Review Article

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AN AYURVEDA APPROACH TO COMBAT TOXICITY OF CHEMO-RADIOTHERAPY IN CANCER PATIENTS

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Received on: 19/11/15 Revised on: 21/12/15 Accepted on: 29/12/15

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DOI: 10.7897/2277-4343.07271

ABSTRACT

Cancer is a dreadful disease of global concern, affecting a large population both in developed & in developing countries. According to the American Cancer Society, cancer incidence rates have risen by 23% in males & by 43 % in females since mid-1970s. Deaths arising from cancer constitute 2–3% of the annual deaths worldwide. In cancer, there is no perfect treatment available to kill the abnormal growth of cells. Chemo – radiotherapy is usually done to kill these cells but these therapies in return, produces severe toxicity or side effects like nausea, vomiting, diarrhoea, sleep disturbance, anaemia, alopecia, hepatotoxicity etc. which have a devastating effect on quality of life of patients. Through an *Ayurveda* prospective, these adverse effects can be taken as manifestation of aggravated of *pitta dosh* especially under the group of *raktapitta* or *raktadushti* (vascular inflammations). Our enriched *Ayurveda* is full of medicinal herbs like ginger, garlic, turmeric etc. which can, not only, reduce toxicity of these therapies but can also improve general wellbeing & immunity of patients. This paper deals with these types of herbs which can help in curbing this problem.

Keywords: Cancer, Chemo-radiotherapy, Adverse Effects, Ayurveda, Herbs

INTRODUCTION

Cancer also known as malignant tumour or malignant neoplasm is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. In other words, cancer is a hyper proliferative disorder that involves transformation, dysregulation of apoptosis, proliferation, invasion, angiogenesis & metastasis. General treatments for cancer are: Surgery, Chemotherapy, Radiotherapy.

Chemotherapy: Chemotherapy is the use of anti-cancer drugs to treat cancer. It can stop the growth of a tumour and kill cancer cells that have spread to other parts of the body, may also reduce the risk of recurrence, may shrink the size of a tumour to reduce cancer-related symptoms. It may be given after surgery (adjuvant chemotherapy) or before surgery (neoadjuvant chemotherapy). A few anti-cancer drugs are taken by mouth or injected into the muscle or fat tissue below the skin, but most are injected into a vein. Some chemotherapeutic drugs that are used together are: Cyclophosphamide, doxorubicin, 5-fluorouracil, Methotrexate, Paclitaxel etc.

Radiotherapy: is a cancer treatment that uses high doses of radiation to kill cancer cells and stop them from spreading, to shrink tumour size, to reduce symptoms. Radiation therapy can be external beam (when a machine outside body aims radiation at cancer cells) or internal (when radioactive source is put closer to tumour). Mostly external beam is used.

Toxicity of chemo-radiotherapy: Chemotherapeutic drugs & radiations target all rapidly-dividing cells and therefore affect

not only tumour cells but also other cells in the body which are undergoing rapid cell division like skin and the skin's appendages hair and nails, gastrointestinal cells, bone marrow and its product blood cells, and reproductive cells including sperm and ova, oral and vaginal mucosa. So in this way, chemo-radiotherapy not only kills abnormally growing cells, but also normal rapidly growing cells, therefore produces side effects.

Common side effects of chemo-radiotherapy are

1. Haematological toxicity - bone marrow suppression resulting in neutropenia (absolute neutrophil count <100cells/mm³), anaemia (dyspnoea, dizziness, headache and palpitation) and thrombocytopenia (platelet count of less than 100,000/mm³, or 100x10⁹/L) leading to increased risk of infections & bleeding.
2. Gastrointestinal side effects - nausea and vomiting, anorexia and taste changes, oral mucositis, diarrhoea and constipation.
3. Dermatological toxicity - can be local and systemic. Local- phlebitis, urticaria, pain, erythema, vein discoloration, and tissue necrosis. Systemic- alopecia, dermatitis, nails changes, hyperpigmentation, urticaria, photosensitivity reactions.
4. Gonadal dysfunction- In men, reduction in sperm counts (oligospermia). In women, destruction of oocytes leading to ovarian failure and premature menopause.
5. Nervous system changes- tingling, burning, weakness, or numbness in hands or feet, weakness, tired or achy muscles, shaking or trembling, hearing loss, stomach pain, such as constipation or heartburn, fatigue, confusion and memory problems (cognitive deficits), dizziness, depression.¹

Ayurveda view towards chemo-radiotherapy side effects

When the major side effects of chemo-radiotherapy are seen according to Ayurveda perspective, it appears that they are the manifestations of aggravated *pitta dosh* especially under the group of *raktapitta* (haemorrhage) or *raktadushti* (vascular inflammations) like *raktakoshtha* (urticaria), *raktavisphota* (red vesicle), *aasyavipak* (stomatitis), *amlata* (hyperacidity), *daha* (burning), *shonitkleda* (sloughing of blood), *ushmadhikya* (high temperature), *tiktasyata* (bitter taste in mouth), *trishnadhikya* (excessive thirst), *chhardi* (vomiting), *khalitya* (alopecia). But some toxic symptoms can be related with aggravated *vata* & *kaphaj* dosh like *vidbheda* (diarrhoea), *kashayasyata* (tastelessness or astringent taste in mouth), *udarda* (urticaria), *shvetavabhasta* (pallor), *tripiti* (anorexia), *apakti* (indigestion), *udarveshtan* (abdominal pain), *ucchashruti* (hearing loss), *tama*, *bhrama* (fainting & dizziness), *nakhabheda* (cracking of nails), *padasuptata* (numbness of foot), *vepathu* (tremors).²

Ayurveda approach to mitigate chemo-radiotherapy toxicity

At the physical level

Ayurveda herbs

Herbs which can be used to fight toxicity are- *Tinospora cordifolia*, *Zingiber officinale*, *Allium sativum*, *Curcuma longa*, *Semecarpus anacardium*, *Phyllanthus amarus*, *Punica granatum*, *Ocimum sanctum*, *Acacia Arabica*, *Boerhavia diffusa*, *Panchgavya*

Their specific karmas have direct effects on chemo-radiotherapy toxicity.

Tinospora cordifolia Willd. (Guduchi)

Karma- *Daha* (in hyperacidity), *raktadosha* (in haemorrhagic disorder), *pandu har* (in anaemia), *dhatukrita*, *medhya* (brain tonic), *vayasthapan* (anti-ageing), useful part- stem, habit- climber

Zingiber officinale Roscoe (Shunthi)

Karma- *Vami har* (anti-emetic), *shula* (analgesic), *vibandh har* (in constipation), *ruchya* (appetiser), *aampachani* (indigestion), *gulmahar* (anti-tumour), *ajirnahar*, useful part- rhizome, habit- herb

Allium sativum Linn. (Rason)

Karma- *Gulma nashak* (anti-tumour), *vrishya* (aphrodisiac), *medhya* (brain tonic), *rasayan* (rejuvenation), useful part- leaf, rhizome, habit- herb

Curcuma longa Linn. (Haridra)

Karma- *vishnashak* (anti-allergic), *kandu nashak* (anti-histaminic), *vrana* (wound-healing) & *aruchi nashak* (anorexia), useful part- rhizome, habit- small plant

Semecarpus anacardium Linn.f. (Bhallatak)

Karma- *Gulmahar* (anti-tumour), *kapha har* (decongestive), *medha agni vriddhi* (brain tonic & appetiser), useful part- nut, fruit, oil, habit- tree

Phyllanthus amarus Linn. (Bhumyamalaki)

Karma- *Daha* (in hyperacidity), *kandu vinashini* (anti-itching), *rakta dosh har* (in haemorrhagic disorder), *yakrita pliha vikar har* (liver & spleen disorders), useful part- panchang. Habit- herb

Punica granatum Linn. (Dadim)

Karma- *Ruchikar* (appetiser), *varchvibandh har* (anti-constipation), *shram har* (energetic), useful part- fruit, fruit peel, root bark, seeds, flower, leaf, habit- tree.

Acacia Arabica Willd (Babool)

Karma- *aam*, *rakta atisar nashak* (anti-diarrhoeal), *pitta daha arti nashak* (antacid), useful parts- leaf, flower, bark & niryas (gum resin), habit- tree

Ocimum sanctum Linn. (Krishna tulsi)

Karma- *kapha*, *vata har*, *agni deepen* (anorexia), *ruchikar* (appetiser) useful parts- leaf & seeds, habit- herb

Boerhavia diffusa Linn. (Punarnava)

Karma- *panduhar* (anaemia), *shool har* (analgesic), *rasayan* (rejuvenation), *rakta dosh vinashak* (haemorrhagic disorders), useful part- whole plant, root, leaf, habit- spreading herb^{3,4,5}

Panchgavya

It is a mixture of cow's milk, curd, ghee, urine & swaras of cow's dung.

Cow' milk- *rasayan* (rejuvenation), *rakta vikar nashak* (haemorrhagic disorders),

Curd- *rochan*, *deepen* (appetiser), *vrishya* (aphrodisiac), *balavardhan*, *atisar* (anti-diarrhoeal)

Ghrta- *smriti*, *buddhi* (brain tonic), *agni vardhak* (appetiser), *kshaya nashak* (anti-weakness)

Urine- *agnideepak* (appetiser), *medhya* (brain tonic), *gulma har* (anti- tumour), *kandu har* (anti-itching), *pandu nashak* (anti-anaemic), *varch vibandh har* (anti-constipation), *kamla nashak* (anti-jaundice)⁶

Dietary therapy

Cancer patients should avoid all processed, genetically engineered foods, refined sugars, foods with additives as these foods are tamasic in nature & clog the channels & upset normal bodily functions, should avoid over-eating & should follow Ayurveda guidelines- grace before eating, avoid too much water with meals, chewing food properly, combining food properly, resting for a while after eating, intake of large amount of fruits & vegetables.

At the mental level

The role of the mind in healing must be emphasized as mental disturbances are a subtle cause than the physical imbalances in the *doshas*. Healing the mind is therefore more difficult and requires positive self-inquiry and insight. Positive thinking activates the immune system and supports healing. Healing begins with the purification of the mind. Periods of silence and a lack of sensory stimulation are the best methods of purifying the mind, and can then be supported through the specific use of karma like *shirodhara* can help produce inner silence while tonifying the mind. *Nasya* & *abhyanga* supports mental purification.

Psychological therapy (Sattvavajaya chikitsa)

Sattvik practices are important for keeping the mind clear & supporting the healing process. Patients benefit from spending more time in nature, taking walks in the garden. All patients with cancer can be benefitted by reducing stress and engaging in activities that bring joy, and should be encouraged to pursue their love of art, music, writing, and other forms of self-expression, and be surrounded by loving friends and family.⁷

Meditation, Yoga & Asan

Cat & cow stretch, *Supta Baddha Konasana*, *Savasana*, *Sheersasan* & *pranayama*, bridge posture, warrior posture etc. they are known for total relaxation of body & mind. They control blood pressure, heart rate & body temperature, quiet mind at the same time & improve the circulation of blood & oxygen.

DISCUSSION

Tinospora cordifolia Willd. (*Guduchi*)

Anti-cancer & chemo-radio protective activity- Root extract of *T. cordifolia* shows radio-chemo protective role as it causes extensive increase in body weight, tissue weight, tubular diameter in cancer patients. Dichloromethane extracts of *Tinospora cordifolia* inhibits NF-KB & act as nitric oxide scavenger to show anti-cancer activities because of presence of glucosides like syringine, pergnane glycoside, palmatosides etc. & alkaloids like choline, tembetarine, magnoflorine.⁸

Anti-oxidant activity- Methanolic extract of stem of *T. cordifolia* has been reported to possess anti-oxidant activity, by increasing the erythrocytes membrane lipid peroxide and catalase activity. Aqueous extract of *Tinospora cordifolia* has been reported to exhibit free radical scavenging activity. Thus it has a radio protective activity.⁹

Immunomodulatory activity- *Tinospora cordifolia* has a large variety of compounds which are responsible for immunomodulatory and cytotoxic effects like cordifolioside A, magnoflorine, tinocordioside and syringine.

It is very useful in dementia, motor & cognitive deficits because of presence of glycosides in it like furanoid, diterpene glycoside, tinocordioside etc.¹⁰

Zingiber officinale Roscoe (*Shunthi*)

Anti-emetic effect- The components in ginger that are responsible for antiemetic effect are thought to be the gingerols, shogaols, and galanolactone, a diterpenoid of ginger. Ginger extract possesses antiserotonergic and 5-HT₃ receptor antagonism effects because of which there is increased gastro duodenal motility & increased gastric emptying. Ginger stimulates appetite and the secretion of digestive enzymes, is antispasmodic, toxin digesting.¹¹

Tissue & radioprotective effects- Several extracts and fractions of *Z. officinale* have been shown to protect against chemically-induced tissue damage. Ethanol extract of the rhizome of *Z. officinale* and oil extracted from the plant is effective in ameliorating carbon tetrachloride and acetaminophen (paracetamol)-induced acute hepatotoxicity. The hydro alcoholic extract of ginger rhizome reduces the severity of radiation sickness and the mortality, and protects mice from gastrointestinal syndrome, as well as bone marrow syndrome. Ginger hydroalcoholic extract acts as a gastroprotective agent in radiation-induced taste aversion (CTA) and emesis in rats. The mechanisms of this gastro-protection may be due to anti-oxidant, neuromodulatory and radioprotective mechanisms.¹²

Antioxidant activity- Ginger roots extracts contain polyphenol compounds (6-gingerol and its derivatives), which have a high antioxidant activity, to counter free radicals mediated oxidative stress in the cell. Antioxidant activity is due to the presence of flavones, isoflavones, flavonoids, anthocyanin, coumarin, lignans, catechins and isocatechins.¹³

Immunostimulant activity- It was found on experimentation on aquaculture that ginger exhibit immunostimulant activity. Aqua culture was made infected with *pseudomonas aeruginosa*, it was found that ginger not only prevented drastic decline in TEC & Hb values but also increased TLC, leucocyte & neutrophils

count, thereby improved general health of fish to withstand the stress condition. This immunostimulant potential is due to shogaols, gingerols present in ginger.¹⁴

Allium sativum Linn. (*Rason*)

Immuno-modulatory effects- *Allium sativum* an important medicinal plant having immuno-modulatory effects. Three proteins lectins or agglutinins ASA II and ASA I showing immune-modulatory effects extracted from raw garlic extract exhibit the mitogenic activity towards human peripheral blood lymphocytes, murine splenocytes and thymocytes.¹⁵

Antioxidant activity- Several organosulfur compounds derived from garlic like two lipophilic organosulfur compounds, diallyl sulfide (DAS) and diallyl disulfide (DADS) and two hydrophilic organosulfur compounds, s-ethyl cysteine (SEC) and n-acetyl cysteine (NAC) exhibit antioxidant activity. They protect against lipid-related oxidations by activating associated antioxidant enzymes like glutathione-s-transferase and catalase.¹⁶

Curcuma longa Linn. (*Haridra*)

Anti-cancer effect- Curcumin inhibits cell growth by inhibiting expression of basic fibroblast growth factor and the angiogenesis factors, vascular endothelial growth factor and basic fibroblast growth factor. Curcumin induces apoptosis of cancer cells and inhibits angiogenesis by blocking cyclosporine A-resistant phorbol myristate acetate + anti-CD28 pathway of T-cell proliferation. Curcumin reduces the testicular damage caused by exposure to di-n-butylphthalate as it causes increase in Glutathion, testosterone levels and increases glucose-6-phosphate dehydrogenase activity and decrease in malondialdehyde levels. These effects can be due to intrinsic antioxidative abilities of curcumin.

Hepatoprotective effect- Curcumin protects cells against lipid peroxidation induced by paracetamol. This may be due to the antioxidative effects of the phenolic groups of curcumin.¹⁷

Chemopreventive effect- Curcumin activate the DDR (DNA damage response), providing an opportunity and rationale for the clinical application of these nutraceuticals in the chemoprevention of prostate cancer.¹⁸ Chemoprotective effects in esophageal epithelial cells exposed to bile acids; Curcumin reverses bile acid suppression of gene expression of SOD-1 and also able to inhibit bile acid induction of COX-2 gene expression.¹⁹

Neuroprotective effect- Curcuma oil significantly reduces the ill effect of ischemia by attenuating nitrosative and oxidative stress. Ischemia induces collapse of mitochondrial membrane potential, cytochrome c release, altering the Bax: Bcl-2 ratio and subsequently caspases activation led to induction of apoptosis in sequential fashion was reverse significantly by Curcuma oil. So there is an evidence for the high efficacy of Curcuma oil as a neuroprotective.²⁰

Semecarpus anacardium Linn.f. (*Bhallatak*)

Anti-cancer & chemo-radio protective activity- especially effective in hepatocellular carcinoma. *S.anacardium* nut extract is found to detoxify a potent hepatocarcinogen, aflatoxin B1 & causes its metabolites to be excreted in urine. It potentiates the efficacy of widely used anticancer drugs like mitomycin-C, 5-fluorouracil & methotrexate. Unfortunately, bhallawanols & their epoxides have no role to play in observed anticancer property. But it contains K-40 which exhibits effective radio protective activity. Nut extract also has immuno-modulatory potency in hepatocellular carcinoma patients.²¹

***Phyllanthus amarus* Linn. (Bhumyamalaki)**

Chemo-protective activity- 75% methanolic extract of *Phyllanthus amarus* plant shows chemoprotective activity against cyclophosphamide induced toxicity. It reduces myelosuppression & increase in WBC count, bone marrow cellularity as well as the number of maturing monocytes that accounted for its chemoprotected activity.²²

Anticancer activity- The aqueous extract of *P. amarus* exhibit potent anticarcinogenic activity against 20-methyl-cholenthere (20-MC) induced sarcoma development by inhibiting metabolic activation of carcinogen as well as inhibition of cell cycle regulators & DNA repair.²³

Hepatoprotective activity- *P. amarus* possess a potent hepatoprotective effect against aflatoxin B(1)- induced hepatic damage by a mechanism involving reduction in intracellular level of both enzymatic & non-enzymatic antioxidants.²⁴

***Punica granatum* Linn. (Dadim)**

Anticancer activity- various pomegranate extracts (juice, seed oil, peel) potently inhibit prostate cancer cell invasiveness & proliferation, cause cell cycle disruption, induce apoptosis, inhibit tumour growth.

Radio protective activity- due to the presence of advanced levels of antioxidants, flavonoids & free radical scavenging activity, it exhibits radioprotective activity.

Neuroprotective activity- it is highly effective in stress induced neurodegeneration. The drug triggers inhibition of AchE, causes prolonged half-life of acetylcholine which is useful in treating cognitive decline, improving memory or related CNS activity.²⁵

***Ocimum sanctum* Linn. (Krishan tulsi)**

Chemo-radioprotective activity- The flavonoid, Orientin isolated from the leaf extract of *O. sanctum* was shown to provide protection against radiation. It shows significantly greater free radical inhibiting activity in vitro than DMSO. Orientin inhibited free radical formation in the absence of EDTA & thus exhibiting the radioprotective activity. Vicenin- 2 effectively induced anti-proliferative, anti-angiogenic and pro-apoptotic effect in Prostate cancer cells & radioprotective effect. Eugenol has its chemopreventive effects on N methyl- N(1)-nitro-N-nitrosoguanidine (MNNG)-induced gastric carcinoma.²⁶

Anticancer activity- *Ocimum sanctum* is beneficial against the stress and depression during tumor. Human fibrosarcoma cells in culture treated with an ethanolic extract of *O. sanctum* induced cytotoxicity at 50 µg/ml and above. Morphologically the cells showed shrunken cytoplasm and condensed nuclei. The cells also showed depleted intracellular glutathione and increased levels of lipid peroxidation products. Administration of aqueous and ethanolic extracts of *O. sanctum* to mice bearing Sarcoma-180 solid tumors mediated a significant reduction in tumor volume and an increase in lifespan. These observations clearly indicate *O. sanctum* extracts possess anticancer activity.²⁷

***Acacia Arabica* Willd. (Babool)**

Chemo-radioprotective activity- *A. arabica* is easily accessible source of natural antioxidants, which can be used as a supplement to facilitate in the therapy of free radical mediated diseases such as chemo-radiotherapy treated cancer. Furthermore, the high scavenging property of *A. arabica* may be due to hydroxyl groups existing in the phenolic compounds that can scavenge the free radicals.²⁸

***Boerhavia diffusa* Linn. (Punarnava)**

Anti-cancer & chemo preventive activity- a methanol: chloroform fraction of *B. diffusa* could inhibit the proliferation of human cervical cancer HeLa cell line. The S-phase inhibition

of the cell cycle and apoptosis played important roles in *B. diffusa*-induced anti proliferative activity against HeLa cells. Moreover, the alcoholic and water extracts of *B. diffusa* is known to contain several bioactive molecules such as reducing sugars, starch and lignans, liriiodendrin, syrigaresinol and several boeravinones. The activity shown by the *B. diffusa* has been attributed to these diverse compounds.²⁹

Anti-oxidant activity- Ethanolic extract of leaves of *B. diffusa* exhibit very strong antioxidant property & free radical scavenging property.³⁰

Immunomodulatory effect- it exhibits cell rejuvenation property, Immunomodulators are materials which can modify the body's defence mechanism either by enhancing or controlling immune responses. They can regulate the cytokine production such as tumor necrosis factor, interleukins and interferons and these cytokines may, in turn, activate different cells of immune system such as T-cells or natural killer cells. The chloroform and ethanol extracts inhibited T cell mitogen (phytohemagglutinin-PHA) which stimulated proliferation of peripheral blood mononuclear cells, Natural killer cell cytotoxicity as well as lipopolysaccharide induced nitric oxide production & thus produce the immunomodulatory effects.³¹

Panch gavya: cow's urine

Anti-cancer & chemo-radio preventive properties- cow urine enhances the efficacy and potency of anti-cancer drugs. Scientists have proved that the pesticides even at very low doses cause apoptosis (cell suicide) in lymphocytes of blood and tissues through fragmentation of DNA. Distilled cow urine protects DNA and repairs it rapidly as observed after damage due to pesticides.³² It protects chromosomal aberrations by mitomycin in human leukocyte.³³ Cow urine helps the lymphocytes to survive and not to commit suicide (apoptosis) & prevents pathogenic effect of free radicals. These radicals cause damage to various tissues and attack enzymes, fat and proteins disrupting normal cell activities or cell membranes, producing a chain reaction of destruction leading to side effects of chemo-radio therapy.³⁴

Immunomodulatory effect- it enhances both cellular and humoral immune response. the immunomodulatory effect of *kamdhenu ark* prepared from cow urine in mice and found that cow urine enhances both T and B cell proliferation and also increases the level of IgG, IgA and IgM antibodies titres. It also increases the secretion of interleukin-1 and 2.³⁵

Cow's milk

Anti- cancer activity- Cow milk fat component is potential anti-carcinogenic agent, which reduces the chances of colon, breast and skin cancer. Milk fat has a specific fatty acid (a cis-trans isomer of linoleic acid), which may cause inhibition of cancerous growth, which prevents the uncontrolled spread of tumour cells. It was found on animal experimentations in mouse models that CLA can protect against the induction and proliferation of chemically-induced skin, stomach, colon, prostate and mammary tumors.³⁶

Combined effect of Panchgavya

Antioxidant activity: Chemo-radio therapy tends to generate free radicals in both aqueous and lipid portions of intracellular and extracellular environments. In this situation, it is crucial for the body to have a combination of water soluble and lipid soluble antioxidants to acquire the full range of protection. Panchagavya is a unique preparation having both water based (colloidal milk without fat portion, urine, curd and dung) and fat based (ghee, milk with fat particles) products. It is likely to provide both polar and non-polar natural antioxidants. So it can be used against toxicity of chemo-radio therapy.³⁷

Dietary therapy: Proper food choices are essential to normalize digestion and to prevent the formation of ama. Fruits and vegetables contain a wide range of phytochemicals that reduce the incidence of many cancers. e.g. Sulforaphane (cauliflower), P. Coumaric Acid (tomatoes), Genistein (soy beans), Capsaicin (chili peppers) and Flavanoids (citrus fruits).

Psychological therapy (Sattvavajaya chikitsa): Yogasan & meditation reduce tension, remove blockage & promote healing. They can also help in cognitive deficits. *Yoga asanas* and relaxation techniques calm the nerves & provide anxiety relief. *Yoga* used as therapy for cancer can help clear out toxins accrued during cancer treatment more effectively. *Yoga, asanas* stimulate not just muscles, but also increases blood flow, balances the glands and enhances the lymphatic flow in the body & thus enhancing the body's internal purification processes. In addition to removing toxins, yoga for cancer can help dissipate tension and anxiety and enable cancer patients to settle into a greater sense of ease and well-being. It strengthens the body & boosts the immune system.

CONCLUSION

Cancer is primarily a disease of older age; finding less toxic therapies is a major priority. Current cancer therapies are less effective and exhibit toxicities which are intolerable in most of the cases. The molecular targets of chemo-preventive agents are similar to those currently being used to treat cancer. Tumour cells use multiple cell survival pathways to prevail, and to find out those agents which can suppress these multiple pathways without producing severe side effects or no side effects is the need of hour. These agents can have great potential in the treatment of cancer. Most of the active principles present in Ayurveda herbs do indeed suppress multiple pathways. Ayurveda herbs & therapies are pharmacologically safe, can be used alone or as adjuncts to current chemotherapeutic agents to enhance therapeutic effects and minimise chemo-radio therapy-induced toxicity. Therefore, it can be said that Ayurveda herbs can be used not only to prevent cancer, but also to treat cancer, to fight against chemo-radio therapy induced toxicity & also to improve the general well-being of the cancer patient.

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Cite this article as:

Saini Malvika, Sharma Satyapal, Jaiswal Mohan Lal, Kotecha Mita. An Ayurveda approach to combat toxicity of chemo-radiotherapy in cancer patients. Int. J. Res. Ayurveda Pharm. Mar - Apr 2016;7(Suppl 2):124-129 <http://dx.doi.org/10.7897/2277-4343.07271>

Source of support: Nil, Conflict of interest: None Declared

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