(Review Article)

IJARPB
International Journal of Advanced Research in Pharmaceutical & Bio Sciences
(A peer reviewed International journal for Pharmaceutical and Bio Sciences)

Received on 03/01/2012; Revised on 16/01/2012; Accepted on 09/02/2012.

Cancer— an Ayurvedic Perspective

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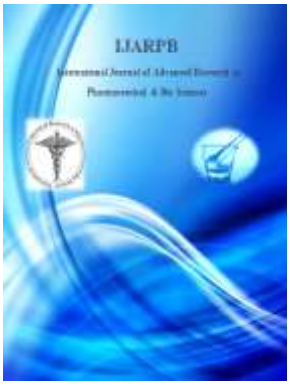

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Abstract

An integrated approach is needed to manage cancer using the growing body of knowledge gained through scientific developments. Thousands of herbal and traditional compounds are being screened worldwide to validate their use as anti-cancerous drugs. The science of Ayurveda is supposed to add a step on to the curative aspects of cancers that have resemblance with clinical entities of *arbuda* and *granthi* mentioned in *Sushrutha samhita*. Hence, an attempt is made in this review to discuss about the pathology and therapeutic management of various cancers described in Ayurveda. Review of literature on anticancer drugs of plant origin revealed identification of newer ayurvedic drugs that are not mentioned in the ancient texts.

KEY WORDS: *Charaka, Sushruta,* samhitas, Pathogenesis of tumors.

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INTRODUCTION

Cancer is one of the most dreaded diseases of the 20th century and spreading further with continuance and increasing incidence in 21st century. In the United States, as the leading cause of death, it accounts for 25% of all the deaths in humans presently. It is considered as an adversary of modernization and advanced pattern of socio-cultural life dominated by Western medicine. Multidisciplinary scientific investigations are making best efforts to combat this disease, but the sure-shot, perfect cure is yet to be brought into world medicine. Recently, a greater emphasis has been given towards the researches on complementary and alternative medicine that deals with cancer management. Several studies have been conducted on herbs under a multitude of ethno botanical grounds. For example, Hartwell [1–9] has collected data on about 3000 plants, those of which possess anticancer properties and subsequently been used as potent anticancer drugs [10]. Ayurveda, a traditional Indian medicine of plant drugs has been successful from very early times in using these natural drugs and preventing or suppressing various tumors using various lines of treatment. The broad aim of this article is to provide a general outline on descriptions of cancers and their management from an ayurvedic practitioners' perspective underlying its scientific principles involved in treating these conditions with the use of natural products. This article reviews the available literature regarding researches on anti-cancerous ayurvedic herbs and also includes a summary of treatment strategies for various cancers. It is written with an intention to raise awareness and encourage implementation of ayurvedic therapies for combating cancer and suggesting an integrated approach in tumor management and treatment.

Ayurvedic concept of cancer

Charaka[11] and *Sushruta*[12] samhitas, two well-known Ayurvedic classics, describe cancer as inflammatory or non-inflammatory swelling and mention them as either *Granthi* (minor neoplasm) or *Arbuda* (major neoplasm). Ayurvedic literature defines three body-control systems, viz., the nervous system (*Vata* or air), the venous system (*Pitta* or fire), and the arterial system (*Kapha* or water) which mutually coordinate to perform the normal function of the body. In benign neoplasm (*Vataja*, *Pittaja* or *Kaphaja*) one or two of the three bodily systems are out of control and is not too harmful because the body is still trying to coordinate among these systems. Malignant tumors (*Tridosaja*) are very harmful because all the three major bodily systems lose mutual coordination and thus cannot prevent tissue damage, resulting in a deadly morbid condition.

Fundamental classification

Ayurvedic classification of neoplasm depends on various clinical symptoms in relation to *Tridoshas*.

Group I: Diseases that can be named as clear malignancy, which includes *arbuda* and *granthi*, e.g. *mamsarbuda* (melanoma) and *raktarbuda* (leukaemia), *mukharbuda* (oral cancer), etc.

Group II: Diseases that can be considered as cancer, such as incurable ulcers with e.g. *tridosaj gulmas* (abdominal tumors like carcinomas of the stomach and liver or lymphomas).

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Group III: Diseases with the possibility of malignancy, e.g. *Visarpa* (erysipelas), *asadhya kamala* (incurable jaundice) and *nadi vrana* (sinusitis) [13, 14].

Etiology

According to *Sushruta*, the fundamental cause of major neoplasm is the pathogens that affect all parts of the body. He called the sixth layer of the skin as *'Rohini*,' (epithelium) and pathogenic injuries to this layer in muscular tissues and blood vessels caused by lifestyle errors, unhealthy foods, poor hygiene and bad habits results in the derangement of doshas, which leads to the manifestation of tumors [12, 15.] Excess of water or fat in the corpus of the tumor and the stability and rigid confinement of the *doshas* in a particular place were described as reasons for the non-infectious and non-suppurative nature of these abnormal growths[12, 16]. Cancer in each person differs according to the person's exposure to *pathogens* and genetic constitutions which make each of them to react differently to the same diet. The factors responsible for the vitiation of *doshas* are discussed here[17].

a. *Vata aggravating factors*: excessive intake of bitter, pungent, astringent, dry foods and stressful conditions.

b. *Pitta aggravating factors*: excessive intake of sour, salty, fried foods and excessive anger.

c. *Kapha aggravating factors*: excessive intake of sweet, oily food and sedentary nature.

d. *Rakta aggravating factors*: excessive intake of acid or alkali containing foods. Fried and roasted foods, alcoholic beverages, sour fruits are some examples. Excessive anger or severe emotional upset, sunbathing or working under scorching sun or near fire and hot conditions, etc. are some other causes[11].

e. *Mamsa aggravating factors*: excessive use of exudative foods like meat, fish, yoghurt, milk and cream. Behaviours leading to exudation like sleeping during the day and overeating are some of the causes for pathogens invading the fatty tissues.

f. *Medo aggravating factors*: excessive intake of oily foods, sweets, alcohol and lazy attitude [11, 12].

Pathogenesis of tumors

According to Ayurvedic principles, the disease cannot be named on its own because it differs between persons in terms of illness, clinical presentation and also the treatment required [14]. Thus, pathogenesis in Ayurveda is explained on the basis of *Tridoshas*. *Agni* or *Pitta*, which is present in each and every cell, is responsible for digestion and metabolism in human body. The decrease in *Agni* is inversely proportional to the related tissue and therefore in *arbuda,* the decreased state of *dhatwagni* (deranged metabolism) will result in excessive tissue growth. *Vata* can be correlated with the anabolic phase of growth whereas *kapha* to the catabolic phase. Cancer originates due to a metabolic crisis, i.e. aggravation of *vata* forces and suppression of *kapha* forces, both interacting with one another resulting in proliferation. However, the abnormal cancerous growth at a specific organ (*Ekadesavriddhi*) is managed by Compensation from other parts of the body (*Anyasthaniyakshaya*), e.g. body weight loss (cachexia) [17]. *Sushruta* has proposed six stages in the pathogenesis of all diseases but his concept suits more to the pathology of the tumor than pathogenesis itself.

1. *Sanchaya*: early stages of localized neoplastic changes.

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2. *Prakopa*: transformation of primary growths into metastatic tumors.

3. *Prasara*: metastasis.

4. *Sthana samsraya*: complete metastasis and secondary growth.

5. *Vyakti*: clinical signs and symptoms are expressed.

6. *Bheda*: the stage where differentiation of growth occurs on the basis of histopathology[17].

CANCER THERAPY — a practical dilemma

Any practical solution in combating this dreadful disease is of paramount importance. An alternative solution to western medicine embodied with severe side effects is the use of medicinal plant preparations to arrest the insidious nature of the disease. Many herbs have been evaluated in clinical studies and are currently being investigated phytochemically to understand their tumouricidal actions against various cancers. Thus, cancer patients who already got crippled with this disease, further burdened by drug-induced toxic side effects have now turned to seek help from the complementary and alternative medicine hoping for a better cure. Ayurvedic therapy was found to be able to cure these chronic diseases better, which were previously not amenable to treatment by western medical practices. This traditional Indian medicine with its evolution through centuries has always fascinated practitioners and researchers for its applications in cancer treatment on a scientifically proven research background.

Principles of ayurvedic treatment

Abuse of nature's law upsets the human system and ends up in disease like cancer. It is again the nature, the foremost physician who brings the cure. The Ayurvedic system of medicine was well founded on the basic principles of nature and its elements after a careful and thorough study of human physiology. This is the first system to emphasize health as the perfect state of physical, psychological, social and spiritual component of a human being. The therapeutic approach of Ayurveda has been divided into four categories as *Prakritisthapani chikitsa* (health maintenance), *Roganashani chikitsa* (disease cure), *Rasayana chikitsa* (restoration of normal function) and *Naishthiki chikitsa* (spiritual approach) [18]. Finding the cause of an illness is the basic goal of ayurvedic therapy. It classifies disease development into six stages that include aggravation, accumulation, overflow, relocation, build-up in a new location, and manifestation into a recognizable disease. Ayurvedic physicians can diagnose an illness at even initial stages of body imbalance and their therapeutic approach maintains a balance by supplying deficient substances as well as reducing the excessive ones. Surgery is considered only for advanced cases.

Ayurvedic texts about cancer treatment

During the 7th century BC, Atreya and Dhanwantari used herbal medicines for treating the early stages of cancer and surgery in advanced cases. In the 8th century AD, Vagbhata, a Buddhist physician composed two texts: *Astanga Hrdaya* [19] and *Astanga sangraha* [20] where new methods for cancer treatment were introduced. Other Ayurvedic texts of internal medicine, viz., Chakradatta [21] composed by Chakrapani (10th century AD), the *Sarangadhara Samhita* [22] by Sarangadhara (14th century AD), the *Bhavaprakasha Samhita* [23] by Bhavamisra (15th century AD), the Satmya Darpan Samhita by Viswanath (16th century AD), the Vaisajya

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Ratnabali by Binoda Lala Sen Gupta (18th Century AD), the Rasatarangini by Sadananda Sharma (19th century AD), etc. explain numerous remedies to treat internal and external neoplasms.

Treatment modalities

Sodhana chikitsa (purification process), which eliminates vitiated *doshas*, have been primarily used for medical management of cancer. When both internal and external medications were given then it is called as *panchakarma chikitsa*. The other type of curative therapy is called *somana chikitsa*, which pacifies *dosha* and gradually relieves the disease. However, this treatment is prescribed only to weaker patients for whom *sodana chikitsa* is contraindicated. In *Rasayana prayoga* (immunotherapy), certain poisonous plants, mercury like metals and animal products were rendered non-toxic and harmless by the use of alchemy and are used as rejuvenating drugs. Other methods of treatment include, *dhatwagni chikitsa* (correction of metabolic defects), *vyadhipratyanika chikitsa* (specific anti-cancerous drugs) and *lakshanika chikitsa* (symptomatic treatment) [24]. When medical treatment practices fail, then the case was left to surgeons. Surgical cancer management in *Ayurveda* include the principles of fomentation by means of external application, cleansing by internal medication, treatment to liquefy the contents of the swelling, opening the tumor surgically for evacuation of its contents, cauterization to avoid recurrence and post-operative care for healing the wound [15].Cauterisation with alkalis and acids and other surgical procedures were performed with herbal and mineral medicines. *Arbuda* is excised completely from its deep root seat and cauterization done to destroy any of the remaining cell particles [24].

Classical drugs claimed in ayurvedic texts

Traditional line of treatment: Traditional methods employed in treatment of various cancers were given in Table 1. In addition to these traditional methods, various herbal combinations mentioned in Ayurvedic texts are listed in Table 2. The main objective of these tables is to support the physicians and researchers to utilize these traditional methods as well as herbal drugs for an effective cancer treatment.

Table 1: Classical treatment protocols for various tumors in Ayurveda.

Type of Tumor	Tumor subtypes	Classical treatment procedures
Granthi	*Vatika granthi*	*Helloborus niger*, *Tinospora cordifolia*, *Clerodendron serratum*, *Aegle marmelos*, *Hoya viridiflora*, *Elephantopus scaber*, *Soymida febrifuga* and *Gynandropis pentaphylla*were applied locally
	Paittika granthi	*Terminalia chebula* powder *with* either grape or sugarcane juice were used orally. The paste of

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		Glycyrrhiza glabra, *Eugenia jambolana, Terminalia arjuna* or *Calamus rotang* were used of external application
	Kapaja granthi	Paste of *Capparis spinosa*, *Capparis sepiaria*, *Agati grandiflora*, *Lagenaria vulgaris*, *Premna herbacea*, *Pongamia glabra*, *Musa sapientum* and *Randia dumetorum* used in local application
Arbuda	Classical procedures	Fomentations, cauterisation, scraping, bloodletting, medicated enemata and other surgical procedures
	Traditional treatment	Habitual intake of *Basella rubra* or application of alkali preparation of *Musa paradisiaca*, *Conch shell ash*, *Elaeocarpus tuberculatus*, *Sulphur*, *Potassium carbonate*, *Embelia ribes* and *ginger* were used to cure *arbuda*
	Vataja arbuda	Paste of *Benincasa cerifera*, *Cucumis memordica*, *Cocos nucifera*, and *Eranda beeja*, *Ricinus communis* along with butter or milk were applied
	Pittaja arbuda	Tumours were treated with leaves of *Ficus glomerata*, *Tectona grandis,* and *Elephantopus scaber* repeatedly and then with a honey mixed fine paste of *Aglaja roxburghiana*, *Caesalpinia sappa*, *Symplocos racemosa*, *Terminalia arjuna*, *Xanthium strumarium* was applied
	Kaphaja arbuda	After surgical removal of tumour, a drug that remove doshas from both the ends (vomiting and purgation) were employed. Then for purification, a decoction of *Clitoria ternatea*, *Jasminum grandiflorum* and *Nerium odorum* leaves was used. For the postoperative care, oil cooked with *Premna herbacea*, *Embelia ribes*, *Cissampelos pareira* was applied
	Medoja arbuda	*Curcuma domestica*, *Triticum sativum*, *Symplocos racemosa*, etc. were made into a powder and applied externally by mixing them with honey. Oil from *Pongamia glabra* were used of internal administration

Table 2: List of herbs commonly used in ayurvedic anticancer treatment.

No	Name of the Herb	Method and Use
1	*Vitis vinifera*	The mixture of *Terminalia chebula*, grape juice and *sugar cane juice* has been used [3]. Resveratrol, a natural product

		derivative from grape juice has been proved to possess cancer chemo preventive activity
2	*Baliospermum montanum*	The paste comprising of *Baliospermum montanum*, *Plumbago zeylanica*, *Euphorbia neriifolia*, *Calotropis procera*, jaggery, *Semecarpus anacardium* applied over the tumours.
3	*Madhuca indica*	This paste is prepared from the barks of *Madhuca indica*, *Syzygium cumini*, *arjuna Terminalia arjuna* and *Salix caprea* and prescribed for local application
4	*Pandanus odoratissimum*	A paste of *Pandanus odoratissimum* with sugar was applied externally
5	*Pterospermum acerifolium*	The flowers of *Pterospermum acerifolium* mixed with sugar to be applied locally
6	*Raphanus sativus*	Local application of *Raphanus sativus* powder paste with the radish ash was considered effective against *kaphaja arbuda*
7	*Barleria prionitis*	The *Barleria prionitis* oil prepared with whole plant is indicated for external application during acute stages of cyst in blood vessels
8	*Prosopis cineraria*	This paste made up of *Prosopis cineraria* seeds, *Raphanus sativa*, *Moringa oleifera*, barley and mustard with sour buttermilk was applied locally for disintegrating cysts
9	*Amorphopallus campanulatus*	The mature tuber is first burnt and then mixed with butter and jaggery and applied for tumour destruction
10	*Oxoxylum indicum*	The drug *Oxoxylum indicum* prescribed in treatment of *granthi*
11	*Basella rubra*	The plant and leaves are ground with sour buttermilk with salt for preparing a poultice and indicated for *arbuda*
12	*Flacourtia romantchi*	The paste of *Flacourtia romantchi, Cassia fistula*, *Capparis sepiaria*, is recommended for *kaphaja* tumours
13	*Moringa oleifera*	The paste of *Moringa oleifera* seeds, *Solanum xanthocarpum*, *Sinapis dichotoma*, *Holarrhena antidysenterica* and *Nerium odorum* roots prepared with buttermilk is used for *arbuda* tumors
14	*Ficus bengalensis*	Application of mixture of *Ficus bengalensis* and *Saussurea lappa* spacify tumor growth on bone
15	*Curcuma domestica*	The *Curcuma domestic* powder in combination with *Symplocos racemosa*, *Soymida febrifuga*, is mixed with honey and this is used as an external remedy

SCIENTIFIC PRINCIPLES OF AYURVEDIC ANTICANCER DRUGS

Herbal decoctions consisting of multiple herbs each possessing tremendous potential for a cancer cure are commonly used in Ayurveda. These formulations are reported to work on multiple biochemical pathways and are capable of influencing several organ systems simultaneously. The benefit of an herbal decoction is that it can nourish the body as a whole by supporting various organ systems [25]. Many of the herbs mentioned below have scientifically-proven anti-cancerous properties and are used for the treatment of various cancers.

Andrographis paniculata

The extract and isolated diterpenes (andrographiside and neoandrographolide) from this plant are proved to be beneficial against tumourigenesis by their anti-lipoperoxidative action and by enhanced carcinogen detoxification action [26–29].

Annona atemoya/muricata

Bullatacin, an acetogenin isolated from the fruit of *Annona atemoya*, induces apoptosis, preceded by chromatin margination and tumour cells condensation[30].Several other annonaceous acetogenins, e.g. muricins A–G, muricatetrocin A and B, longifolicin, corossolin, and corossolone are also showed to be significantly selective in bringing in vitro cytotoxicities to tumour cells [31].

Phyllanthus niruri/amarus

An aqueous extract of *P. amarus* increases the life span of the tumour bearing rats and normalizes-glutamyl transpeptidase activity[32]. It plays a major role in disruption of HBsAg mRNA transcription and post-transcription which could be beneficial against viral carcinogenesis [33].

Piper longum

Piperine, an active alkaloid extracted from this plant has been used as an ingredient of ayurvedic anticancer formulations because of its anti-oxidative potency in both in vitro and in vivo conditions [34].

Podophyllum hexandrum linn. (Podophyllin)

It is a powerful anticancer drug against various cancers for e.g. sarcomas, adenocarcinoma and melanoma. Podophyllin and its active principle, podophyllotoxin are known for their cytotoxic effect by virtue of their properties of mitotic inhibition, nuclear fragmentation, impaired spindle formation and they are also found to be karyoplastic. The mechanism of action has been suggested as necrosis and is a direct consequence of its cytotoxic effect on tumour tissues. These derivatives have been analysed in cancer chemotherapeutic studies and the methods of preparation of these compounds are patented[10]. In recent days, chemically modified podophyllotoxins are widely used in cancer therapeutics. VP-16 (etoposide), a podophyllotoxin derivative has been tested against in vitro and in vivo cancer cells and been used against hepatic cancers for more than a decade[35]. It has proved its efficacy in combination with epirubicin in phase II studies [36, 37]. By this combination therapy at least 3% of the patients had complete cure and 36% had partial

response. P-glycoprotein, a drug efflux pump, seems to be less effective in reducing VP-16 concentration in cancer cell lines and hence this drug proves to be more efficient in these cells [38]. It is also safe even above therapeutic dosage without much toxic effects[39].

Tinospora cordifolia

The active principles from *T. cordifolia* enhance host immune system by increasing immunoglobulin and blood leukocyte levels and by the stimulation of stem cell proliferation. It has the ability to reduce solid tumour volume by 58.8%, which is comparable to cyclophosphamide, a known chemotherapeutic agent [40–42]. These immunostimulating properties can be used in the prevention of tumour mediated immunosuppression and hence could be a drug choice for various cancers.

Semecarpus anacardium

In Ayurveda classics, numerous references are available on the anticancer properties of *Semecarpus anacardiu* nuts[43]. An extensive review describes the phytochemical and pharmacological properties of *S. anacardium* [44]. The chloroform extract of *S. anacardium* nut possess antitumour action with increased life. span against leukaemia, melanoma and glioma [45,46]. The milk extract of *S. anacardium* produces regression of hepatocarcinoma by stimulating host immune system [47] and normalizing tumour markers including alpha-fetoprotein levels [48,49]. This preparation stabilizes the lysozomes, and normalizes glycoprotein and mineral content in the body during cancer progression [50,51]. It also corrects hypoglycaemia[52] and controls abnormal lipid peroxidation[53] by the maintenance of antioxidant defense status [54]. In the microsomes, it acts as a bifunctional inducer of both phase I and II biotransformation enzymes and prevents tumour initiation by preventing carcinogen activation [55,56]. Histologically, on treatment with the *S. anacardium* extract to hepatocarcinoma animals, the liver sections showed almost a normal architecture. The nodules become completely regressed and further cell necrosis was prevented[57]. *Anacartin forte,* another preparation from *S. anacardium* has been used for several decades as an anticancer drug since it is giving health improvement with alleviation or disappearance of troublesome symptoms. It provides clinical benefit with an extension of survival time in various cancers including oesophageal, chronic myeloid leukaemia, urinary bladder and liver cancer [58]. Another Ayurvedic drug containing *S. anacardium*, *Amura rohitaka*, *Glycyrrhiza glabra* and copper powder were reported to inhibit breast tumour development in mice by significantly extending the survival period. This drug was also found to be efficient in clinical trials[13]. Ayurvedic herbs, which are widely used and scientifically proven of their anticancer properties, are present under,

Agar
(Aquilaria agallocha)

Agnimantha
(Premna integri folia)

Amla
(Emblica officinalis)

Ashwagandha
(Withania somnifera)

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Bala
(Sida cordifolia)

Basil
(Ocimum sanctum)

Guduchi
(Tinospora cardi folia)

Guggul
(Commiphora mukul)

Bilva
(Aegel marmelos)

Brihat Kantakari
(Solanum indicum)

Isabgol
(Plantago Ovata Husk)

Jeevanti
(Leptadenia reticulata)

Bhumiyamalaki
(Phyllantus amarus)

Chandan
(Santalum album)

Kachur
(Curcuma zedoary)

Karkatakashringi
(Pistacia integerrima)

Draks
(Vitis vinifera)

Ela
(Ellateria cardamomum)

Kushta
(Saussurea lappa)

Laghu Kantakari
(Solanum xanthocarpum)

Gambhari
(Gmelina arborea)

Gokshura
(Tribulus terrestris)

Mustak
(Cyprus rotundus)

Neem
(Azadirachta indica)

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Nagkeshar
(Mesua ferrea)

Neelotpala
(Nymphaea stellata)

Pippali
(Piper longum)

Punarnava
(Spreading Hagweed)

Salai Guggul
(Boswellia Serrata)

Vasa
(Adathoda vasica)

Shatavari
(Asparagus racemosus)

Shilajit
(Mineral Pitch)

Shynaka
(Oroxylum indicum)

Tejpatra
(Cinnamomum tamala)

Turmeric
(Curcuma longa)

Varahikand
(Dioscorea bulbifera)

Figure 1: Sources of Ayurvedic drugs.

POTENTIAL BENEFITS OF AYURVEDA DURING CANCER CACHEXIA

Cancer cachexia is a common clinical problem that substantially impacts upon the quality of life and survival of cancer patients. The pathophysiology of this syndrome implicates tumor induced metabolic changes and immune responses. Clinical manifestations include anorexia, chronic nausea and change in body image. Among several potential benefits of ayurvedic medicine, relief from cancer cachexia is especially valuable.

An Ayurvedic herb used in cancer therapy results not only in total healing, but also reduces the side effects and cancer associated complications. It also avoids the need for supplemental therapy to manage cancer cachexia. Each herbal product contains multiple active principles that may operate synergistically, producing therapeutic benefits and lowering the risks on adverse effects. The anorexia or weight loss could be effectively managed by *Withania somnifera*, *Sida cordifolia*, *Asparagus racemosa*, *Vitis vinifera*, *Plumbago zeylenica*, *Tinospora cordifolia*, *Zingiber officinale*, *Coptidis rhizoma*, etc. These herbs have been shown to improve appetite, food intake, malnutrition, fatigue and sensation of well-being which could elicit bodyweight gain. These

herbs might stimulate the flow of digestive juices, thereby improving digestion and increasing the appetite. *Aegle marmelos*, *Holarrhenaantidysenterica*, *Punica granatum*, *Cyperus rotundus*, *Emblica officinalis*, and *Plumbago zeylanica* can be used as anti-diarrhoeals when diarrhoea becomes one of the complications of cancer cachexia. *Terminalia chebula* could be useful against chronic constipation and digestive disorders which are common in cancer patients resulting in loss of appetite. *Eclipta prostrata*, *Emblica officinalis*, *Withaniasomnifera*, *Piper longum* can be directed to correct nausea and vomiting [59]. Among the above-mentioned herbs, *Withania somnifera* [60] and *Tinospora cordifolia* [42] are also proven to be powerful immunostimulants, which could increase body resistance power during cancer associated immunosuppression.

Ayurvedic anticancer therapy includes recommendations for lifestyle and use of specific foods and herbs which are very helpful not only in preventing the progression of the disease but also makes the patients feel better and comfortable overcoming the symptoms. *Allium sativum* (garlic) could be helpful to manage pain and ache. *Bacopa monniera* strengthens mental faculties and helps to manage insomnia or sleeplessness due to stress[61]. An herbal combination of *Withania sominifera*, *Asparagus racemosa*, *Hydrocotyle asiatica*, *Nardostachys jatamamsi*, *Elettaria cardamomum*, *Tribulus terrestris*, *Zingiber officinalis* and *Eclipta alba* could also be useful in the treatment of anxiety, tension and insomnia. *Ocimum sanctum* is beneficial against stress and depression during cancer. *Curcuma longa*, *Zingiber officinale*, *Glycyrrhiza glabra*, *Terminalia chebula*, *Ocimum sanctum* and *Adhatoda vasica* are used to control cough and shortness of breath especially for lung cancer patients[59]. Thus, ayurvedic therapeutic regimen rejuvenates the body tissues, tones up the systems and act as a tonic to the body against cancer cachexia. This kind of orientation toward total healing and health promotion makes ayurvedic treatment approach to cancer therapy promising.

CANCER THERAPY IN AYURVEDA - Learning from the past, examining the present and advancing to the future,

Because large population use ayurvedic medicine worldwide, there is an urgent need for additional, carefully conducted, high-quality intensive research to evaluate its efficacy and to develop this discipline to meet ever-new challenges of modern medicine in the field of oncology. The most stringent evaluation should take place with gold standards for clinical research—the randomised controlled clinical trial (RCT). Priority for research funding should be given to clinical investigations in Ayurveda involving well-designed studies with encouraging results especially for diseases like cancer to which conventional medicine has been shown to be less effective. Attention should be given not only to the evaluation of safety and examination of effectiveness in treatment strategy, but also to the consideration of community practice settings, patient expectations, compliance and cost effectiveness. Standardization and quality production of herbal products may allow us to develop low cost therapies with reduced risk over pharmaceuticals. In any case, studies on anticancer ayurvedic drugs will be popular from the economy point of view because cancer is becoming the major cause of death.

CONCLUSION AND FUTURE DIRECTIONS

It is estimated that > 80% of the world's population cannot afford modern medicines. In addition to cost, current cancer therapies are minimally effective and exhibit toxicities that are intolerable in most cases. This review presents evidence that agents derived from plants used in Ayurvedic medicine can be used not only to prevent cancer, but also to treat cancer. Because of their pharmacological safety, these agents can be used alone or as adjuncts to current chemotherapeutic agents to enhance therapeutic effects and minimise chemotherapy-induced toxicity. Because cancer is primarily a disease of older age, finding less toxic therapies is a major priority. This review reveals that the molecular targets of chemopreventive agents are similar to those currently being used to treat cancer. Tumour cells use multiple cell survival pathways to prevail, and agents that can suppress these multiple pathways have great potential in the treatment of cancer. The evidence indicates that most of the plant-based agents used in Ayurvedic medicine do indeed suppress multiple pathways. More research is needed in order for these agents to reach their full therapeutic potential.

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