10.5005/jp-journals-10059-0009

REVIEW ARTICLE

# Ayurveda and Plant-based Interventions for Cancer Management: A Systematic Review

[1]Manohar S Gundeti, [2]Narayanam Srikanth, [3]Amrish Dedge, [4]Shruti Khanduri, [5]Parth Dave, [6]Ashish Kumar Tripathi [7]Thrigulla Sakethram, [8]R Govind Reddy

## ABSTRACT

**Introduction:** A resurgence of interest in Ayurveda, other traditional systems of medicine, and complementary and alternative medicine (CAM) has resulted from the preference of many consumers for products of natural origin. The potential benefits of plant-based medicines could lie in their high acceptance by patients, and efficacy and safety. The most prevalent users of traditional medicine are individuals who have refractory conditions and nonlife-threatening conditions that may be chronic viz. neurological disorders, arthritis, etc. The second-largest group of users is those struggling with chronic, potentially life-threatening diseases, such as cancer and human immunodeficiency virus/acquired immunodeficiency syndrome, etc. Both groups turn to Ayurveda and traditional system of medicine for a variety of reasons, such as management as the main treatment option and improved immune functioning, overall functioning, and quality-of-life (QoL) by coping with side effects from conventional therapies, and to relieve symptoms related to their illness. The upsurge in use of traditional system among cancer patients warrants evidence of safety and effectiveness for these interventions as concomitant to conventional cancer therapy.

**Objective:** This manuscript aims at a systematic review of published data on the effectiveness of Ayurveda/ herbal interventions as stand-alone or concomitant in the management of cancer.

**Materials and methods:** Literature search for clinical studies with specific terms was carried using search engines viz. Google scholar, PubMed, Ayush Research Portal, etc. and print journals, reports from May 2017 to June 2017.

**Results:** Various randomized controlled trials (RCTs) have shown that ginger, honey, turmeric, and ashwagandha are effective as add-on in chemotherapy-induced nausea and vomiting (CINV), radiation mucositis, and fatigue. Moreover, single case reports and case–control studies also reported with positive outcomes for Ayurveda as stand-alone and add-ons to conventional treatment.

**Conclusion:** Evidence for effectiveness of Ayurveda as add-on concomitant to conventional cancer treatment is substantial in comparison with Ayurveda as stand-alone, and this may help to develop integrative Ayurveda oncology treatment protocols.

**Keywords:** Ayurveda, Cancer, Integrative, Oncology, Plant.

**How to cite this article:** Gundeti MS, Srikanth N, Dedge A, Khanduri S, Dave P, Tripathi AK, Sakethram T, Reddy RG. Ayurveda and Plant-based Interventions for Cancer Management: A Systematic Review. J Drug Res Ayurvedic Sci 2017;2(2):64-80.

**Source of support:** Nil

**Conflict of interest:** None

## INTRODUCTION

Cancer is the most dreaded disease of the 21st century, and is spreading further with continuance and increasing incidence. Multidisciplinary scientific investigations are making best efforts to combat this disease, but the cure for the disease is still elusive. Management of cancer includes surgery, radiation therapy, chemotherapy, and biological therapy resulting in cure of >50% of patients diagnosed with cancer. The modern approach to the treatment of cancer has reached a plateau. Owing to the importance/benefits of traditional medicine, the World Health Organization (WHO) has included integrative oncology as one of the primary objectives of treatment of cancer besides cure, prevention of recurrence, prolongation of life, rehabilitation, and improvement of QoL.

About 50% of the world's cancer burden is carried by developing countries that ironically have access to only 5% of the resources available to fight the disease. In the developing world, and arguably the developed world, CAM may become an important component of modern oncology, if integrated properly into mainstream medicine.[1] There are many reasons why people living with cancer use traditional systems of medicine like Ayurveda. Accessibility, affordability, tolerability, compromised QoL, and variable success rates are the problem areas of conventional cancer care. In most of these areas, CAM is contributing in one or other ways. According to a survey

[1,3,4,5,7]Research Officer (Ayurveda), [2]Deputy Director General [6]Senior Research Fellow (Botany), [8]Research Officer-In-Charge

[1,3,5,8]Raja Ramdeo Anandilal Podar, Central Ayurveda Research Institute for Cancer, Worli, Mumbai, India

[2,4,6]Central Council for Research in Ayurvedic Sciences Ministry of AYUSH, Government of India, New Delhi, India

[7]National Institute of Indian Medical Heritage, Central Council for Research in Ayurvedic Sciences, Hyderabad, Telangana India

**Corresponding Author:** Shruti Khanduri, Research Officer (Ayurveda), Central Council for Research in Ayurvedic Sciences Ministry of AYUSH, Government of India, New Delhi, India Phone: +919213121355, e-mail: drshruti.ayurveda@gmail.com

on CAM use in cancer, the most common CAM therapy in use was found to be Ayurvedic treatment. Overall, CAM use was found to be 38.7%. About 60% of patients who were aware of CAM were not using CAM, only 40% aware were using CAM.[2] The physicians who work in integrated clinics that provide both conventional and complementary services may refer patients to these clinics for pain management, to learn adaptive coping strategies, to manage chronic and serious medical illness, and to manage cancer-related symptoms.

Diseases mentioned in Ayurvedic texts like *arbuda, granthi, gulma, adhyarbuda, apachi, asadhya-vrana,* etc., can be correlated with neoplasms, solid tumors, and/or malignancies along with some *asadhya* conditions (conditions with bad-to-worst prognosis) of various diseases like *udara, kumbha-kamala, halimaka* (possibilities of hepatobiliary malignancies), *jvara, rajayakshma, pandu* (leukemia), etc. However, if one tries to search for the exact picture of say a sarcoma or leukemia and other such malignant conditions as understood and narrated in biomedical literature from Ayurvedic texts, the exercise would be futile. Instead, it is quite pragmatic to apply the Ayurveda principles, which govern the state of health and disease, i.e., *tridoshas* (three beholders and vitiators of body), *saptadhatu* (seven tissues), agni (digestion and metabolism), *nidana-panchaka* (penta-dimensional diagnostic instrument), *shat-kriyakala* (six stages of morbidity), etc., to certain types of cancer and it will surely open the gates for the diagnosis and exploring potential treatment modalities to handle the same.[3]

In current practices, cancer management through Ayurveda is intended as add-on to conventional treatment; however, stand-alone mode also has shown encouraging outcomes. The social role of use of traditional systems of medicines among people suffering with cancer has been examined; some studies have examined the effectiveness of Ayurveda on symptom management and improvement of QoL. Patients turn to AYUSH systems for a variety of reasons, such as to improve immune functioning, overall functioning, QoL, and to cope with side effects from conventional therapies, to relieve symptoms as stand-alone or add-on management, or as an add-on to conventional management. Ayurveda is found to contribute significantly in most of these issues and it has been seen practically in various published scientific clinical studies and practices. The upsurge in use of CAM among cancer patients warrants evidence of safety and effectiveness for these interventions as concomitant to conventional cancer therapy. Clinical evidences for phytochemicals as anticancer therapy are available; however, few references of systematic reviews or meta-analyses of Ayurveda or plant-based interventions for cancer are found. There is a need for such reviews to generate evidence to formulate Integrative Ayurveda Oncology treatment protocols.

## MATERIALS AND METHODS

### Data Sources

Articles published in different peer-reviewed journals were analyzed for this study. PubMed, AYUSH Research Portal, Google Scholar, and Google were searched during the period of May to June 2017, with specific keywords along with print journals, periodicals, and reports.

### Search Terms and Strategy

Ayurveda or Ayurvedic therapy or Ayurvedic treatment or Herbal or Herbal Ayurveda or Polyherbal or Panchakarma or Rasaushadhi or Rasakalpa or Herbo-mineral or Metallic or Mercurial or Plants or Herbs or Ashwagandha or Haridra or Turmeric or Nimba or Ginger or Tulasi or Guduchi or Chandrashura or Rasayana or Triphala or Gomutra or Cow Urine or Honey or Madhu or Traditional Medicine or Alternative Medicine or Complementary Medicine Ayurveda or Massage or Shirodhara or Leech and Cancer or Precancerous or LSIL or Oral Sub Mucous Fibrosis or Malignancy or Neoplasm or Tumor or Carcinoma or Adenocarcinoma or Leukemia and (Clinical trial) as title, abstract, or keyword. There were no restrictions in language, publication date, or type.

### Study Selection

Inclusion criteria were use of Ayurveda interventions: herbal, polyherbal, herbomineral, metallic preparations with the intent of cure or as add-on; in any type of cancer; any clinical study type. The exclusion criteria were laboratory or nonhuman experiments, healthy volunteer studies of anticancer herbs, and unpublished studies.

## OBSERVATIONS

The PubMed search resulted in 1,653 citations, AYUSH Research Portal yielded 42 citations, and Google Scholar yielded 3,000 citations. However, 68 articles were retrieved after applying the inclusion, exclusion criteria, and others were excluded (Fig. 1).

About 32 out of the 68 are the RCT studies on ginger, honey, and turmeric, and these data are presented in Tables 1 to 3. The remaining 36 studies are categorized based on the study design (Table 4).

In these studies, it was observed that the Ayurvedic interventions were used to reduce the side effects of conventional therapy and used in combinations instead of single Ayurvedic interventions (Table 5).

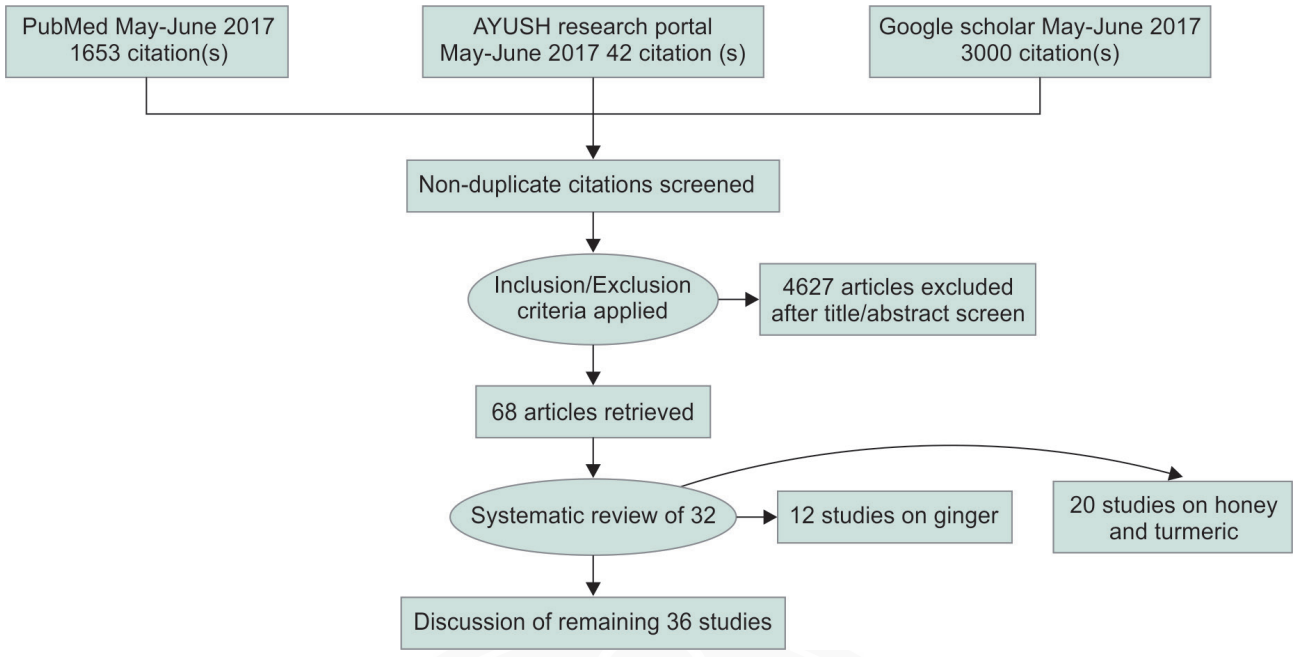


**Fig. 1:** Schematic representation of the methodology

## DISCUSSION

### Studies Related to Ginger

A total of 12 clinical research works are found using ginger in various types of cancer patients (1473). Most of the works were randomized double-blinded placebo-controlled studies to evaluate the efficacy of ginger (root powder/extract) in CINV. In all studies, ginger was used as oral administration except in two studies where it was used as aromatherapy for CINV and salivary gland damage for patients undergoing radioactive iodine (RAI) therapy with differentiated thyroid cancer (DTC). Ginger has shown significant results in terms of scores, intensity, and frequency of CINV. A 5-day aromatherapy treatment using either ginger essential oil or fragrance-matched artificial placebo (ginger fragrance oil), which was instilled in a necklace was used in 60 breast cancer patients. Although evidence derived from this study is not sufficiently convincing that inhaled ginger aromatherapy is an effective complementary therapy for CINV, the findings for health-related QoL (HRQoL) were, however, encouraging with significant improvement in several domains. Thus, ginger is sufficiently evaluated for its antiemetic effect in CINV in cancer management (Table 1).

### Studies Related to Honey

Totally 16 clinical studies were found in cancer patients, where honey was used alone or mixed with others as supplement. Most of these studies were RCTs with a total of 1,093 cancer subjects involved. These studies were focused on with Head and Neck cancer patients, who developed treatment-induced oral mucositis. 11 studies, with one prophylactic study, and studies about malignant wound (1), burn cases (1), radiation-induced burns in breast cancer patients (1), and cancer treatment-induced neutropenia (2). Honey was used as local application in most of the studies (14) for oral mucositis either alone or in combination with turmeric/coffee/olive oil, propolis, beewax). It was compared with various other established treatment drugs other than placebo (2), like normal saline (2), lignocaine (1), betamethasone solution (1 honey + coffee), or silver-coated bandages (2). In one study, honey was used alone and in combination with olive oil–propolis extract, and beeswax (HOPE). Three equal treatment groups: Honey, HOPE (mixture of honey), and control groups were evaluated for outcomes in acute lymphoblastic leukemia (ALL) and grade II/III chemotherapy-induced mucositis. Honey was used internally in one study of febrile neutropenic patients of ALL. Dietary intervention consisted of honey in a dose of 2.5 gm/kg body weight per dose twice weekly for 12 weeks. It showed marked improvement in children in their hematologic parameters. In other studies, where honey (Life Mel Honey, LMH) was used internally in neutropenic patients treated with chemotherapy for primary or metastatic disease; there was no recurrence of neutropenia after LMH intake and no need for treatment with colony-stimulating factors (CSFs) in 12 (40%) patients. Hemoglobin levels remained >11 gm/dL during LMH intake in 19 (64%) patients. Eight (32%) patients reported improvement in QoL (Table 2).

In case of oral mucositis treatment outcomes, honey showed significant improvement in symptoms and improved QoL of patients as compared with control

**Table 1:** Studies related to ginger in cancer

| *Study author, year* | *Study design* | *Sample size* | *Indication* | *Intervention* | *Outcome measure* | *Results* |
|---|---|---|---|---|---|---|
| Ryan et al., 2012[4] | Randomized double-blind placebo controlled | 576 | CINV | Four arms: (1) placebo, (2) 0.5 gm ginger, (3) 1.0 gm ginger, or (4) 1.5 gm ginger | Severity of nausea on a 7-point rating scale | All doses of ginger significantly reduced acute nausea severity compared with placebo on day 1 of chemotherapy. The largest reduction in nausea intensity occurred with 0.5 and 1.0 gm of ginger respectively |
| Zick et al., 2009[5] | Randomized double-blind placebo controlled | 162 | CINV | Dry extract of ginger root 1 gm 53, 2 gm 52, placebo 57 for 3 days | Change in prevalence of delayed CINV Acute prevalence of CINV | Ginger well tolerated with no difference in all AEs, significantly less fatigue |
| Panahi et al., 2012[6] | Pilot, randomized, open-label | 100 | CINV in advanced breast cancer on standard chemotherapy protocol | Ginger (1.5 gm/d in three divided doses every 8 hours) plus standard antiemetic regimen (granisetron plus dexamethasone; the ginger group) or standard antiemetic regimen alone (control group) | Prevalence, score, and severity of nausea, vomiting, and retching were assessed using a simplified form of Rhodes index | Significantly lower prevalence of nausea was observed in the ginger group during 6 to 24 hours postchemotherapy. Despite this effect, no other significant additional benefit from ginger (1.5 gm/d) was observed against prevalence or severity of nausea, vomiting, and retching in any of the assessed periods |
| Konmun et al., 2017[7] | A phase II randomized double-blind placebo-controlled study | 88 | CINV | 6-Gingerol 10 mg or placebo orally twice daily for 12 weeks | The primary endpoint was complete response (CR) rate defined as no emesis or rescue treatment at any time FACT-G score | Overall CR rate was significantly higher in 6-gingerol group as compared with that of the placebo. Mean FACT-G score indicating QoL was significantly higher in 6-gingerol group at 64 days as compared with that. 6-Gingerol significantly improved overall CR rate in CINV, appetite and QoL in cancer patients receiving adjuvant chemotherapy |
| Arslan and Ozdemir, 2015[8] | Experimental randomized controlled | 60 | CINV | Study group-standard antiemetic + oral ginger for first 3 days of chemo cycle Control- standard antiemetic | Nausea severity and the number of vomiting and retching episodes were measured four times | Significantly lower in the intervention group than in the control group ($p < 0.05$). |
| Ansari et al., 2016[9] | Prospective randomized | 150 | CINV in breast cancer | Ginger (500 mg ginger powder, twice a day for 3 days) or placebo | Nausea score, vomiting scores | Ginger is a safe herbal medication, but its effects on CINV are not well defined |
| Sanaati al, 2016[10] | Randomized, double-blind | 65 | CINV in breast cancer patients undergoing chemotherapy | Ginger group for 5 days before and 5 days after chemotherapy was: 2 times a day and 500 mg capsules of powdered ginger root in addition to a routine antiemetic regimen consisting of dexamethasone, metoclopramide and aprepitant (DMA) capsules. Chamomile group: 2 times a day and 500 mg capsules of *Matricaria chamomilla* extract in addition to DMA capsules. Control group, routine antiemetic regimen consisting of DMA capsules | Frequency of nausea vomiting | Taking ginger capsules (1 gm/d) might relieve CINV safely. |

*(Cont'd…)*

(Cont'd…)

| Study author, year | Study design | Sample size | Indication | Intervention | Outcome measure | Results |
|---|---|---|---|---|---|---|
| Lua et al., 2015[11] | Single-blind, controlled, randomized cross-over study | 65 | CINV | 5-Day aromatherapy treatment using either ginger essential oil or fragrance-matched artificial placebo (ginger fragrance oil), which was instilled in a necklace | VAS nausea score, frequency of vomiting, and HRQoL profile (EORTC QLQ-C30 scores) | Evidence derived from this study is not sufficiently convincing that inhaled ginger aromatherapy is an effective complementary therapy for CINV. The findings for HRQoL were, however, encouraging with significant improvement in several domains |
| Levine et al., 2008[12] | Randomized controlled | 28 | CINV | Control group patients continued with their normal diet, protein group patients consumed a protein drink and ginger twice daily, and high protein group patients consumed a protein drink with additional protein and ginger twice daily | Patients recorded in a diary for nausea, frequency, severity, and needed any antiemetic medication. Gastric myoelectrical activity was assessed in 5 patients before and after ingestion of a high protein meal and ginger | Frequent nausea and bothersome nausea were significantly less common among high-protein group patients than among control and protein group patients. Furthermore, significantly fewer patients in the high-protein group used antiemetic medication.<br>In the 5 patients who had tests of gastric myoelectrical activity performed, a significant decrease in gastric dysrhythmia occurred after ingestion of the protein and ginger |
| Pillai et al., 2011[13] | Double-blind randomized controlled | 60 | CINV in chemotherapy cycles of cisplatin/ doxorubicin in bone sarcoma patients | Ginger root powder capsules or placebo capsules as an additional antiemetic to ondansetron and dexamethasone | CINV was evaluated as per Edmonton's symptom assessment scale and National Cancer Institute criteria respectively | Ginger root powder was effective in reducing severity of acute and delayed CINV as additional therapy to ondansetron and dexamethasone in patients receiving high emetogenic chemotherapy |
| Manusirivithaya et al., 2004[14] | Randomized, double-blind crossover study | 48 | CINV in gynecologic cancer patients receiving cisplatin-based chemotherapy. | In regimen I, capsules of ginger root powder were given orally 1 gm/d for 5 days, starting on the first day of chemotherapy.<br>In regimen II, placebo was given on the first day and metoclopramide was given orally thereafter for 4 days. The patients were then crossed over to receive the other antiemetic regimen in their next cycle of chemotherapy | | Among 43 evaluable patients who received both cycles of treatment, success in controls of nausea and emesis was not significantly different between the two regimens in both acute and delayed phases |
| Nakayama et al., 2016[15] | Randomized controlled trial | 71 | Salivary gland damage for patients undergoing RAI therapy with DTC | Aromatherapy group (group I) inhaled blended 1.0 mL of lemon and 0.5 mL of ginger essential oils and a control group (group II) distilled water as placebo for 10 min during admission | Rate of change of the accumulation rate | In comparison with group II, the rate of change of the accumulation rate was significantly higher in the parotid glands and submandibular glands of group I. In comparison with group II, a significant increase in rate of secretion change before and after treatment was noted in the bilateral parotid glands in group I |

**Table 2:** Studies related to honey in cancer

| *Study author, year* | *Study design* | *Sample size* | *Indication* | *Intervention* | *Outcome measure* | *Results* |
|---|---|---|---|---|---|---|
| Charalambous et al., 2017[16] | Parallel randomized controlled trial with two equal arms, the experimental arm (thyme honey) and the control arm (saline) | 72 | Head and neck cancer patients receiving radiotherapy or/and chemotherapy or/ and surgery | Patients in both arms followed the same administration protocol with thyme honey and saline respectively | National Cancer Institute (NCI) xerostomia scale and the xerostomia questionnaire (XQ) | Statistically significant effect of the intervention on xerostomia ($F = 8.474$, $p < 0.001$) and overall QoL ($F = 13.158$, $p < 0.001$) |
| Abdulrehman et al., 2016[17] | Randomized crossover clinical trial | 40 | Febrile neutropenia (FN) | Dietary intervention consisted of honey in a dose of 2.5 gm/kg body weight per dose twice weekly for 12 weeks | Febrile neutropenia in terms of frequency and duration of hospital admission | Honey intervention in a group of children with ALL resulted in positive effects on FN and hematologic parameters |
| Francis and Williams, 2014[18] | Quasiexperimental nonequivalent control group pretest posttest design | 60 | Treatment-induced oral mucositis | Indian turmeric powder with honey | OMAS and 4 MPJ OMAS | Application of Indian turmeric and honey on treatment-induced oral mucositis is effective |
| Raeessi et al., 2014[19] | Double-blind randomized clinical trial | 75 | Oral mucositis | Each 600 gm of the product consisted of "20 eight-mg Betamethasone solution ampoules" in the Steroid (S) group, "300 grams of honey plus 20 grams of instant coffee" in the Honey plus Coffee (HC) group, and "300 grams of honey" for the Honey (H) group | Severity of lesions was clinically evaluated | All three treatment regimens reduce the severity of lesions. The best reduction in severity was achieved in HC group |
| Hawley et al., 2014[20] | Double-blind randomized placebo-controlled trial | 106 | Radiation-induced oral mucositis in head and neck cancer patients | Randomized to swish, hold, and swallow either 5 mL of irradiated organic manuka honey or a placebo gel, four times a day throughout radiation treatment, plus seven more days | Severity of radiation-induced oral mucositis (ROM) according to the Radiation Therapy Oncology Group (RTOG), WHO, and Oral Mucositis Assessment Scale scales, weight, and subjects' symptom severity and QoL, sialometry | No statistically significant difference between the honey and placebo arms in any of the outcome indicators. Those who completed the study in both treatment arms had low rates of RTOG greater than or equal to grade III mucositis; 35% in the honey group and 43% in the placebo group |

*(Cont'd…)*

(Cont'd…)

| Study author, year | Study design | Sample size | Indication | Intervention | Outcome measure | Results |
|---|---|---|---|---|---|---|
| Maiti et al., 2012[21] | Randomized controlled study | 55 | Head and neck cancer requiring radiation to the oropharyngeal mucosal area | Topical application of honey Patients were advised to take 20 mL of honey 15 minutes before, 15 minutes after, and similar amount at bed time | WHO grading system | Significant reduction in the symptomatic grades III and IV mucositis in honey-treated patients compared with controls, i.e., 18 *vs* 41% for grade III and IV *vs* 22% for grade IV mucositis. About 71% of patients treated with topical honey showed no change or a positive gain in body weight. In the control group also, 22% had no weight loss, though none showed weight gain. Furthermore, it did not affect blood sugar level when initial fasting blood sugar level was <150 mg%. |
| Abdulrehman et al., 2012[22] | Randomized controlled clinical trial | 90 | Acute lymphoblastic leukemia and grade II/III chemotherapy-induced mucositis | Three equal treatment groups: Honey, HOPE (mixture of honey, olive oil-propolis extract, and beeswax), and control groups | WHO grading system | Recovery time in grade II mucositis was significantly reduced in the honey group as compared with either HOPE or controls ($p < 0.05$). Healing was faster with either honey or HOPE ($p < 0.01$) |
| Lund-Nielsen et al., 2011[23] | Randomized controlled | 69 | Malignant wounds and advanced cancer | Group I (honey-coated bandages) group II (silver-coated bandages) | Wound size, cleanliness, malodor, exudation, and wound pain. Digital photographs, visual analog scales (VAS), and wound morphology registration for measurement | No statistically significant difference was noted between the groups with respect to wound size, degree of cleanliness, exudation, malodor, and wound pain |
| Lund-Nielsen et al., [24] | Prospective, randomized, single-blind controlled clinical study | 75 | Advanced cancer and malignant wounds to evaluate the bacteriology of malignant wounds | Honey-coated (group I) to a silver-coated (group II) dressing | Swab cultures | No statistically significant differences were found between the type and number of different wound pathogens in the wounds during the course of the study or between groups I and II |
| Bardy et al., 2012[25] | Double-blind, placebo-controlled, randomized trial | 131 | Head and neck cancer who were having radiotherapy to the oral cavity or oropharyngeal area | Manuka honey or placebo (golden syrup) 20 mL 4 times daily for 6 weeks | Mucositis was assessed according to the RTOG scale Throat swabs | There was no significant difference between honey and golden syrup in their effects on mucositis. Active manuka honey did not improve mucositis, but both the honey and the syrup seemed to be associated with a reduction in bacterial infections |
| Shoma et al., 2010[26] | Prospective randomized controlled study | 150 | Radiation-induced burn following breast conservative surgery | Group I received standard burn treatment (control group). Group II received additionally 400 mg Pentoxifylline twice daily. Group III received the same treatment as Group II with adding topical purified honey ointment | Projected cutaneous surface area (PCSA) of burn, pain severity, limitation of movement, and exudation | There was a striking regression of the mean PCSAs of lesions among groups II and III at 12 weeks. The addition of honey was associated with marked pain-relieving effect and rescue of proper motion. Honey was associated with shorter duration of treatment as 74% of group III patients completely recovered after 12 weeks, compared with only 54 and 36% of groups II and I in order |
| Khanal et al., 2010[27] | Single-blinded, randomized, controlled clinical trial | 20 | Radiation mucositis | Honey and lignocaine applied topically to the oral mucosa | Visual assessment scale permitted scoring of degrees of mucositis | The proportion of patients with intolerable oral mucositis was lower in the honey group and this was statistically significant ($p = 0.000$) |

(Cont'd…)

*(Cont'd…)*

| *Study author, year* | *Study design* | *Sample size* | *Indication* | *Intervention* | *Outcome measure* | *Results* |
|---|---|---|---|---|---|---|
| Rashad et al., 2009[28] | Randomized controlled | 40 | Prophylaxis against radiochemotherapy-induced mucositis in head and neck cancer | Prior topical application of pure natural honey, and the control group, receiving concomitant chemotherapy and radiotherapy without honey | Clinical scoring of oral and oropharyngeal mucositis and culturing of pathogenic oral and oropharyngeal microbes | In the treatment group, no patient developed grade IV mucositis and only three patients (15%) developed grade III mucositis. In the control group, 13 patients (65%) developed grade III or IV mucositis ($p < 0.05$). Candida colonization was found in 15% of the treatment group and 60% of the control group, either during or after radiotherapy ($p = 0.003$). Positive cultures for aerobic pathogenic bacteria were observed in 15% of the treatment group and 65% of the control group, during or after radiotherapy ($p = 0.007$) |
| Zidan et al., 2006[29] | Open-labeled prospective study | 30 | Neutropenia in patients treated with chemotherapy for primary or metastatic disease | Life-Mel Honey (LMH) | Blood count | There was no recurrence of neutropenia after LMH intake and no need for treatment with CSFs in 12 (40%) of patients. Hemoglobin levels remained >11 gm/dL during LMH intake in 19 (64%) patients. Eight (32%) patients reported improvement in QoL |
| Motallebnejad et al., 2008[30] | Randomized single-blind (examiner blind) trial | 40 | Radiation-induced mucositis in head and neck cancer | Pure natural honey, 20 mL of honey 15 minutes before radiation therapy, then again at intervals of 15 minutes and 6 hours after radiation. In the control group patients were instructed to rinse with 20 mL of saline before and after radiation | Oral Mucositis Assessing Scale (OMAS) | A significant reduction in mucositis among honey-received patients compared with controls ($p = 0.000$) occurred |
| Biswal et al., 2003[31] | | 40 | Radiation-induced mucositis in head and neck cancer | Topical application of pure natural honey. 20 mL of pure honey 15 minutes before, 15 minutes after, and 6 hours postradiation therapy. | RTOG grading system. | Significant reduction in the symptomatic grade III/IV mucositis among honey-treated patients compared with controls; i.e. 20 *vs* 75% ( $p = 0.00058$). The compliance of honey-treated group of patients was better than controls. Fifty-five percent of patients treated with topical honey showed no change or a positive gain in body weight compared with 25% in the control arm ($p = 0.053$), the majority of whom lost weight |

**Table 3:** Studies related to turmeric in cancer

| *Study author, year* | *Study design* | *Sample size* | *Indication* | *Intervention* | *Outcome measure* | *Results* |
|---|---|---|---|---|---|---|
| Palatty et al., 2014[32] | Randomized controlled Pilot | 50 | Radio-dermatitis in patients with head and neck cancer undergoing radiotherapy | Group I was assigned to a topical application of Johnson's(®) baby oil (Johnson & Johnson Ltd, Baddi, India) and group II for turmeric- and sandal wood oil-containing cream [Vicco(®) turmeric cream (VTC); Vicco Laboratories, Parel, India] Day 1 and continued everyday until 2 weeks after the end of treatment | Radiation Therapy Oncology Group scores | Significant reduction in grades of dermatitis in cohorts applying VTC at all time points, including 2 weeks postradiotherapy ($p < 0.015$ to $p < 0.001$). Occurrence of grade III dermatitis was lower in the cohorts using VTC and was statistically significant ($p < 0.01$). Additionally, follow-up observations 2 weeks after the completion of radiotherapy also showed a reduced degree of radiodermatitis in cohorts applying VTC, which was significant ($p = 0.015$). |
| Rao et al., 2014 | Single-blind, randomized, controlled clinical trial | 80 | Radiation-induced oral mucositis | Turmeric gargle (n = 40) or povidone-iodine (n = 40) | Radiation Therapy Oncology Group grading system WHO OMAS | Group using turmeric as a mouthwash had delayed and reduced levels of radiation-induced oral mucositis and was statistically significant at all time points ($p < 0.001$ to $p < 0.0$ 001). Additionally, the cohorts using turmeric had decreased intolerable mucositis ($p < 0.001$) and lesser incidence of treatment breaks in the first half of the treatment schedule before 4 weeks ($p < 0.01$) and reduced change in body weight ($p < 0.001$) |
| Francis M, 2014[34] | Quasi experimental non equivalent control group Pre test post-test design | 60 | Oral Mucositis | Turmeric powder with honey | | The independent 't' value for post-test 2 and 3 (post-test 2: 2.86 for WHO OMAS and 4.58 for MPJ OMAS, post test 2: 5.42 for WHO OMAS and 7.2 for MPJ OMAS; $p < 0.05$) were significant between experimental and control group. It is inferred that the application of Indian turmeric and honey on treatment-induced oral mucositis is effective |
| Ghalaut et al., 2012[35] | Randomized control study | 50 | Chronic myeloid leukemia | Group I receiving imatinib alone and group II receiving turmeric powder along with imatinib for 6 weeks | Nitric oxide levels | Nitric oxide levels were found to be significantly decreased in both the groups, but more significantly in group II after receiving the respective treatments |

**Table 4:** Categorization of studies based on the study design

| *Sl. no.* | *Study design* | *Number of studies as add-on to cancer treatment* | *Number of studies as preventive intention* |
|---|---|---|---|
| 1 | RCTs | 3 | 0 |
| 2 | Nonrandomized, placebo-controlled trial | 2 | 2 |
| 3 | Nonrandomized multiple arm trials | 4 | 0 |
| 4 | Nonrandomized, controlled trials | 7 | 0 |
| 5 | Single-arm trial | 2 | 4 |
| 6 | Case series | 4 | 0 |
| 7 | Case reports | 8 | 0 |

arm. In a study about malignant wounds and advanced cancer, no statistically significant difference was noted between group I (honey-coated bandages) and group II (silver-coated bandages) with respect to wound size, degree of cleanliness, exudation, malodor, and wound pain. While in a study of radiation-induced burn following breast conservative surgery, honey was used as treatment supplement. Group I received standard burn treatment (control group). Group II received additionally 400 mg Pentoxifylline twice daily. Group III received the same treatment as group II with added topical purified honey ointment. Honey was found to be effective in pain management and also in faster recovery in 74% cases.

### Studies Related to Turmeric

Out of four studies, three were found to be RCTs wherein the turmeric was used locally in radio-dermatitis (2), as gargle in radiation induced oral mucositis (1) and orally turmeric powder in CML (1). Topical application of turmeric containing cream has shown significant reduction in grades of dermatitis at all-time points. Turmeric as a mouthwash had delayed and reduced the levels of radiation-induced oral mucositis and was statistically significant at all-time points. Additionally, turmeric had decreased intolerable mucositis and lesser incidence of treatment breaks in the first half of the treatment schedule before 4 weeks. Local application of turmeric and honey on treatment induced oral mucositis was effective. In CML study, Nitric oxide levels were found to be significantly decreased in both the groups, but more significantly in group receiving turmeric powder along with Imatinib for six weeks in CML. (Table 3).

## OTHER 36 STUDIES

### Randomized Controlled Trials

A total of 214 patients with breast carcinoma receiving adjuvant or neoadjuvant chemotherapy were treated with

**Table 5:** Studies at a glance based on indications and interventions

| *Indication* | *Intervention* | *Indication* | *Intervention* |
|---|---|---|---|
| CINV | Ginger, *MAK, Mauktikyukta Kamdudha, Mauktikyukta Praval Panchamruta, Suvarnabhasmadi, Rasayanavaleha | Fatigue | MAK, Mauktikyukta Kamdudha, Mauktikyukta Praval Panchamruta, Suvarnabhasmadi, Ashwagandha, Rasayanavaleha |
| Chemotherapy-induced neutropenia | Honey | Cisplatin-induced nephrotoxicity | Cystone |
| Radiation-induced oral mucositis, dermatitis, burns | Honey, Turmeric, Yashtimadhu Ghrita, Rasayanavaleha, Carsinolyt | QoL | Liv 52, Septilin, Geriforte, Lukol Gasex Herbolax, Ashwagandha, Arbudahara Rasyana, Whole System Ayurvedic Intervention, LAS-01 |
| Morphine-induced constipation | Misrakasneham | Immunity status | Varunadi Ghrita, Bryt Formula |
| Derangement of liver function | Arogyavardhini | Stress | Geriforte |
| Depression, insomnia | Geriforte | Myeloprotective effect | Brahma Rasayana |
| Chronic myeloid leukemia | Turmeric | AML | Navajeevan, Kamadudha Rasa And Keharuba Pisti, Valapani, Prak-20 |
| Acute lymphoblastic leukemia | Majjabasti | Pain | Leech |
| HPV infection | Praneem Tablet, Basant | Cervical low-grade squamous intraepithelial neoplasia | Haridra |
| Oral submucous fibrosis | Triphala, Turmeric, Tulasi, Whole System Ayurvedic Intervention | Oral cancer | Huma |
| Solid malignancies | Bhallataka, Swarna Bhasma, Navjeevan Rasayana | | |

*Maharshi Amrita Kalash

*Maharishi Amrita Kalash* (MAK), an Ayurvedic compound. There was a significant reduction in toxicities observed in the MAK group throughout chemotherapy cycles. Poor performance status was prevented by concomitant administration of MAK along with chemotherapy. No overgrowth of tumors occurred in the group treated with neoadjuvant chemotherapy receiving MAK.[36]

A total of 78 patients, who were treated for head and neck cancers, were divided into two groups, treatment and control groups. Patients in the intervention group (n = 38) received *Varunadi Ghritha*, 5 gm twice daily for 1 year and followed up to 2 years. In the treatment group, mean percentage increase in CD3, CD19, and CD16 positive cells were significantly higher compared with the control group indicating an immunomodulatory effect of the study compound.[37]

In a prospective open-labeled RCT conducted on 49 cancer patients undergoing six cycles of 70 mg/m$^2$ cisplatin-based regimens, divided into two groups, a control group (I) in which 28 patients received cisplatin without cystone supplement and an experimental group (II) in which 21 patients received cisplatin with cystone supplement, a polyherbal preparation. At the end of the study, mean levels of serum creatinine, blood urea, and serum cystatin C were significantly lower, whereas creatinine clearance was significantly higher in group II compared with group I. Grading of acute kidney injury according to Common Terminology Criteria for Adverse Events revealed significantly better renal status among patients in group II "grades 0 and 1 in 76 and 24% of the patients respectively," compared with group I "grades 0, 1, and 2 in 36, 32, and 32% of the patients respectively."[38]

## Nonrandomized, Placebo-controlled Trial

A trial was undertaken with 108 cervical cancer patients (54 patients as study group and remaining 54 patients as control group). The study group patients received only supportive Ayurvedic patent and proprietary (P&P) remedies as Liv 52, Septilin, Geriforte, Lukol, Gasex, and Herbolax, whereas the control group was managed with conventional allopathic medicaments along with external irradiation. Evaluation at the end of the study revealed that the study group patients maintained an excellent hematobiochemical profile, which helped them to achieve a much better treatment response than the control group. About 55% of cervical cancer cases had 3 years' disease-free survival by consuming herbal medicines along with external tele-cobalt irradiation and brachytherapy.[39]

Phase I: 100 patients with proven head and neck cancer undergoing radiotherapy were divided into two groups. Trial I group of 50 patients received Geriforte, 2 tabs, b.i.d. and control was a group of the remaining 50 on a placebo. Phase II: 50 patients in postradiotherapy phase, 25 were on Geriforte, 2 tabs. b.i.d., and the other

25 on a placebo. Evaluation in both phases was done after 4 to 5 weeks of therapy on complaints, such as lack of interest in surroundings, depression, insomnia, and lack of appetite, lack of a feeling of wellbeing, fatigability, and anxiety. Nearly one-thirds of patients in Phase I and three-fourths in Phase II reported subjective improvement on Geriforte administration.[40]

### Nonrandomized Multiple Arm Trials

A total of 250 cancer cases of either sex, different types, sites stages were treated with a formulation consisting of Bhallataka, Rohitaka, Madhuyashthi, and Tamra Bhasma as stand-alone and as add-on/adjuvant therapy to radio/chemotherapies. Significant gain in weight, increase in survival period, and improved immune status were observed. The side effects of chemotherapy like nausea, anemia, and hairfall were decreased.[41]

A total of 80 cancer patients were divided into four groups. The first was control group, Ayurvedic-Oncocare capsule was given in the second group, third group received only Pranic healing techniques, and group four received both Oncocare capsule and Pranic healing techniques. There was a highly significant improvement in the fourth group, i.e., combination of herbal formulation along with stress-management techniques.[42]

A total of 67 cancer patients of various types who were undergoing six cycles of chemotherapy were given Mauktikyukta Kamdudha, Mauktikyukta, Praval Panchamruta, and Suvarna bhasmadi formulation for 16 weeks and were observed for a period of 6 months. There was a significant effect in reducing the toxic sideeffects of chemotherapy drugs, such as nausea, loss of appetite, constipation, and fatigue.[43]

A total of 75 cancer patients undergoing radiotherapy were randomly divided into four groups: group I with local application of Yashtimadhu (*Glycyrrhiza glabra* L.) powder and honey in the oral cavity for few minutes prior to radiotherapy along with oral intake of Yashtimadhu Ghrita; group II with only local application of the Yashtimadhu powder and honey in the oral cavity; group III patients administered with only local application of honey in the oral cavity; and group IV on conventional modern medication-controlled group. All these patients under the four groups had received radiotherapy and chemotherapy for a maximum duration of 7 weeks. The intensity of radiation- and chemotherapy-induced mucositis was reduced to a great extent by the trial drug.[44]

### Nonrandomized, Controlled Trials

A total of 100 breast cancer patients undergoing chemotherapy were given *Ashwagandha* (*Withania somnifera* (L.) Dunal) root extract at a dose of 2 gm every 8 hours, throughout the course of chemotherapy. Significant improvement in cancer-related fatigue and QoL was found in comparison with the control group.[45]

A total of 50 breast cancer patients undergoing chemotherapy were given *Ashwagandha* (*Withania somnifera* (L.) Dunal) root extract at a dose of 2 gm every 8 hours, throughout the course of chemotherapy. There was a trend for longer survival in the patients treated with *W. somnifera* (L.) Dunal root extract plus chemotherapy along with positive effect on fatigue and improvement in QoL in patients.[46]

A total of 36 cancer patients were divided into two groups, groups I and II. In group I, the patients were treated with radiotherapy and chemotherapy along with adjuvant Rasayana Avaleha (RT + CT + RA), while in group II, only radiotherapy and chemotherapy (RT + CT) were given as the control group. After assessing the results, it was observed that Rasayana Avaleha gave better results in controlling the adverse effect of chemotherapy and radiotherapy in comparison with the control group.[47]

A total of 30 patients of oral carcinoma were divided into three groups with 10 patients in each group. Comparative study was done between three groups by giving radiotherapy alone in one group and Ayurvedic formulation + radiotherapy in the other two groups at different intervals. Results suggested that there was significant reduction of the side effects in the patients who were taking Ayurvedic formulation along with radiotherapy.[48]

An indigenous P&P formulation—Carsinolyt [avaleha (electuary) and Ghana satva (consolidated extract)] was evaluated to prevent side effects of radiotherapy on 40 patients; group I patients were given Carsinolyt and radiotherapy simultaneously, whereas group II patients were given radiotherapy only. The results achieved were encouraging with improvement of 56.62% in mucosal reactions, 37.5% in hematological status, 18.18% in pain, 8.33% in salivary reactions, and 21.42% in skin reactions.[49]

In a controlled clinical trial, a liquid Ayurvedic (herbal) preparation (*Misraka sneham*) was compared with a conventional laxative tablet (Sofsena) in the management of opioid-induced constipation in patients with advanced cancer. Although there was no statistically significant difference in the apparent degree of laxative action between the two, the results indicate that the small volume of the drug required for effective laxative action, the tolerable taste, the once-daily dose, the acceptable side effect profile, and the low cost make *Misraka sneham* a good choice for prophylaxis in opioid-induced constipation.[50]

The effect of an indigenous medical preparation—*Brahma Rasayana* (BR)—on the hematopoietic protection in cancer patients undergoing radio in association with chemotherapy was studied. Administration of BR

accelerated the recovery of the hematopoietic system as seen by a rapid rise in total leukocytes. Both lymphocytes and neutrophils were significantly increased by *Rasayana* treatment. The *Rasayana* treatment also made serum lipid peroxidation decrease confirming its capacity of reducing oxidative stress induced by cancer treatment.[51]

### Single-Arm Trial

A total of 84 patients with cancer of various organs like tongue, stomach, breast, and lungs were treated with Bhallataka (*Semecarpus anacardium* L.f. ), which resulted in improvement in general condition and symptom relief in 50% patients.[52]

A total of 43 patients were given *Swarna Bhasma* (SB) for 1 year; 17 patients showed response. The response was best in rectal cancer group 70% (7/10). Nearly 41.02% patients survived for 1 year after treatment, but, after 5 years, this came down to 15.38%.[53]

### Case Series

Two patients with oral cancer were treated with "Huma" a polyherbal therapy derived from various important Ayurvedic herbs viz. Nimba (*Azadirachta indica*), Haridra (*Curcuma longa*), Amalaki (*Embelica officinalis*), Tulasi (*Ocimum sanctum*), Bhallataka (*Semecarpus anacardium*), Guduchi (*Tinospora cordifolia*), etc. Complete regression of the tumor/lesion was observed in one patient and marked remission in other. One patient completed over 7 years' disease-free survival. In the other patient, the disease relapsed after stoppage of therapy and the patient survived for 15 months.[54]

A total of 75 cases of various hepatobiliary disorders in this series included 60 patients of cholecystolithiasis, 10 patients of choledolithiasis, and 5 patients of cancer of gall bladder who were operated upon (cholecystectomy). *Arogyawardhani* was given in the dose of 1 gm B.D. after meals for 45 to 60 days after cholecystectomy. *Arogyawardhani* has significantly lowered the level of serum bilirubin, thymol turbidity, alkaline phosphatase, and serum proteins. The use of *Arogyawardhani* is advocated in the patients of postcholecystectomy syndrome and in other cases where there is dearrangement of liver functions.[55]

*Arbudaharana rasayana*, a herbo-mineral compound formulation (*Anubhuta yoga* ) practiced by traditional healers of Orissa as a folklore medicine, for the management of Arbuda was studied clinically in 10 patients of nonoperable malignancy of different regions of body like scalp, vagina, esophagus, bladder, and oral cavity. The drug was given in powder form, 5 gm twice a day, orally with lukewarm water for 2 months. Symptomatic relief was observed in treated patients with overall improvement in QoL. No adverse effect of drug was observed.[56]

Nine female breast cancer patients who had undergone chemotherapy and had completed primary curative treatment 1 to 12 months earlier were recruited in a 4-month individualized intervention that included diet, lifestyle, yoga, and marma (similar to acupressure). Every other participant was selected for semistructured interviews at baseline and completion. The authors concluded that the whole system Ayurvedic intervention appeared to lead to an enhanced awareness of the body's innate healing mechanisms and a strong motivation to use them for self-care. The holistic nature of the intervention facilitated integration of mind and body resulting in a sense of increased vitality. These findings correlated with quantitative QoL measurements indicating improved global health.[57]

### Case Reports

A 47-year-old diabetic male of high-risk acute myeloid leukemia (AML)-M3 (type of Blood cancer) was treated on allopathy regimen, but had recurrence. He was treated with Navajeevan, Kamadudha rasa, and Keharuba pishti for period of 6 years, got complete remission, and was disease-free for 13 years. This was a pilot Ayurvedic study conducted by the Central Council for Research in Ayurveda and Siddha, Ministry of AYUSH.[58]

A 16-year-old boy with AML (a type of blood cancer) with relapse despite allopathy treatment was treated with Ayurvedic therapy (Navjeevan, Valapani, Kamdhuda, Prak-20) for 5 years, and this resulted in 12 years of disease-free survival.[59]

A case of laryngeal carcinoma was treated using rasayana therapy (Navjeevan rasayana (A compound formulation containing *Abhraka bhasma*, *Shuddha Gandhaka*, *Vanga bhasma, Shuddha Parada, Shuddha Haratala, Tamra bhasma, Swarna bhasma, Hirakbhasma*) along with other Ayurvedic formulations like *Tribhuvankirti*, *Shwas kuthar rasa*, powder of *Solanum xanthocarpum* L., *Saussurea lappa* (Falc.) Lipsch, tankan, and *Sitopaladi churna* along with radiotherapy. Within 4 weeks of treatment, the patient's voice became clear and he retained his physical fitness; there was complete tumor response along with optimization of laryngeal functions like voice, breathing, and swallowing without any adverse effects of radiotherapy. After 8 months of treatment, computed tomography scan was repeated, which showed total clearance of the tumor and he was asymptomatic, healthy with absolutely normal voice.[60]

A case of colon cancer was treated with rasayana therapy postsurgery and adjuvant chemotherapy. Rasayana therapy included *navjeevanrasayana*, *tamrabhasm*a,

swarnabhasma, *hirakbhasma* along with Ayurvedic formulations like *prawal panchamrut*, *kamdudha, lashunadiwati*, powders of Bilwa (*Aegal marmelos*), kutaj (*Holereana antidysentrica*), aamalki (*Phallyanthus embelica*) with agni rasayana, sutendrarasayana and pranwallabhrasayana. Within 4 weeks of treatment, patient's appetite became normal and he retained his physical fitness. Thereafter, he underwent chemotherapy. All the cycles of chemotherapy were well tolerated by the patient, and he completed the prescribed schedule of chemotherapy. After chemotherapy, patient was exclusively on Ayurvedic rasayana therapy. Patient is surviving disease-free for 4 years with excellent QoL.[61]

A 62-year-old case of hepatocellular carcinoma was treated with a holistic interdisciplinary approach, i.e., modern medicine treatment followed by Ayurveda treatment and Yoga. Decoction (nimba, guduchi, sadabahara, apamarga, nagarmotha, shirisha, tulasi), *rasa aushadhi/bhasma* (*Hemabhraka, Tamra sindoora, Vangabhasma, Vaikrantabhasma, Pushkrajabhasma, Manikyapishti*), *pippalirasayana, tamalakyadi* syrup was given. This treatment has shown improvement in appetite, food intake, and a feeling of well-being.[62]

A herbo-mineral formulation (LAS-01) was employed on a case of non-Hodgkins lymphoma after chemotherapy and radiation with no remedial effects. In a short span of treatment, marked clinical and radiological effects were observed. The patient felt improvement in comparison of modern treatment in healing the nasal wound and QOL.[63]

A 62-year-old male patient with synchronous renal cell carcinoma and leiomyosarcoma was admitted with severe pain. However, for 2 months, the patient came to the clinic in good condition free of pain. The patient reported outpatient self-treatment with seven leeches (*Hirudo medicinalis*) to the lumbar region in the interim that resulted in complete healing of pain.[64]

A 4-year-old patient was treated with an Ayurvedic formulation and *majjabasti* to get the bone marrow transplant effect. The patient got significant result with the help of Ayurvedic medicines.[65]

## STUDIES RELATED TO PREVENTIVE INTENTION

### Nonrandomized, Placebo-controlled Trial

A total of 21 diagnosed cases positive for human papillomavirus (HPV)16 infection without or with low-grade squamous intraepithelial lesion (LSIL) or inflammation were assigned to receive intravaginal, topical application of either "Praneem" tablet (a polyherbal formulation) or placebo for 30 days excluding the days of menstrual period and were evaluated for persistence of HPV infection. The results showed that a 30-day intravaginal application of the "Praneem" can result in elimination of HPV infection from the uterine cervix along with marked improvement in clinical symptoms.[66]

In a study conducted in collaboration with ICMR, 35 female patients enrolled were assigned alternatively to receive intravaginal capsules of "BASANT," two capsules (250 mg each) each night or two placebo capsules for 30 days, excluding the days of menstrual period, and they were evaluated for the presence or absence of HPV16 in cervical cells. The "BASANT" was formulated with curcumin from *Curcuma longa* (haridra), purified extracts of *Emblica officinalis* L (Amalaki), *Azadirachta indica* A.juss. (nimba) leaves, and *Aloe barbadensis* Mill. (kumari). After 30 days of intravaginal insertion of BASANT, all 11 HPV-16 positive cases became HPV-negative.[67]

### Single-arm Trial

A total of 21 female patients with persistent cervical LSIL, a precancerous stage were treated with Haridra (*Curcuma longa*) capsules for 12 weeks. It was found to arrest or regress LSIL in Pap smears and colposcopy, with reduction in the circulating interleukin 6 levels.[68]

A total of 34 teenager boys of the 13-to-19-year-old age group of North India with precancerous lesions in the mouth were advised indigenous mouth rinse (triphala). Triphala was found to have great potential for reversal of these lesions.[69]

A total of 45 patients of recently diagnosed oral submucous fibrosis (OSMF) were advised to mix 1 gm of turmeric powder and 1 gm of tulsi powder in glycerin to make a paste. The patients were instructed to apply this paste all over the oral mucosa 4 to 5 times per day and not to eat or drink anything for the next 15 minutes. Statistically highly significant ($p < 0.001$) results were obtained in burning sensation and mouth opening.[70]

A total of 24 patients with OSMF were administered *Erandabhrishta haritaki* powder 5 to 10 gm initial 3 days at bed time for *koshthashuddhi* (mild purgation), followed by *Shadabindu taila nasya* (errhine therapy) 4 to 8 drops in each nostril for 5 days. After that, *Pratisarana* (external application), *kavala* (gargling), and rasayana yoga were administered twice a day simultaneously for 60 days. Statistically highly significant ($p < 0.001$) results were found in symptoms, such as burning sensation of mouth, intolerance to spicy food, dryness of mouth, pain while opening the mouth, and clinically marked improvement was observed in decreased taste.[71]

## CONCLUSION

Emphasis on generating tangible evidence is essential to demonstrate efficacy of stand-alone Ayurveda interventions in cancer backed by published case reports.

Well-designed studies with adequate sample sizes are required for validation of the leads from Ayurveda as stand-alone clinical studies. Many RCTs and case–control studies have generated reasonably good evidence for Ayurveda and plant-based interventions as add-on concomitant to conventional cancer treatment to combat its toxicities, particularly, radiation mucositis and chemotherapy-induced nausea and vomiting and overall fatigue. For effective dissemination of merits of Ayurveda for prevention and management of cancer, the published information may be suitably made available to all stakeholders, such as academicians, clinicians, and researchers through Web portals. Further, these portals may be linked with existing the AYUSH Research portal being maintained by CCRAS at http://ayushportal.nic.in.

## REFERENCES

1. Pal SK. Use of alternative cancer medicine in India. Lancet Oncol 2002 Jul;3(7):394-395.
2. Kumar D, Goel NK, Pandey AK, Puri S. Complementary and alternative medicine use: epidemiological concerns and perceptions of cancer patients based on a pilot study. Int J Med Health Res 2016 Aug;2(8):40-46.
3. Kushavaha, VH. Charaka Samhita Part I reprint edition. Sutrasthana, Trishothiya Adhyaya, 18/44-47. Varanasi: Chaukhambha Orientalia; 2009. p. 287.
4. Ryan JL, Heckler CE, Roscoe JA, Dakhil SR, Kirshner J, Flynn PJ, Hickok JT, Morrow GR. Ginger (Zingiber officinale) reduces acute chemotherapy-induced nausea: a URCC CCOP study of 576 patients. Support Care Cancer 2012 Jul;20(7): 1479-1489.
5. Zick SM, Ruffin MT, Lee J, Normolle DP, Siden R, Alrawi S, Brenner DE. Phase II trial of encapsulated ginger as a treatment for chemotherapy-induced nausea and vomiting. Support Care Cancer 2009 May;17(5):563-572.
6. Panahi Y, Saadat A, Sahebkar A, Hashemian F, Taghikhani M, Abolhasani E. Effect of ginger on acute and delayed chemotherapy-induced nausea and vomiting: a pilot, randomized, open-label clinical trial. Integr Cancer Ther 2012 Sep;11(3): 204-211.
7. Konmun J, Danwilai K, Ngamphaiboon N, Sripanidkulchai B, Sookprasert A, Subongkot S. A phase II randomized double-blind placebo-controlled study of 6-gingerol as an anti-emetic in solid tumor patients receiving moderately to highly emetogenic chemotherapy. Med Oncol 2017 Apr;34(4):69.
8. Arslan M, Ozdemir L. Oral intake of ginger for chemotherapy-induced nausea and vomiting among women with breast cancer. Clin J Oncol Nurs 2015 Oct;19(5):E92-E97.
9. Ansari M, Porouhan P, Mohammadianpanah M, Omidvari S, Mosalaei A, Ahmadloo N, Nasrollahi H, Hamedi SH. Efficacy of ginger in control of chemotherapy induced nausea and vomiting in breast cancer patients receiving doxorubicin-based chemotherapy. Asian Pac J Cancer Prev 2016 Jan;17(8):3877-3880.
10. Sanaati F, Najafi S, Kashaninia Z, Sadeghi M. Effect of ginger and chamomile on nausea and vomiting caused by chemotherapy in Iranian women with breast cancer. Asian Pac J Cancer Prev 2016 Aug;17(8):4125-4129.
11. Lua PL, Salihah N, Mazlan N. Effects of inhaled ginger aromatherapy on chemotherapy-induced nausea and vomiting and health-related quality of life in women with breast cancer. Complement Ther Med 2015 Jun;23(3):396-404.
12. Levine ME, Gillis MG, Koch SY, Voss AC, Stern RM, Koch KL. Protein and ginger for the treatment of chemotherapy-induced delayed nausea. J Altern Complement Med 2008 Jun;14(5): 545-551.
13. Pillai AK, Sharma KK, Gupta YK, Bakhshi S. Anti-emetic effect of ginger powder versus placebo as an add-on therapy in children and young adults receiving high emetogenic chemotherapy. Pediatr Blood Cancer 2011 Feb;56(2):234-238.
14. Manusirivithaya S, Sripramote M, Tangjitgamol S, Sheanakul C, Leelahakorn S, Thavaramara T, Tangcharoenpanich K. Antiemetic effect of ginger in gynecologic oncology patients receiving cisplatin. Int J Gynecol Cancer 2004 Nov-Dec;14(6): 1063-1069.
15. Nakayama M, Okizaki A, Takahashi K. A randomized controlled trial for the effectiveness of aromatherapy in decreasing salivary gland damage following radioactive iodine therapy for differentiated thyroid cancer. Biomed Res Intov 2016 N;2016:9509810.
16. Charalambous A, Lambrinou E, Katodritis N, Vomvas D, Raftopoulos V, Georgiou M, Paikousis L, Charalambous M. The effectiveness of thyme honey for the management of treatment-induced xerostomia in head and neck cancer patients: a feasibility randomized control trial. Eur J Oncol Nurs 2017 Apr;27:1-8.
17. Abdulrehman MA, Hamed AA, Mohamed SA, Hassanen NA. Effect of honey on febrile neutropenia in children with acute lymphoblastic leukemia: a randomized crossover open-labeled study. Complement Ther Med 2016 Apr;25:98-103.
18. Francis M, Williams S. Effectiveness of Indian turmeric powder with honey as complementary therapy on oral mucositis: a nursing perspective among cancer patients in Mysore. Nurs J India 2014 Nov-Dec;105(6):258-260.
19. Raeessi MA, Raeessi N, Panahi Y, Gharaie H, Davoudi SM, Saadat A, Karimi Zarchi AA, Raeessi F, Ahmadi SM, Jalalian H. "Coffee plus honey" versus "topical steroid" in the treatment of chemotherapy-induced oral mucositis: a randomised controlled trial. BMC Complement Altern Med 2014 Aug;14:293.
20. Hawley P, Hovan A, McGahan CE, Saunders D. Randomized placebo-controlled trial of manuka honey for radiation-induced oral mucositis. Support Care Cancer 2014 Mar;22(3):751-761.
21. Maiti PK, Ray A, Mitra TN, Jana U, Bhattacharya J, Ganguly S. The effect of honey on mucositis induced by chemoradiation in head and neck cancer. J Indian Med Assoc 2012 Jul;110(7):453-456.
22. Abdulrehman M, Elbarbary NS, Ahmed Amin D, Saeid Ebrahim R. Honey and a mixture of honey, beeswax, and olive oil-propolis extract in treatment of chemotherapy-induced oral mucositis: a randomized controlled pilot study. Pediatr Hematol Oncol 2012 Apr;29(3):285-292.
23. Lund-Nielsen B, Adamsen L, Kolmos HJ, Rørth M, Tolver A, Gottrup F. The effect of honey-coated bandages compared with silver-coated bandages on treatment of malignant wounds-a randomized study. Wound Repair Regen 2011 Nov;19(6): 664-670.
24. Lund-Nielsen B, Adamsen L, Gottrup F, Rorth M, Tolver A, Kolmos HJ. Qualitative bacteriology in malignant wounds–a

prospective, randomized, clinical study to compare the effect of honey and silver dressings. Ostomy Wound Manage 2011 Jul;57(7):28-36.
25. Bardy J, Molassiotis A, Ryder WD, Mais K, Sykes A, Yap B, Lee L, Kaczmarski E, Slevin N. A double-blind, placebo-controlled, randomised trial of active manuka honey and standard oral care for radiation-induced oral mucositis. Br J Oral Maxillofac Surg. 2012 Apr;50(3):221-226.
26. Shoma A, Eldars W, Noman N, Saad M, Elzahaf E, Abdalla M, Eldin DS, Zayed D, Shalaby A, Malek HA. Pentoxifylline and local honey for radiation-induced burn following breast conservative surgery. Curr Clin Pharmacol 2010 Nov;5(4): 251-256.
27. Khanal B, Baliga M, Uppal N. Effect of topical honey on limitation of radiation-induced oral mucositis: an intervention study., Int J Oral Maxillofac Surg 2010 Dec;39(12):1181-1185.
28. Rashad UM, Al-Gezawy SM, El-Gezawy E, Azzaz AN. Honey as topical prophylaxis against radiochemotherapy-induced mucositis in head and neck cancer. J Laryngol Otol 2009 Feb;123(2):223-228.
29. Zidan J, Shetver L, Gershuny A, Abzah A, Tamam S, Stein M, Friedman E. Prevention of chemotherapy-induced neutropenia by special honey intake. Med Oncol 2006 Dec;23(4): 549-552.
30. Motallebnejad M, Akram S, Moghadamnia A, Moulana Z, Omidi S. The effect of topical application of pure honey on radiation-induced mucositis: a randomized clinical trial. J Contemp Dent Pract 2008 Mar;9(3):40-47.
31. Biswal BM, Zakaria A, Ahmad NM. Topical application of honey in the management of radiation mucositis: a preliminary study. Support Care Cancer 2003 Apr;11(4):242-248.
32. Palatty PL, Azmidah A, Rao S, Jayachander D, Thilakchand KR, Rai MP, Haniadka R, Simon P, Ravi R, Jimmy R, et al. Topical application of a sandal wood oil and turmeric based cream prevents radiodermatitis in head and neck cancer patients undergoing external beam radiotherapy: a pilot study. Br J Radiol 2014 Jun;87(1038):20130490.
33. Rao S, Dinkar C, Vaishnav LK, Rao P, Rai MP, Fayad R, Baliga MS. The Indian spice turmeric delays and mitigates radiation-induced oral mucositis in patients undergoing treatment for head and neck cancer: an investigational study. Integr Cancer Ther 2014 May;13(3):201-210.
34. Francis M et al. Effectiveness of Indian Turmeric Powder with Honey as Complementary Therapy on Oral Mucositis: A Nursing Perspective among Cancer Patients in Mysore. Nurs J India. 2014 Nov-Dec; 105(6):258-260.
35. Ghalaut VS, Sangwan L, Dahiya K, Ghalaut PS, Dhankhar R, Saharan R. Effect of imatinib therapy with and without turmeric powder on nitric oxide levels in chronic myeloid leukemia. J Oncol Pharm Pract 2012 Jun;18(2):186-190.
36. Saxena A, Dixit S, Aggarwal S, Seenu V, Prashad R, Bhushan SM, Tranikanti V, Misra MC, Srivastava A. An Ayurvedic herbal compound to reduce toxicity to cancer chemotherapy: a randomized controlled trial. Indian J Med Paediatr Oncol 2008 Jan;29(2):11.
37. Ravindran D, Hariharan I, Muwonge R, Kumar RR, Radhakrishna Pillai M, Ramadas K. Efficacy of Varunadi Ghritha (Polyherbal compound) in treated head and neck cancer cases as a biological response modifier. Ayu 2014 Apr-Jun;35(2):168-174.
38. El-Ghiaty MA, Ibrahim OM, Abdou SM, Hussein FZ. Evaluation of the protective effect of Cystone against cisplatin-induced nephrotoxicity in cancer patients, and its influence on cisplatin antitumor activity. Int Urol Nephrol 2014 Jul;46(7):1367-1373.
39. Acharya DK, Kulkarni KS. Supportive treatment with herbal remedies along with external irradiation in cancer cervix patients (a review of 108 cancer cervix patients). Antiseptic 2002 Aug:99(8):299-301.
40. Saksena AK, Verma SK, Agarwal KK. A clinical trial of Geri forte as an antistress agent in cancer patients. J Res Educ Indian Med 1988 Jan-Mar;7(1):101-104.
41. Prasad, GC. Ayurvedic drugs in the management of cancer. New Delhi: Central Council for Research Ayurveda & Siddha; 1999.
42. Sabharwal P, Dinkar Sarma M, Agarwal DP. Effect of intervention of Ayurveda and Practical implementation of Shadchakras (Pranic Healing) An indigenous approach as co- therapy with Chemotherapy & Radiotherapy for physical & mental wellbeing of cancer patients – a clinical study. J Ayurveda 2008 Oct-Dec;2(4).
43. Deshmukh V, Kulkarni A, Bhargava S, Patil T, Ramdasi V, Gangal S, Godse V, Datar S, Gujar S, Sardeshmukh S. Effectiveness of combinations of Ayurvedic Drugs in alleviating drug toxicity and improving quality of life of cancer patients treated with chemotherapy. Support Care Cancer 2014 Nov;22(11):3007-3015.
44. Das D, Agarwal SK, Chandola HM. Protective effect of Yashtimadhu (Glycyrrhiza glabra) against side effects of radiation/chemotherapy in head and neck malignancies. Ayu 2011 Apr;32(2):196-199.
45. Biswal BM, Sulaiman SA, Ismail HC, Zakaria H, Musa KI. Effect of Withaniasomnifera (Ashwagandha) on the development of chemotherapy-induced fatigue and quality of life in breast cancer patients. Integr Cancer Ther 2013 Jul;12(4): 312-322.
46. Biswal BM, Sulaiman AM, Ismail HC, Zakaria H, Jalil Abdul MI, Muhammad KI. Phase II clinical study of combination chemotherapy with herb Withaniasomnifera (Ashwagandha) in breast cancer. Eur J Cancer 2012 Apr;48(4):S8-S9.
47. Vyas P, Thakar AB, Baghel MS, Sisodia A, Deole Y. Efficacy of Rasayana Avaleha as adjuvant to radiotherapy and chemotherapy in reducing adverse effects. Ayu 2010 Oct;31(4): 417-423.
48. Gupta S, Kushwaha HK, Jhunjhunwala A, Agarwal DP. Taming the side effects of radiotherapy in oral carcinoma patients with help of Ayurvedic Medicine (Clinical Study). J Ayurveda 2008 Oct-Dec;2(4).
49. Broca A, Sharma UC, Kushwaha HK, Sharma SS, Agarwal DP, Chauguley A. Evaluation of Clinical Response of Carcinolyt (Herbal Nutrients) to control adverse effects of radiotherapy in cancer patients. J Ayurveda 2007 Jan-Mar;1(1).
50. Ramesh PR, Kumar KS, Rajagopal MR, Balachandran P, Warrier PK. Managing morphine-induced constipation: a controlled comparison of an Ayurvedic formulation and senna. J Pain Symptom Manage 1998 Oct;16(4):240-244.
51. Joseph CD, Praveenkumar V, Kuttan G, Kuttan R. Myeloprotective effect of a non-toxic indigenous preparation Rasayana in cancer patients receiving chemotherapy and radiation therapy. A pilot study. J Exp Clin Cancer Res 1999 Sep;18(3):325-329.
52. Vaidya, ADB.; Amonkar, AJ.; Bhatt, NS.; Parikh, PM. Complementary and alternative medicine for cancer care in India: basic and clinical perspective. In: Alaoui-Jamali M, editor.

Semecarpusanacardium: clinical studies, alternative and complementary therapies for cancer. New York: Springer; 2010.
53. Das S, Das MC, Paul R. Swarna Bhasma in cancer: a prospective clinical study. Ayu 2012 Jul;33(3):365-367.
54. Pal SK, Fatima SH, Kalandar A. Effect of poly herbal preparation HUMA on oral cancer: two case reports. Int J Med Sci Biotechnol 2013 Aug;1(1):65-70.
55. Sharma SK. Effect of Arogyawardhani on liver function after cholecystectomy in the case of cholecystolithiasis, choledocholithiasis and carcinoma gall bladder. JREIM 1991;10(2): 19-28.
56. Mahanta V, Dudhamal TS, Gupta SK. Management of Arbuda (cancer) with herbomineral formulation – a pilot study. GJRMI 2013 May;2(5):374-379.
57. Lapedis M, Adler SR, Hecht FM, Miaskowski C, Agarawal S, Kaptchuk TJ, Abrams DI, Lad VD, Dhruva A. Qualitative analyses from a prospective clinical study of a whole systems ayurvedic intervention for breast cancer survivorship. J Altern Complement Med 2014 May;20(5):A75.
58. Prakash B, Parikh PM, Pal SK. Herbo-mineral Ayurvedic treatment in a high risk acute promyelocytic leukemia patient with second relapse: 12 years follow up. J Ayurveda Integr Med 2010 Jul;1(3):215-218.
59. Prakash B. Treatment of relapsed undifferentiated acute myeloid leukemia (AML-M0) with Ayurvedic therapy. Int J Ayurveda Res 2011 Jan-Mar;2(1):56-59.
60. Bendale Y, Bendale V, Ladsongikar K, Birari-Gawande P, Kadam A, Gund P. Laryngeal squamous cell carcinoma successfully treated with rasayana therapy – a case report. Rasamruta 2015 Mar;7(6):1-5.
61. Bendale Y, Bendale V, Ladsongikar K, Birari-Gawande P, Kadam A, Gund P. Prognostic significance after use of Rasayana therapy in a colon cancer patient–a case report. Rasamruta 2015 Apr;7(6):1-5.
62. Jayawardhane ND, De Silva RH, Tripathi JS, Narasimha Murthy KH, Tiwari SK. An effective herbomineral treatment as an adjuvant therapy for the improvement of quality of life of hepatocellular carcinoma (hcc) patient: a case report. Int Res J Pharma 2012 Jul;3(7):266-270.
63. Saxena RC, Trivedi VP, Tripathi R, Tewari SP, Tewari A, Tiwari BD, Srivastava A. Non Hodgkins Lymphoma: a rare tumour of Nasal Mucosa treated with LAS-01.IJAMY 2013 Apr-Jun;6(2):79-82.
64. Kalender ME, Comez G, Sevinc A, Dirier A, Camci C. Leech therapy for symptomatic relief of cancer pain. Pain Med 2010 Mar;11(3):443-445.
65. Rathi R, Rathi B. A case report of acute lymphoblastic leukemia – an ayurvedic approach. Ayurpharm Int J Ayur Alli Sci 2014 Feb;3(3):48-51.
66. Shukla S, Bharti AC, Hussain S, Mahata S, Hedau S, Kailash U, Kashyap V, Bhambhani S, Roy M, Batra S, et al. Elimination of high-risk human papillomavirus type HPV16 infection by 'Praneem' polyherbal tablet in women with early cervical intraepithelial lesions. J Cancer Res Clin Oncol 2009 Dec;135(12):1701-1709.
67. Talwar GP, Sharma R, Singh S, Das BC, Bharti AC, Sharma K, Singh P, Atrey N, Gupta JC. BASANT, a polyherbal safe microbicide eliminates HPV-16 in women with early cervical intraepithelial lesions. J Cancer Ther 2015 Dec;6(14):1163-1166.
68. Joshi JV, Paradkar PH, Jagtap SS, Agashe SV, Soman G, Vaidya AB. Chemopreventive potential and safety profile of a curcuma longa extract in women with cervical low-grade squamous intraepithelial neoplasia. Asian Pac J Cancer Prev 2011 12(12):3305-3311.
69. Deshpande A, Tandon S, Deshpande N. Low resource screening method of precancerous lesions and its reversal by Triphala in teenage Indian population. Ayu 2014 Apr-Jun;35(2):160-167.
70. Srivastava A, Agarwal R, Chaturvedi TP, Chandra A, Singh OP. Clinical evaluation of the role of tulsi and turmeric in the management of oral submucous fibrosis: A pilot, prospective observational study. J Ayurveda Integr Med 2015 Jan-Mar;6(1):45-49.
71. Patel KR, Rajagopala M, Vaghela DB, Shah A. A pilot study on Ayurvedic management of oral sub mucous fibrosis. Ayu 2015 Nov;36(1):34-40.

# हिन्दी सारांश

## कैंसर की चिकित्सा के लिए आयुर्वेद एवं पादप आधारित चिकित्साः एक व्यवस्थित समीक्षा

[1]मनोहर एस गुंडेटी, [2]नारायणम श्रीकांत, [3]अमरीश दीगे, [4]श्रुति खंडूड़ी, [5]पार्थ दावे
[6]आशीष कुमार त्रिपाठी, [7]त्रीगुल्ला सकेतराम, [8]आर गोविंद रेड्डी

**भूमिकाः** प्राकृतिक मूल के उत्पादों के लिए कई उपभोक्ताओं की पसंद के परिणामस्वरूप आयुर्वेद, अन्य पारम्परिक चिकित्सा पद्धति और पूरक व वैकल्पिक चिकित्सा में अभिरुचि पुनर्जीवित हुई है। पादप आधारित औषधियों के संभावित लाभ उनकी रोगियों द्वारा अधिक स्वीकारिता, प्रभावकारिता एवं सुरक्षा में हो सकते है। तंत्रिका सम्बन्धी विकार, सन्धिवात आदि जीर्ण व जटिल अवस्थाएं जो की प्राणघातक नहीं होती हैं, से ग्रस्त व्यक्ति पारम्परिक चिकित्सा का सबसे अधिक उपयोग करते हैं। जीर्ण व सम्भावित प्राणघातक रोगों जैसे कैंसर व एच आई वी/एड्स आदि से ग्रस्त व्यक्ति दूसरा सबसे बड़ा उपयोग करने वाला वर्ग है। दोनों वर्ग आयुर्वेद और पारम्परिक चिकित्सा पद्धति को विभिन्न कारणों से अपनाते हैं जैसे कि मुख्य चिकित्सा विकल्प के रूप में, प्रतिरक्षा कार्यप्रणाली में सुधार के लिए, समग्र कार्यप्रणाली में सुधार के लिए, परम्परागत उपचार से उत्पन्न दुष्प्रभावों से उबरने हेतु जीवन की गुणवत्ता में सुधार के लिए और उनके रोग से सम्बधित लक्षणों से राहत के लिए। कैंसर रोगियों में पारंपरिक पद्धति के उपयोग में वृद्धि इसकी परम्परागत कैंसर उपचार के सहवर्ती प्रयोग हेतु सुरक्षा एवं प्रभावकारिता के साक्ष्य का द्योतक है।

**उद्देश्यः** कैंसर की चिकित्सा या सहवर्ती चिकित्सा के रूप में आयुर्वेद वानस्पतिक प्रयोगों की प्रभावकारिता के प्रकाशित आंकड़ों की एक व्यवस्थित समीक्षा करना इस लेख का उद्देश्य है।

**विधिः** मई २०१७ से जून २०१७ तक प्रकाशित पत्रिकाओं, रिपोर्टों एवं गूगल स्कोलर, पबमेड, आयुष रिसर्च पोर्टल आदि सर्च इंजन का उपयोग करते हुए विशिष्ट परिपेक्ष्य के साथ आतुरीय अध्ययनों के साहित्य का अन्वेषण किया गया।

**परिणामः** विभिन्न रेन्डमाइज्ड कंट्रोल ट्रायल्स (आर सी टी) से ज्ञात हुआ कि अदरक, शहद, हल्दी व अश्वगंधा कीमोथेरेपी प्रेरित मितली (जी मिचलाना) व उल्टी (वमन), रेडिएशन म्युकोसाईटीस व थकावट में सहवर्ती चिकित्सा के रूप में प्रभावकारी है। इसके अतिरिक्त सिंगल केस रिपोर्ट्स व केस कंट्रोल स्टडीज में भी चिकित्सा व परम्परागत चिकित्सा के सहवर्ती के रूप में आयुर्वेद के सकारात्मक परिणाम प्रतिवेदित किए गए।

**निष्कर्षः** कैंसर के उपचार में आयुर्वेदीय चिकित्सा की तुलना में परम्परागत कैंसर चिकित्सा की सहवर्ती चिकित्सा के रूप में आयुर्वेद की प्रभावकारिता के साक्ष्य मिलते हैं और इससे एकीकृत आयुर्वेद अर्बुद विज्ञान (आई ए ओ) चिकित्सा प्रोटोकोल विकसित करने में मदद मिल सकती है।

**मुख्य शब्दः** आयुर्वेद, एकीकृत, अर्बुद विज्ञान, कैंसर।