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IMMUNOMODULATORY EFFECTS OF VIDHIVAT RASAYANA UPAYOGA IN POST-COVID SYNDROME: A COMPARATIVE CLINICAL STUDY BASED ON IGG AND IGA BIOMARKERS

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ABSTRACT:
Antimicrobial resistance (AMR) has become one of the most serious global public health threats, driven by the rapid
Background: Post-COVID syndrome is characterized by persistent immune dysregulation and prolonged multisystem symptoms that adversely affect quality of life. Although symptomatic management is commonly practiced, evidence-based interventions targeting immune restoration remain limited. Ayurveda advocates Vidhivat Rasayana Upayoga as a rejuvenative approach to enhance host defence and promote physiological recovery. Objective: To evaluate the immunomodulatory effects of Vidhivat Rasayana Upayoga with Haritaki Churna followed by Rasayana Churna Vati compared with Rasayana Churna Vati alone in patients with post-COVID syndrome using Serum Immunoglobulin G (IgG) and Immunoglobulin A (IgA) as objective biomarkers. Methods: A randomized, open-label, parallel-group exploratory clinical study was conducted at the All India Institute of Ayurveda, New Delhi. Sixty patients with post-COVID syndrome were randomly allocated into two groups ($n = 30$ each). Group A received Rasayana Churna Vati alone, whereas Group B received Haritaki Churna followed by Rasayana Churna Vati for 30 days. Serum IgG and IgA levels were assessed before and after treatment, and statistical analyses were performed using appropriate parametric and non-parametric tests, with $p < 0.05$ considered statistically significant.
Results: Both groups demonstrated a highly significant increase in serum IgG levels following treatment ($p < 0.001$), with no significant intergroup difference ($p = 0.668$). Serum IgA levels decreased significantly in both groups ($p < 0.001$); however, Group B showed a significantly greater reduction than Group A ($p < 0.001$), indicating superior modulation of this biomarker. Overall, both treatment protocols improved immunological parameters, while the sequential Rasayana regimen produced a more pronounced effect on IgA.
Conclusion: Vidhivat Rasayana Upayoga demonstrated promising immunomodulatory potential in patients with post-COVID syndrome. Although both interventions effectively improved immune biomarkers, sequential administration of Haritaki Churna followed by Rasayana Churna Vati showed greater efficacy in modulating IgA, suggesting an additional therapeutic benefit. Larger multicentric studies with extended immunological evaluation are warranted to confirm these findings.

KEYWORDS: Post-COVID syndrome, Long COVID, Ayurveda, Rasayana, Haritaki Churna, Immunomodulation, IgG, IgA.

INTRODUCTION

Post-COVID syndrome, also known as post-acute sequelae of SARS-CoV-2 infection (PASC) or long COVID, has emerged as a significant global health challenge affecting millions of individuals following recovery from acute coronavirus disease 2019 (COVID-19). Although the acute infection resolves in most patients, a considerable proportion continue to experience persistent clinical manifestations for weeks or months, resulting in impaired functional capacity and reduced quality of life. The persistence of these symptoms has transformed post-COVID syndrome into an important public health concern requiring effective restorative therapeutic strategies.

The clinical spectrum of post-COVID syndrome is heterogeneous and commonly includes persistent fatigue, myalgia, arthralgia, dyspnea, cognitive impairment, sleep disturbances, anxiety, depression, and exercise intolerance. These manifestations are believed to arise from complex interactions involving persistent immune activation, chronic inflammation, endothelial dysfunction, autonomic imbalance, and residual tissue injury. Consequently, restoration of immune homeostasis has become one of the principal therapeutic goals in the management of post-COVID syndrome.

Growing evidence indicates that dysregulation of both innate and adaptive immune responses contributes substantially to the prolonged clinical course of post-COVID syndrome. The generation of effective and sustained antiviral immunity involves coordinated cellular and humoral immune mechanisms, which collectively contribute to host defence and immunological homeostasis following viral infections. Among adaptive immune components, immunoglobulins play a pivotal role in host defense against viral pathogens. Effective immune response against SARS-CoV-2 involves coordinated humoral and cellular mechanism that contribute to viral clearance and long-term immunological protection. Immunoglobulin G (IgG) represents long-term humoral immunity, whereas immunoglobulin A (IgA) constitutes the primary mucosal immune defence against respiratory viral infections. Evaluation of these biomarkers provides objective evidence regarding immune restoration and may serve as valuable indicators for assessing therapeutic efficacy in patients recovering from SARS-CoV-2 infection.

Despite continuous advances in supportive care and rehabilitation, contemporary management of post-COVID syndrome remains largely symptomatic. At present, no universally accepted therapeutic intervention specifically restores immune dysregulation associated with long COVID. This therapeutic gap has stimulated increasing interest in traditional and integrative medical systems that emphasize restoration of physiological balance, enhancement of host defense mechanisms, and long-term health promotion rather than symptomatic relief alone.

Ayurveda describes epidemic disorders under the concept of Janapadodhwamsa, wherein disturbances in common environmental factors including Vayu, Jala, Desha, and Kala collectively predispose large populations to disease. Classical Ayurvedic literature advocates Vidhivat Rasayana Upayoga as a systematic rejuvenative intervention capable of enhancing Vyadhikshamatva, promoting tissue restoration, improving physiological resilience, and facilitating recovery following debilitating illnesses. These classical concepts demonstrate remarkable relevance in the context of post-COVID recovery, where immune restoration and functional rehabilitation remain major clinical priorities.

The concept of Avarana, which denotes obstruction of normal physiological pathways resulting in impaired systemic function, provides an additional Ayurvedic perspective for understanding the persistent multisystem manifestations observed in post-COVID syndrome. Progressive removal of such functional obstruction through appropriate Rasayana interventions may contribute to restoration of normal physiological processes and immune competence, thereby supporting comprehensive recovery in affected individuals.

Rasayana therapy represents one of the most distinctive therapeutic approaches described in Ayurveda for promoting longevity, enhancing physiological resilience, and improving Vyadhikshamatva (host defence). Classical Ayurvedic texts recommend Vidhivat Rasayana Upayoga, which emphasizes the systematic administration of Rasayana formulations to restore tissue integrity and improve resistance against diseases. In recent years, increasing scientific evidence has suggested that several Rasayana drugs possess antioxidant, anti-inflammatory, immunomodulatory, and adaptogenic properties, making them promising candidates for managing immune dysfunction associated with post-COVID syndrome.

Haritaki (Terminalia chebula Retz.) is one of the most extensively studied Rasayana drugs and has been traditionally indicated for promoting health and rejuvenation. Experimental and clinical studies have demonstrated its antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory activities, which may contribute to restoration of immune balance following viral infections. Similarly, Rasayana Churna Vati, a classical polyherbal formulation, is intended to improve metabolic efficiency, tissue nourishment, and overall physiological recovery. The combined use of these interventions according to the principles of Vidhivat Rasayana Upayoga may therefore provide additional therapeutic benefits in individuals recovering from COVID-19.

Objective assessment of therapeutic efficacy requires reliable biomarkers. Among humoral immune markers, IgG reflects long-term systemic immune response, whereas IgA plays a crucial role in mucosal immunity against respiratory pathogens. Evaluation of these biomarkers provides measurable evidence regarding immunological recovery and may complement clinical assessment in post-COVID syndrome.

Although several studies have evaluated Ayurvedic interventions for improving post-COVID symptoms, evidence regarding the immunomodulatory effects of Vidhivat Rasayana Upayoga using IgG and IgA biomarkers remains limited. Therefore, the present study was undertaken to evaluate the immunomodulatory potential of Vidhivat Rasayana Upayoga in post-COVID syndrome through comparative assessment of IgG and IgA biomarkers, while simultaneously documenting its clinical effectiveness.

MATERIALS AND METHODS

Study Design

Parameter	Description
Study Design	Randomized, open-label, parallel-group exploratory clinical trial
Study Centre	All India Institute of Ayurveda (AIIA), New Delhi
Study Population	Patients diagnosed with post-COVID syndrome
Sample Size	60 participants
Group Allocation	Group A (n = 30) and Group B (n = 30)
Randomization	Eligible participants were randomly allocated into two treatment groups
Intervention Period	30 days
Follow-up Period	60 days
Total Study Duration	90 days
Primary Outcome	Serum IgG and IgA biomarkers
Secondary Outcome	Clinical improvement in post-COVID symptoms

Study Intervention

Group	Intervention	Dose & Administration	Duration
Group A	Rasayana Churna Vati	Five tablets (120 mg each), once daily on an empty stomach with lukewarm water	30 days
Group B	Haritaki Churna followed by Rasayana Churna Vati	Haritaki Churna (3–5 g) once daily on an empty stomach, followed by the same regimen as Group A	30 days

Eligibility Criteria

Inclusion Criteria

- Patients diagnosed with post-COVID syndrome.
- Participants willing to provide written informed consent.
- Individuals fulfilling the study eligibility criteria.

Exclusion Criteria

- Pregnant and lactating women.
- Patients with severe systemic illness.
- Participants with serious uncontrolled medical disorders.
- Individuals unwilling to participate or complete follow-up.

Statistical Analysis

The collected data were statistically analyzed using appropriate parametric and non-parametric tests. A p value of <0.05 was considered statistically significant.

4. RESULTS

4.1 Participant Characteristics

A total of 63 patients with post-COVID syndrome were assessed for eligibility. Of these, 60 participants completed the study protocol and were included in the final statistical analysis, with 30 participants in each treatment group. Three participants did not complete the study and were excluded from the final analysis.

The baseline demographic profile and immunological parameters indicated that the two treatment groups were broadly comparable prior to initiation of the intervention. The highest proportion of participants in Group A belonged to the 31–40 years age group, whereas in Group B the majority of participants were in the 21–30 years age group. Male participants predominated in both treatment groups.

Table 1. Baseline Characteristics of the Study Population

Variable	Group A (n = 30)	Group B (n = 30)
Participants analysed	30	30
Dropouts	2	1
Predominant age group	31–40 years (14)	21–30 years (12)
Male/Female	20/10	16/14
Baseline Serum IgG (Mean ± SD)	57.70 ± 21.74	50.27 ± 12.16
Baseline Serum IgA (Mean ± SD)	6.78 ± 0.76	6.62 ± 0.82

4.2 Effect of Intervention on Serum IgG

Within-group analysis demonstrated a highly significant increase in serum IgG concentrations following treatment in both study groups ($p < 0.001$). In Group A, the mean serum IgG concentration increased from 57.70 ± 21.74 at baseline to 134.67 ± 34.64 after treatment. Similarly, Group B demonstrated an increase from 50.27 ± 12.16 to 131.20 ± 27.28 following intervention.

Comparison of post-treatment serum IgG concentrations between the two groups did not reveal a statistically significant difference ($p = 0.668$), indicating that both therapeutic interventions were comparably effective in improving serum IgG levels.

Table 2. Effect of Intervention on Serum IgG

Parameter	Group A	Group B
Baseline (Mean ± SD)	57.70 ± 21.74	50.27 ± 12.16
Post-treatment (Mean ± SD)	134.67 ± 34.64	131.20 ± 27.28
Mean Difference	+76.97	+80.93
Within-group p value	<0.001	<0.001
Between-group p value	—	0.668

4.3 Effect of Intervention on Serum IgA

A statistically significant reduction in serum IgA concentrations was observed in both treatment groups following intervention ($p < 0.001$). In Group A, the mean serum IgA concentration decreased from 6.78 ± 0.76 at baseline to 2.97 ± 0.51 after treatment. Likewise, Group B demonstrated a reduction from 6.62 ± 0.82 to 2.56 ± 0.32 following treatment.

Intergroup analysis demonstrated a statistically significant difference in post-treatment serum IgA concentrations, with comparatively lower post-treatment values observed in Group B, indicating a greater treatment effect on this biomarker.

Table 3. Effect of Intervention on Serum IgA

Parameter	Group A	Group B
Baseline (Mean ± SD)	6.78 ± 0.76	6.62 ± 0.82
Post-treatment (Mean ± SD)	2.97 ± 0.51	2.56 ± 0.32

Mean Difference	−3.81	−4.06
Within-group p value	<0.001	<0.001
Between-group p value	—	<0.001

4.4 Overall Immunological Outcome

Both therapeutic interventions produced statistically significant modulation of the evaluated immunological biomarkers. Significant within-group improvement was observed in serum IgG and serum IgA following treatment. Although post-treatment serum IgG concentrations did not differ significantly between the two groups, post-treatment serum IgA demonstrated a statistically significant intergroup difference, indicating a comparatively greater treatment effect in participants receiving Vidhivat Rasayana Upayoga before administration of Rasayana Churna Vati. These findings demonstrate the immunomodulatory potential of both treatment protocols in the management of post-COVID syndrome.

5. DISCUSSION

The present exploratory comparative clinical study was undertaken to evaluate the immunomodulatory efficacy of Vidhivat Rasayana Upayoga with Haritaki Churna followed by Rasayana Churna Vati in comparison with Rasayana Churna Vati alone in patients suffering from post-COVID syndrome. The findings demonstrated significant improvement in serum IgG and serum IgA levels following treatment in both study groups. These observations indicate that both therapeutic interventions contributed to restoration of immune function after recovery from acute SARS-CoV-2 infection.

Post-COVID syndrome is increasingly recognized as a complex multisystem disorder characterized by persistent immune dysregulation, chronic low-grade inflammation and delayed physiological recovery. Although viral clearance occurs in the acute phase, many individuals continue to experience fatigue, musculoskeletal symptoms and altered immune responses for several weeks or months. Consequently, therapeutic strategies aimed at restoring immune homeostasis have gained considerable attention in post-COVID rehabilitation.

In the present study, both treatment groups demonstrated a statistically significant increase in serum IgG concentrations following intervention. IgG is the predominant immunoglobulin responsible for long-term humoral immunity and reflects recovery of adaptive immune function after infection. The observed improvement suggests that Rasayana therapy may facilitate restoration of immunological competence rather than merely providing symptomatic relief. Similar observations have been reported in recent studies evaluating the immunorestorative potential of Ayurvedic interventions.

The post-treatment comparison of serum IgG between the two groups did not demonstrate a statistically significant difference, indicating that both therapeutic protocols were effective in improving humoral immune response. However, the sequential administration of Haritaki Churna before Rasayana Churna Vati may have provided additional physiological support by improving the internal milieu before initiation of rejuvenative therapy. This concept is consistent with the classical principles of Vidhivat Rasayana Upayoga.

A more pronounced effect was observed with serum IgA, where the group receiving Vidhivat Rasayana Upayoga demonstrated greater improvement after treatment. IgA plays an essential role in mucosal immune defence and serves as the first immunological barrier against respiratory pathogens. Therefore, favourable modulation of serum IgA may indicate improved regulation of mucosal immunity during post-COVID recovery.

According to Ayurvedic principles, Haritaki possesses Deepana, Pachana, Anulomana and Srotoshodhana properties. Administration of Haritaki Churna before Rasayana Churna Vati may improve digestive and metabolic functions, facilitate elimination of Ama and optimize the functional integrity of Srotasa. Such preparatory measures may enhance the bioavailability and therapeutic efficacy of subsequent Rasayana therapy, thereby contributing to superior immunological outcomes.

The concept of Avarana described in Ayurveda also provides a plausible explanation for the findings of the present study. Functional obstruction of physiological pathways may impair tissue nourishment and normal immune regulation. Removal of these obstructions before administration of Rasayana therapy may facilitate restoration of physiological balance and improve tissue responsiveness. This sequential therapeutic approach appears to support the comparatively better biomarker response observed following Vidhivat Rasayana Upayoga.

Recent integrative Ayurvedic research has emphasized that restoration of Agni, maintenance of Srotasa integrity and improvement of tissue metabolism are fundamental prerequisites for achieving sustained therapeutic benefit. These concepts are in agreement with the present findings and may explain the additional clinical advantage observed with the sequential Rasayana protocol.

The present study possesses several strengths. Objective evaluation using serum IgG and IgA biomarkers enhanced the scientific validity of the findings beyond symptom-based assessment alone. Furthermore, the

comparative study design enabled evaluation of the additional therapeutic contribution of Haritaki Churna administered according to the principles of Vidhivat Rasayana Upayoga.

Despite these encouraging observations, certain limitations should be acknowledged. The study was conducted at a single centre with a relatively small sample size. Immunological assessment was limited to serum IgG and IgA biomarkers, while evaluation of cytokines, inflammatory mediators and cellular immune markers could have provided a more comprehensive understanding of the underlying mechanisms. Therefore, multicentric randomized clinical studies with larger sample sizes and broader immunological assessment are warranted to further validate these findings.[. Khan, S. R., Van Der Burgh, A. C., Peeters, R. P., Van Hagen, P. M., Dalm, V. A. S. H., & Chaker, L. (2021). Determinants of Serum Immunoglobulin Levels: A Systematic Review and Meta-Analysis. Frontiers in Immunology, 12, 664526. https://doi.org/10.3389/fimmu.2021.664526]

ACKNOWLEDGMENTS

The authors thank the All India Institute of Ayurveda (AIIA), New Delhi, for providing the facilities and support for this study. We are also grateful to all the participants for their cooperation. Special thanks to the faculty, lab staff, and clinical team for their help in patient recruitment, investigations, data collection, and follow-up.

Author Contributions

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Final Approval of the Manuscript: All authors approved the final version and agree to be accountable for all aspects of the work.

Funding

The authors declare that no external funding was received for this study.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

Ethical Approval

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by the Institutional Ethics Committee of the All India Institute of Ayurveda (AIIA), New Delhi. All participants provided written informed consent before enrollment.

Informed Consent

Written informed consent was obtained from all participants prior to their inclusion in the study.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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