Frontiers in Health Informatics
ISSN-Online: 2676-7104
www.healthinformaticsjournal.com
2024; Vol-13: Issue 8
Open Access

Digital Ayurveda–Based Integrative Oncology for Prevention of Throat Tumor Recurrence: A Digitally Monitored Observational Clinical Study

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Cite this paper as: Dr.Abhishek Singh, Dr. Alakh Tyagi (2024). Digital Ayurveda–Based Integrative Oncology for Prevention of Throat Tumor Recurrence: A Digitally Monitored Observational Clinical Study. Frontiers in Health Informatics, Vol. 13, No.8, 7881-7884

ABSTRACT

Background: Recurrence of throat tumors continues to pose a major challenge in head and neck oncology despite significant advances in surgery, radiotherapy, and chemotherapy. Survivorship care now emphasizes integrative and digitally supported approaches to improve immune resilience, reduce oxidative stress, and enhance quality of life. Ayurveda, through Rasayana Chikitsa, offers a rejuvenative framework that aligns with modern integrative oncology principles[1],[2],[3].

Objective: This study aimed to evaluate the effectiveness of a digitally monitored Rasayana-based integrative oncology model in reducing recurrence risk and improving survivorship outcomes in patients treated for throat tumors.

Methods: An open-label observational study was conducted on thirty post-treatment throat tumor patients. Participants were divided into a Rasayana-integrative group receiving Ayurvedic Rasayana therapy with digital follow-up and a control group receiving standard oncological care alone. Clinical recurrence, immunological parameters, antioxidant status, and quality of life (WHOQOL-BREF) were assessed over six months[4].

Results: The Rasayana-integrative group demonstrated a lower recurrence rate, statistically significant improvement in immune parameters, enhanced antioxidant status, and superior quality-of-life outcomes compared to controls[5],[6],[7],[8].

Conclusion: Digitally supported Rasayana therapy represents a promising integrative oncology strategy for long-term cancer survivorship and recurrence prevention. Further randomized, multicentric trials are warranted[9],[10].

Keywords: Digital Ayurveda, Integrative Oncology, Rasayana Therapy, Throat Tumor Recurrence, Cancer Survivorship

1.INTRODUCTION

Throat tumors, including malignancies of the larynx, pharynx, and adjacent upper aerodigestive tract, represent a significant proportion of head and neck cancers worldwide[7]. Although advancements in diagnostic imaging, surgical techniques, radiotherapy planning, and systemic therapies have improved short-term survival, tumor recurrence remains a persistent and clinically significant problem[7]. Recurrent disease is often associated with increased morbidity, therapeutic resistance, psychological distress, and reduced survival rates[8].

From a biomedical perspective, tumor recurrence is influenced by residual microscopic disease, dysregulated immune surveillance, chronic inflammation, and sustained oxidative stress[7,8]. Conventional cancer treatments may further compromise immune function and antioxidant defenses, thereby increasing vulnerability to relapse during the survivorship phase[8].

Ayurveda conceptualizes tumor pathology under Arbuda and Granthi, emphasizing the role of impaired Agni, Dhatu imbalance, and depletion of Ojas in disease persistence and recurrence[3,9]. Rasayana Chikitsa, a specialized branch of Ayurveda, aims to restore physiological equilibrium, enhance Vyadhikshamatva (host resistance), and promote long-term tissue rejuvenation[3,9]. In the digital health era, integrating Rasayana therapy with digital monitoring platforms offers a novel and patient-centered approach to post-oncology care[2,10].

2. MATERIALS AND METHODS

2.1 Study Design and Digital Framework

This was a six-month, open-label observational clinical study conducted at Prem Raghu Ayurvedic Medical College and Hospital, Hathras, India. Digital follow-up mechanisms, including teleconsultation, electronic symptom tracking, and digital adherence monitoring, were utilized to enhance continuity of care[2,10].

2.2 Participants

Thirty patients aged 30–65 years with histologically confirmed throat tumors who had completed primary oncological treatment were enrolled. All participants were clinically disease-free at baseline[11].

Participants were allocated into two groups:

- Group A (Rasayana–Digital Integrative Group): Standard post-treatment care plus Rasayana therapy with digital monitoring[9,12,13].
- Group B (Control Group): Standard post-treatment oncological follow-up alone.

2.3 Inclusion and Exclusion Criteria

Inclusion criteria included documented remission, high clinical risk of recurrence, and willingness to comply with Ayurvedic and digital follow-up[11]. Patients with active metastasis, ongoing chemotherapy, or severe systemic illness were excluded[11].

2.4 Rasayana Intervention

The Rasayana regimen administered for six months included:

- Amalaki Rasayana (5 g twice daily)[5,12]
- Guduchi Ghana Vati (500 mg twice daily)[6]
- Ashwagandha Churna (3 g twice daily)[13]
- Chyavanprasha Avaleha (10 g once daily)[5]

Lifestyle and dietary counseling based on Pathya-Apathya principles was provided, emphasizing **tobacco and alcohol cessation, light nutrition, stress management, and sleep hygiene[3].**

2.5 Outcome Measures

Primary outcomes included clinical and radiological recurrence[7]. Secondary outcomes comprised hematological and immunological parameters, antioxidant status, and quality of life assessed using WHOQOL-BREF[4,5,6,7,8].

2.6 Statistical Analysis

Data were analyzed using appropriate parametric tests. A p-value < 0.05 was considered statistically significant[11].

3.RESULTS

At the end of six months, the Rasayana–Digital Integrative Group demonstrated a markedly lower incidence of tumor recurrence compared to the control group[7]. Significant improvements were observed in lymphocyte counts, hemoglobin levels, and antioxidant markers, suggesting enhanced immune resilience[6],[8]. Quality-of-life scores improved across physical, psychological, social, and environmental domains[4].

4. DISCUSSION

The present study highlights the potential of integrating Rasayana therapy with digital health tools in post-oncology care[9],[10]. Rasayana formulations are known to exert antioxidant, immunomodulatory, adaptogenic, and tissue-nourishing effects[5],[6],[9],[13]. Digital monitoring enhanced treatment adherence, early symptom detection, and patient engagement[2],[10].

From an Ayurvedic perspective, Rasayana therapy restores Dhatu Samya and strengthens Ojas, counteracting the internal milieu conducive to tumor recurrence[3],[9]. These mechanisms parallel contemporary oncological concepts of immune reconstitution and survivorship optimization[7],[8]. Digital platforms further facilitate personalized and continuous care, bridging traditional medicine with modern healthcare delivery[2],[10].

5. CONCLUSION

Digitally supported Rasayana-based integrative oncology care may play a significant role in reducing recurrence risk and improving long-term survivorship in throat tumor patients[9],[10]. The model aligns traditional Ayurvedic wisdom with modern digital health strategies[2]. Larger randomized controlled trials are necessary to validate these findings and establish standardized integrative protocols[9],[10].

ETHICS STATEMENT

The study was approved by the Institutional Ethics Committee of Prem Raghu Ayurvedic Medical College and Hospital[11]. Written informed consent was obtained from all participants prior to enrollment[11].

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the present study are available from the corresponding author upon reasonable request[11].

6. LIMITATIONS

The present study has certain limitations. The observational design and relatively small sample size limit the generalizability of the findings[11]. The absence of randomization and blinding may introduce selection and observer bias[11]. Digital monitoring tools were limited to follow-up communication and adherence tracking[2],[10]; advanced digital biomarkers and wearable-based physiological monitoring were not employed. Additionally, biochemical immune markers were restricted to routine laboratory parameters, and advanced molecular or genomic analyses were beyond the scope of this study[8].

7. FUTURE DIRECTIONS

Future research should focus on large-scale, multicentric randomized controlled trials to validate the role of Rasayana-based integrative oncology in cancer survivorship[9],[10]. Incorporation of advanced digital health technologies such as mobile health applications, wearable biosensors, AI-driven symptom analytics, and remote immune monitoring could further strengthen personalized follow-up and early detection of recurrence[2],[10]. Exploration of molecular immunological markers and digital phenotyping may help elucidate the

mechanistic pathways underlying Rasayana therapy[9]. Establishing standardized Digital Ayurveda protocols could facilitate wider clinical adoption and integration into national and global oncology survivorship frameworks[2],[10].

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