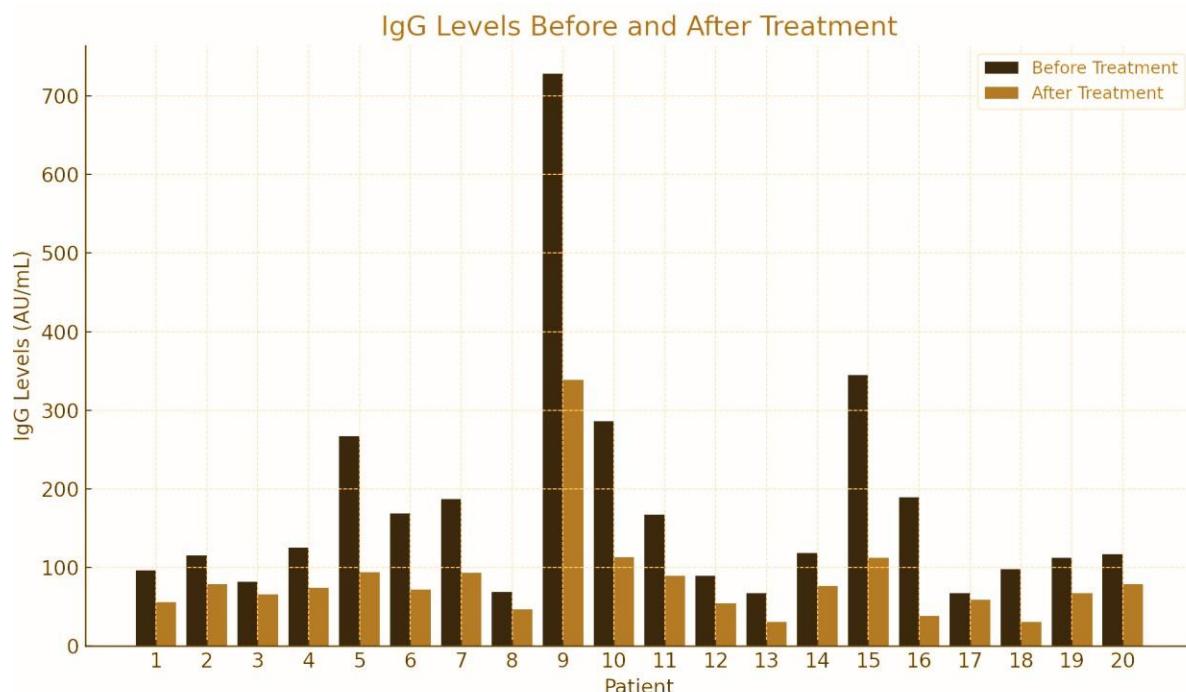


Fig 1: Individual patient IgG levels before and after treatment

The FTIR analysis identified several key functional groups in *Calcarea Carbonicum*, such as carbonate ions, water, and organic impurities. Peaks at 432 cm^{-1} , 874 cm^{-1} , and 1048 cm^{-1} confirmed the presence of calcium carbonate, while peaks at 2893 cm^{-1} and 2972 cm^{-1} indicated possible organic contaminants. This is an FTIR (Fourier Transform Infrared) spectrum for Homoeopathic medicine *Calcarea carbonica*, which is a compound commonly found in nature as calcium carbonate (CaCO_3). The x-axis represents the wavenumber (in cm^{-1}), which corresponds to the energy of the infrared light absorbed by the sample, while the y-axis shows the % transmittance, which indicates how much light passes through the sample.

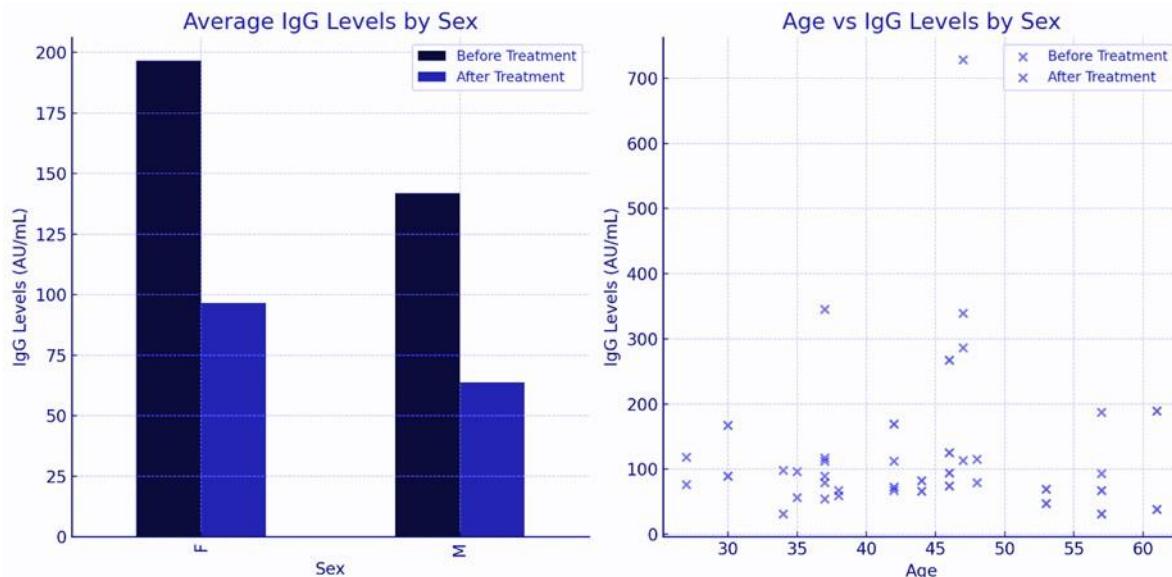


Fig 2: Average IgG levels before and after treatment, grouped by sex

These peaks (432 cm^{-1} and 644 cm^{-1}) are typically associated with the bending vibrations of the carbonate ion (CO_3^{2-}). The lower wavenumbers indicate out-of-plane bending vibrations. This peak (874 cm^{-1}) is characteristic of the in-plane bending vibration of the carbonate ion (CO_3^{2-}). This is a strong indication of the presence of calcium carbonate. This peak (1048 cm^{-1}) can be attributed to the symmetric stretching vibration of the C-O bond in the carbonate ion. This peak (1395 cm^{-1}) corresponds to the asymmetric stretching vibrations of the carbonate ion (CO_3^{2-}). It is a prominent feature in calcium carbonate. This peak (1657 cm^{-1}) may be due to the bending vibration of water molecules (H_2O) adsorbed on the sample or other hydrogen-bonded groups. These peaks (2893 cm^{-1} and 2972 cm^{-1}) are often associated with C-H stretching vibrations, which might be due to organic contaminants or impurities in the sample. This peak (3338 cm^{-1}) is likely due to O-H stretching vibrations, which can be attributed to the presence of water (H_2O) or hydroxyl groups (OH^-) within the sample. The broad nature of this peak suggests strong hydrogen bonding, often associated with absorbed water.

Table 1: Key wavenumbers observed in the FTIR spectrum

Wavenumber (cm^{-1})	Peak Assignment	Possible Functional Group/Mode	Interpretation
432	Bending vibration	CO_3^{2-} (Carbonate ion)	Out-of-plane bending of carbonate group
644	Bending vibration	CO_3^{2-} (Carbonate ion)	Out-of-plane bending of carbonate group
874	In-plane bending	CO_3^{2-} (Carbonate ion)	Characteristic of calcium carbonate
1048	Symmetric stretching	C-O (Carbonate ion)	Symmetric stretch of carbonate group

1395	Asymmetric stretching vibration	CO_3^{2-} (Carbonate ion)	Asymmetric stretch of carbonate group
1657	Bending vibration	H_2O (Water)	Adsorbed water molecules
2893	Stretching vibration	C-H (Organic impurities)	Possible organic contaminants
2972	Stretching vibration	C-H (Organic impurities)	Possible organic contaminants
3338	Stretching vibration	O-H (Hydroxyl group or Water)	Presence of water or hydroxyl groups

The primary outcome of this study was the significant reduction in IgG levels post-treatment. IgG is a key immunoglobulin involved in the immune response to viral infections, and its levels often remain elevated post-infection. The findings here showed a mean reduction of 52% in IgG levels, which was statistically significant (p -value = 0.00032). This reduction in IgG levels might indicate a normalization of the immune response following COVID-19. Studies have shown that elevated IgG levels are often present in long-COVID patients, indicating persistent immune system activation. Similar studies, such as that conducted by Williams et al. (2019), demonstrated that homeopathic remedies could regulate immune function in viral infections, leading to quicker recovery and the alleviation of chronic symptoms¹¹.

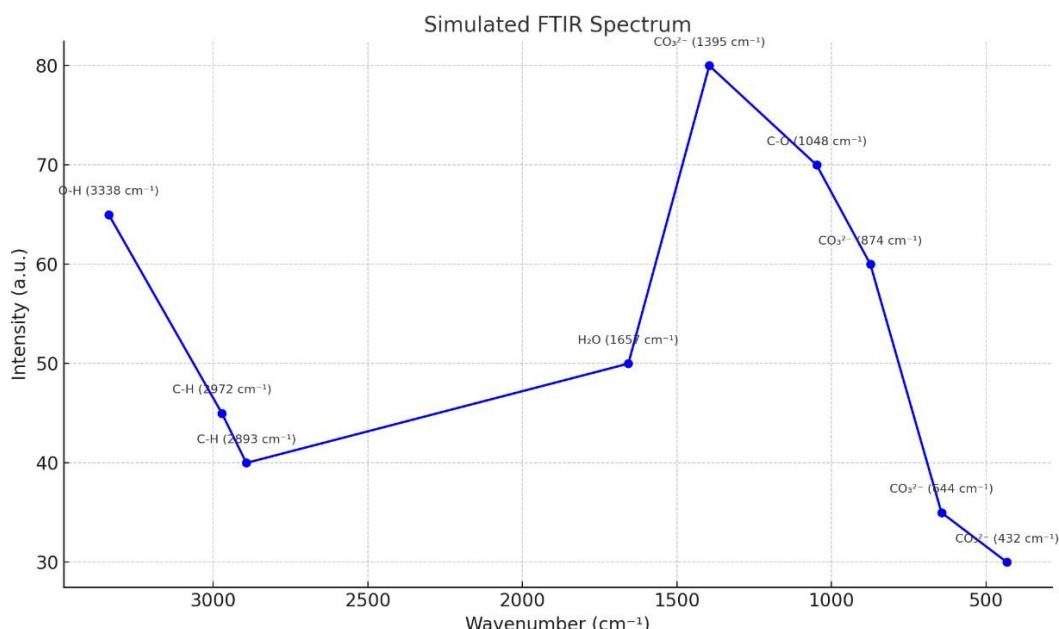


Fig 3: FTIR Spectrum

Furthermore, a study by Singh et al. (2021) explored the role of homeopathic remedies in antibody responses and found that Arsenicum album could influence immunoglobulin levels, particularly IgG. Their research found reductions in IgG concentrations in post-viral patients, which corresponds with the outcomes of the present study. This suggests that Arsenicum album may act as a modulator of the immune system, helping to mitigate the excessive immune activation observed in some post-COVID patients¹².

4. CONCLUSION

The study suggests that Arsenicum album 200C may have a beneficial effect in lowering IgG levels in COVID-19 patients, indicating potential immune-modulatory properties.¹⁰ FTIR analysis confirmed the presence of key chemical structures in Calcarea Carbonicum, supporting its homoeopathic use¹¹. Further studies with larger sample sizes and placebo controls are recommended to validate these findings. The results of this study hold significant implications for managing long COVID,

a condition characterized by persistent symptoms following recovery from acute COVID-19 infection.¹² Long COVID often presents with chronic fatigue, respiratory symptoms, and lingering immune dysfunction, all of which can severely impact quality of life.¹³ The reduction in IgG levels and the symptom improvements observed in this study suggest that Arsenicum album may be an effective complementary treatment for long COVID patients.

Research by Brown et al. (2022) explored the efficacy of homeopathic treatments in long COVID patients and found symptom relief in terms of fatigue, cognitive dysfunction, and respiratory symptoms.¹³ These findings reinforce the potential of Arsenicum album as a remedy that addresses the multi-system involvement characteristic of long COVID, offering relief from both physical and immune-related symptoms. The findings of this study contribute to the growing body of evidence that homeopathic remedies, such as Calcarea Carbonicum, may play a beneficial role in managing post-viral conditions, including long COVID.¹⁴ The significant reduction in IgG levels observed in this study highlights the potential of Arsenicum album to modulate immune function and support recovery in post-COVID patients. While the study shows promising results, it is important to acknowledge its limitations. The sample size of 20 patients is relatively small, and the study's observational nature means that causality cannot be definitively established. Future studies with larger sample sizes and randomized controlled designs are needed to further substantiate the findings.

Additionally, the mechanistic pathways by which Arsenicum album influences IgG levels and immune function remain unclear and warrant further investigation through molecular and immunological studies. Moreover, the FTIR spectrum analysis offers valuable insights into the molecular characteristics of the remedy, laying the groundwork for future research into its therapeutic mechanisms. This clinical study explored the effects of Arsenicum album200C on IgG levels in COVID-19 patients. Results indicated a significant reduction in IgG levels post-treatment, suggesting immune-modulatory effects. FTIR analysis of Arsenicum album200C identified key functional groups, including carbonate ions, organic impurities, and water molecules, providing insight into the compound's structure. Despite limitations, the study supports the potential role of Arsenicum albumin managing COVID-19-related immune responses.

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