Indo Global Journal of Pharmaceutical Sciences, 2021; 11(3): 20-27

INDO GLOBAL JOURNAL OF PHARMACEUTICAL SCIENCES
ISSN 2249- 1023

Ayurveda in Management of Side Effects of Oncotherapy

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Received: 07.05.2020
Accepted: 21.08.2020
Published: 30.04.2021
Keywords
Ayurveda; Radiotherapy; Chemotherapy; Dosha, Visha.

ABSTRACT: Cancer, being a leading cause of death takes away approximately 9.6 million life per year globally. Drugs, chemotherapy and radiation therapies used for cancer treatment are often toxic and damages the adjacent healthy cells. The side effects may be acute (occurring within a few weeks after therapy), intermediate or late (occurring months or years after the therapy). The presently available "protectors" for overcoming the side effects of therapy have not been up to the mark which creates the need of finding a more efficient alternative. Ayurveda an ancient system of medicine and most widely practiced especially because of its side effects free treatment principles. According to Ayurveda, there are three 'doshas' (Vata, Pitta, and Kapha). The side effects of chemotherapy and radiotherapy are very common with the signs of aggravated 'pitta dosha'. In Ayurveda, two 'vishas' (gara and dushivisha) are also there. Theses cause symptoms like chemotherapy and radiotherapy side effects. The 'kapha' helps the 'visha' to retain inside the body. In the Vedic system, cancer is viewed as a psychic disorder, a disruption in the aura allowing the entrance of a negative astral force. Emotional cleansing, mantra, and meditation are important to counter this. The Polyherbal preparations (Chavanprash avaleha, Triphala) show control on the side effects of chemotherapy and radiotherapy by showing the radio-protective effect. Here in this review, we have tried to demystify the Ayurveda principles and its role for the possible treatment of side effects of chemotherapy and radiotherapy with a view leading to enhanced quality of life for cancer patients.

Cite this article as: Sarkar, S.; Choudhury, A.; Dey, B.K. Ayurveda in management of side effects of oncotherapy. Indo Global J. Pharm. Sci., 2021; 11(3): 20-27. **DOI**: http://doi.org/10.35652/IGJPS.2021.113003 .

INTRODUCTION

Cancer has become the second most serious disease threatening human life, after cardiovascular diseases [1]. Due to population growth and aging, the affected and death rate associated with cancer are rapidly increasing globally which reflects the increase in the prevalence and distribution of major risk factors of cancer [2-3]. The global cancer burden is estimated to have risen to 18.1 million new cases and 9.6 million deaths in 2018. Worldwide, one in 5 men and one in 6 women develop cancer during their lifetime, like that one in 8 men and one in 11 women die from the disease. The total number of people who are alive within 5 years of a cancer diagnosis, called the 5-year prevalence, is estimated to be 43.8 million [4]. Chemotherapy and radiotherapy are highly used and effective methods of cancer treatment. Chemotherapy is taken by mouth or injection and usually exposes the whole body to cancer-fighting drugs, but radiation therapy is usually a local treatment [5]. Approximately 50% of all cancer patients receive radiation therapy during their treatment [6-7]. Radiation therapy contributes around 40% towards curative treatment [8]. Only because of chemotherapy the mortality rate due to cancer started declining from 1990 [9]. But these two promising techniques come with several side effects. Anorexia, Nausea, Vomiting, Alteration in taste, Sleep disturbances, Headache, Dry skin, Constipation are side effects of Radiotherapy and Alopecia, Constipation, Nausea-vomiting, Diarrhea, Mucositis, etc. comes with chemotherapy. In the case of long term administration pharyngitis, esophagitis, laryngitis, persistent dysphagia, fatigue, hepatotoxicity, infertility, and cognitive deficits also occur. It can also cause secondary tumors [10-12]. Ayurveda is considered by many scholars to be the oldest healing science. In Sanskrit, Ayurveda means "The Science of Life" [13]. According to Ayurveda, there are three "Doshas" (Vata, Pitta, Kapha) and two "Vishas" (Gara and Dushi), manifestations of

these (mainly Pitta Dosha) is related with the side effects of Radio and Chemotherapy. Conventionally, chemo and radioprotector were used to treat side effects but due to the failure of these two, Ayurveda is now coming into knowledge. And the most interesting part is that Ayurveda does not have any side effects [10].

Radiotherapy: Radiation therapy is used to cure cancers that are localized. It also can provide local control or complete response with no recurrence in the treated area or symptom relief in cancers. Radiation may be used alone or with other treatments, such as surgery, chemotherapy, hormones, or targeted therapy.

High-energy radiation damages genetic material (deoxyribonucleic acid, DNA) of cells and thus blocking their ability to divide and proliferate further. Although radiation damages both normal cells as well as cancer cells, the goal of radiation therapy is to maximize the radiation dose to abnormal cancer cells while minimizing exposure to normal cells, which is adjacent to cancer cells or in the path of radiation [14].

Radiation therapy can be given in three ways:

1. External radiation: This technique uses a machine that directs high-energy rays from outside the body into the tumor. It's done during outpatient visits to a hospital or treatment center. It's usually given over many weeks and sometimes will be given twice a day for several weeks.
2. Internal radiation: Internal radiation is also called *brachytherapy*. A radioactive source is put inside the body into or near the tumor. With some types of brachytherapy, radiation might be placed and left in the body to work. Sometimes it is placed in the body for a while and then removed.
3. Systemic radiation: Radioactive drugs given by mouth or put into a vein are used to treat certain types of cancer. These drugs then travel throughout the body [5].

Chemotherapy: Drugs in this class differ from all others in that they are designed to inhibit/kill the infecting organism and to have no/minimal side effects on the recipient. This type of therapy is generally called chemotherapy which has come to mean 'treatment of systemic infections with specific drugs that selectively suppress the infecting microorganism without significantly affecting the host.' The basis of selective microbial toxicity is the action of the drug on a component of the microbe (e.g. bacterial cell wall) or metabolic processes (e.g. folate synthesis) that is not found in the host, or high affinity for certain microbial biomolecules (e.g. trimethoprim for bacterial dihydrofolate reductase). Due to an analogy between the malignant cell and the pathogenic microbes, the treatment of neoplastic diseases with drugs is also called 'chemotherapy'. The anticancer drugs either kill cancer cells or modify their growth. However, the selectivity of the majority of drugs is limited and they are one of the most toxic drugs used in therapy [15].

Medications used in chemotherapy are usually given using an infusion into a vein (IV drip), but some can also be taken as tablets. Different drugs are often given in combination with one another. These medications travel in the bloodstream and usually affect the whole body. So they can also reach cancer cells that aren't detected in examinations, and that can therefore not be targeted with surgery or radiation. This kind of treatment is known as systemic treatment. In some cases, local chemotherapy is also used. In the case of Basal cell carcinoma, the chemotherapy medications applied as a cream or an ointment, which only acts locally.

People who receive chemotherapy over a long period can sometimes get these drugs through a device called a port. A port is a small container that is inserted under the skin in an outpatient operation and connects to a large vein with a thin tube. It's even possible to do chemotherapy with tablets at home. But it may still be necessary to stay at the hospital for very intensive treatments. This is the case, for example, if there's a high risk of infection or if doctors have to do frequent checks, for example of kidney function [16].

Chemotherapy is an important component of treatment for many cancers, and new anti-cancer drugs represent one of the largest areas of pharmaceutical development [17, 18]. However, the nature of chemotherapy means that while damaging cancer cells it also damages healthy cells, leading to side effects [19].

Table 1. List of radioprotectors and chemo protectors

Protectant & Description	Mechanism of action	Ref.
Dexrazoxane (Derivative of EDTA)	Cardio-protection is achieved by chelation of intracellular iron	[21,22]
Mesna (Thiol compound)	functions as a regional detoxicant of the oxazaphosphorine metabolites	[20]
Amifostine (Formerly known as WR-2721, it is a naturally occurring thiol, it is a prodrug)	Metabolite WR-1065, scavenges oxygen-derived free radicals and hydrogen donation to repair damaged target molecules	[20, 23]
Palifermin (Recombinant human keratinocyte growth factor and 140 residues long.)	acts on epithelial tissue to protect it from chemotherapy and radiation-induced mucosal injury	[23]

CONVENTIONAL METHODS FOR TREATMENT OF RADIO AND CHEMOTHERAPY'S SIDE EFFECTS

Radio and Chemotherapy are both very promising therapy for cancer treatment. Half of the cancer patients get these therapies. In most cases, they get a very positive result. But

these two therapies come with a list of side effects that can harm the quality of life of the patients [20]. So to control the side effects mainly three therapeutic agents are used.

- Protectors- given for tissue damage before the appearance of symptoms.
- Mitigators- given during or shortly after a course of radiation therapy.
- Treatments- given when toxicity develops months to years after therapy [10].

Some examples of protectors and their mechanism of action are noted in **Table 1**.

AYURVEDA ON CANCER, RADIO AND CHEMOTHERAPY

Ayurveda is the oldest science of healing. According to Ayurveda, the human body is indivisible and health is a stable state of the network of the interrelated functions of body, mind, and consciousness. So disease is the disturbance in the stability of this network [24]. In Ayurveda cancer is negative life energy that has entered into the body. The negative energy comes from the excess "Apana" which is downward moving air. Cancer cells show growth outside the rule of "Parna" or oxygen [25]. In both Charaka and Sushruta Samhita cancer is described as inflammatory and non-inflammatory. The terms "Granthi" and "Arbuda" have been used to denote minor or major neoplasm respectively [26].

In Ayurveda cancer (Arbuda) is divided into many types-

1. Types of Arbuda according to "Dosha"- According to Acharaya Sushruta, There are three doshas (humors) "vata" (all kinds of movements in the body such as circulation, nerve impulse travel, respiration etc), "pitta" (digestion, metabolism, oxidation, conjugation, reduction, enzymatic and hormonal activities etc), and "kapha" (body moisture, the stability of the joints, firmness of the body, bulk, strength, weight, and endurance). Extreme diversion of doshas, may lead to fatality. So according to the symptoms the variations of different types of Arbuda can be labeled as "vataja" , "pittaja", "kaphaja" and arbuda which has symptoms of all three humours is called "tridasaja".
2. Types of Arbuda according to Dhatu- According to Sushruta in Nidhana Sthana, there are seven Dhatus (Tissue or cells) named "rasa" (plasma), "rakta" (blood), "mamsa" (muscle),"meda" (Fat), "asthi" (bone), "majja" (marrow/nerve), "sukra" (reproductive tissue). Four dhatus are involved in Arbuda and they are "medajaarbuda", "mamsajaarbuda", "raktajaarbuda", and "adhyasthi".
3. Types of Arbuda according to Site- According to Sushruta, Arbuda can occur in any of the parts of the human body. There are some examples of arbudas are "Vartmarbuda" (eyelid), "Karnarbuda" (ear), "Nasarbuda" (Nose), "Taluarbuda" (Palate), "Jalabuda" and "Ostharbuda" (Lip), "Galarbuda" (Throat), "Mukharbuda" (Buccal mucosa) and "Sirarbuda" (Tumors of head or brain). Genital organs also show arbudas like "mamsarbuda" and "sonitarbuda".
4. Types of Arbuda according to Prognosis- According to Ayurvedic texts, arbudas are differentiated in two categories named "sadhya" (probably cysts) and "asadhya" (incurable). Examples are "Mamsarbuda", "Raktarbuda" and "Tridoshaj" occurring in ear, nose, throat etc. are considered as "Asadhya" and benign tumors or chronic inflammatory swelling are considered as "sadhya" [27-28].

As discussed earlier the most promising therapies of cancer come with so many side effects and this affects the normal life of the patients. The conventional protectors have failed to cure the side effects. So now the Ayurveda has come to the mind of the scientists because if the side effects are cured by this method then it does not show any after-effects. Doshas have a very important part in the Radio and chemotherapy side effects. When the side effects have been seen through the Ayurvedic perspective, it has been noted that they are similar to the manifestations of aggravated "pitta dosha" especially under the group of disorders called "Raktapitta" (hemorrhage) or "Raktadushti" (vascular inflammation) [10].

Chemotherapy and radiotherapies are toxic substances and they harm the body in many ways that is why they show that many side effects. There are some "vishas" (toxic substances) described in Ayurveda. When some of them enter into the body shows effects similar to the chemotherapy and radiotherapy side effects. Two types of "vishas" are there which show the symptoms, they are- "garavisha" and "dushivisha". The 'kapha' helps the 'visha' to retain in the body.

Dosha: Ayurveda considers each human being to have a unique physical, physiological, and mental constitution so it requires the correspondingly unique treatment regime. In Ayurvedic philosophy, there are three doshas (humors) and these are "vata", "pitta', "kapha" of the body and it is important to determine the unique combination of physical, physiological, and psychological features of an individual [29].

- Vata: The meaning of the word "vata" is air. The qualities of vatas per Ayurvedic science include dryness, cold, lightness, mobility, penetration and roughness. These are responsible for all kinds of movements in the body such as circulation, nerve impulse travel, respiration etc. The category of Vata dosha includes processes responsible for cell division and cell signaling, movement at all levels of the physiology, excretion of wastes, and also cognition. Vata also regulates the activities of Kapha and Pitta.
- Pitta: "Pitta" is "Fiery dosha". Qualities of pitta mentioned in Ayurvedic texts include heat, sourness, and moisture together. Bodily functions such as appetite, thirst, digestion, metabolism, body heat, and eyesight, the softness of the body, lustre, mental calmness, and intelligence are governed by the pitta dosha. Pitta

manifests itself through the processes of digestion, metabolism, oxidation, conjugation, reduction, enzymatic and hormonal activities etc. Pitta dosha also includes processes responsible for metabolism, thermoregulation, energy homeostasis, pigmentation, vision, and attentional processes. The symptoms of aggravated pitta dosha match with the radio and chemotherapy side effects.

- Kapha: "Kapha" contains "watery elements" Kapha dosha has the qualities of moisture, steadiness, coolness, heaviness, softness and stickiness. Kapha is responsible for body moisture, the stability of the joints, firmness of the body, bulk, strength, weight, and endurance. Kapha dosha includes processes responsible for anabolism, growth, and maintenance of a structure, storage, and stability [29-30].

Visha: A position is commonly defined as a substance which when administered, inhaled or swallowed is capable of acting deleteriously on the body & hazardous damage to vital organs [31].

The word "visha" came from the word "vis" means root and having a preposition "ka". This means to encompass, pervade, or occupy. A substance that enters and vitiates the healthy "dhatu" of the body and may or may not show lethal signs and symptoms is defined as "visha". Vishas are classified into 2 main categories like Nasiargika and Kritima. Under kritrimavisha two types of poisons like Gara Visha and Doshi Visha [31-32].

Garavisha: Garavisha is a toxic combination of various toxic substances that exerts lethal effects after some interval of some time and as such doesn't kill the patient immediately. According to Acharya Charaka, "A Poison formed by the combination of different poison (Samyogaja visha) or concocted poison finds its reference under Gara visha other than the basic classification of Visha as Sthavaraand Jangama visha".

According to Acharya Sushruta and Acharya Vagbhata opines that the poison which is formed from the waste materials from the animals (excreta) or combination of medicines or bhasmas which are having opposite properties or the poisons having the less potency can be considered as Gara visha.

As per Acharya Yogaratnakara, It takes approximately 15days to 1 month for the signs to appear after the ingestion of the Gara visha.

Anemia, poor digestion, palpitation of heart, Flatulence, Edema in hands and feet, Distension in abdomen, Malabsorption syndrome, Tuberculosis, Abdominal lumps, Lethargy, Heaviness in body, Hemorrhage.

Dushivisha: Acharya Sushruta and Acharya Vagbhata described Dushi Visha as any kind of poison originating from inanimate or animate sources or any artificial poison (Kritrima Visha) retained in the body after partial expulsion or which has provisionally undergone detoxification, by the anti-poisonous drugs, the wind or the sun is termed latent poison (DushiVisha) Unfavorable environment (desha), time (kala), food (ahara), overexertion, mental dilemma, anger, etc. reduce the immunity of the person. In such circumstances, the eastern/frontal winds, sunlight, rain, clouds, indigestion, aama visha etc., help in the further vitiation of the dhatus & the symptoms of Dushi visha appear. The symptoms can be Loose stools, Altered complexion, Foul smell from mouth, Impaired olfactory and gustatory senses, Unquenchable thirst, Slurring and broken speech, Vomiting, Sorrow/Depression [31].

Ayurvedic preparations and their constituents for treatment of Radio and Chemotherapy's side effects

All conventional drugs show some side effects in the case of chemotherapy and radiotherapy. So the better treatment alternatives are the prime need of the time. The ancient practice of medicines may play a vital role in this regard as it follows only the natural way of healing with very few side effects. In India, Ayurveda has being practiced for many centuries as it contains knowledge of various ranges of diseases, their diagnosis, and treatment procedures. Some Ayurvedic preparations are currently being used to overcome the side effects caused due to radiotherapy and chemotherapy. Some ayurvedic preparations showing Chemo & Radio Protective effect are discussed in (**Table no. 2**) and some of the preparations, for which side effect they are used, main herb and their mechanism of action are noted in (**Table no. 3**).

Table 2. Ayurvedic preparations showing Chemo protective& Radio protective effect

Ayurvedic Preparations containing Chemo & Radio Protective effect with Main herbs	Mechanism of action	Ref.
Amrita prasham- Amla (*Embelica officinalis*), Tulsi (*Ocimum tenuiflorum*), Kesar (*Crocus sativus*), Mulethi (*Glycyrrhiza glabra*)	• Reduces the radiation-induced loss of body weight and arrested the decrease in the weight of liver, kidney, and spleen	[33]
Ashwagandha rasayana- Ashwagandha root (*Withania somnifera*)	• Prevents radiation induced emaciation • Decrease in the organ weight • Inhibits radiation-induced increase in serum glutamate pyruvate transaminase (GPT) levels and lipid peroxidation levels	[33]
Brahma rasayana- Contains 35 different plant extract among them	• Protects mice from radiotoxic effects • reduces the loss of organ (spleen liver and kidney) and body	[33]

Haritaki*(Terminalia chebula),*Amla (*Embelica officinalis*) are important.	weight • Decreased the levels of serum and liver lipid peroxides, alkaline phosphatase, and GPT • Increases the levels of lymphocytes and neutrophils in cancer patients undergoing radiotherapy	
Narasimha rasayana- Chitraka (*Plumbago zeylanica*), Gayatri (*Acacia catechu*), Haritaki (*Terminala chebula*), Vibhitaka (*Terminala belerica*) etc.	• Increases the body weight and the organ weights of the recipient mice • Decreases the levels of radiotoxic biochemical endpoints and the levels of serum and tissue lipid peroxides, serum alkaline phosphatase, and GPT	[33]
Chavanprash Avaleha- Amla (*Embelica officinalis*)	• Protects against the γ radiation-induced sickness and mortality.	[34]
Triphala- Haritaki(*Terminala chebula*), Vibhitak(*Terminala belerica*) and Amla(*Embilica officinalis*)	• Protects against the γ radiation-induced sickness and mortality.	[35]

Table 3. Ayurvedic preparations used in the management of side effects of chemotherapy& radiotherapy

Chemo & radio therapy Side effects	Ayurvedic Preparations & ingredients	Mechanism of action	Ref.
Anaemia	• Cow's milk or urine with Haritaki or Triphala decoction • Dhatria valeha-Amla (*Emblica officinalis*), shunti (*Zingiber officinale*), pippali (*Piper longum*), mrudwika (*Vitis vinefera*), yashtimadhu (*Glycyrrhiza glabra*), vamshalochana (*Bambusa arundinacea*).	Helps to increase the iron percentage in body	[36, 37]
Anorexia	• Liquid formulations made from the herbs such as Shunthi (*Zingiber officinale*), maricha (*Piper nigrum*), pippali (*Piper longum*), lodra (*Symplocos racemosa*), teja Patra (*Cinnamomum zeylanicum*) and yavaksharas (*Hordeum vulgare*) • Lavangadi churna	It improves digestion	[10]
Alopecia	• Manjishthadikwatha-Manjishta (*Rubia cordifolia*), Kalinga (*Holarrhenaanti dysenterica*), Amrita (*Tinospora cordifolia*), Musta (Cyperus rotundus), Bala (*Sida cordifolia*), Sunti (*Zingiber officinalis*), Haridra (*curcuma longa*), Kshudra (*Solanum melongena*) • Triphala Yavakutakwatha • Gunjabeeja (*Abrus precatorius*) Lepaalong with Gunja Taila	• Manjishthadi kwatha acts as a blood purifier • Triphala and Gunjabeeja Lepa have Antioxidant, Wound healing, Antimicrobial, Anti-inflammatory	[38]
Bleeding & Bruising (thrombo-cytopenia)	• Giloy (*Tinospora cordifolia*) and Durwa (*Cynodon dactylon*) swarasa • Ojaswani churna, Shatavari Churna • Kumar kalyanras- *Aloe vera* juice extract, Bhasma of gold, iron and mercury and copper- iron pyrite	• Increases platelet count and increase WBC level	[39]
Constipation	• Triphala with warm water and ghee for increased pitta aggravates vata • "Erandtail" (caser oil) with the decoction of triphala or milk or with meat soup for increased pitta and vata • Polyherbal preparation of "Isabgol husk" (*Plantago ovate),* senna (*Senna alexandrina*) extract and triphala	• Act as laxative	[40]

Cognitive deficit	• Medhyarasayana- Shankhapushpi (*Convolvulus pluricaulis*), Brahmi, Guduchi (*Tinospora cordifolia*), Ashwagandha, Vacha (*Acorus Calamus*), Satavari (*Asparagus racemosus*), Yashtimadhu (*Glycyrrhiza glabra*), Jatamansi (*Nardostachys jatamansi*) • Chavanprash	• Used as brain tonics and improve the psychological faculties	[41]
Diarrhoea	• pepper powder with honey or butter milk with powder of chitraka(*Plumbago zeylanica*) • Pippalyadi yoga- long pepper (*Piper longum*), licorice, Bilva (*Aegle marmelos*), sowa (*Shatahva Anethum*), madana (*Randia spinosa*), Vacha (*Acorus calamus*), Kushta (*Saussurea lappa*), shati (*Hedychium spicatum*) etc. • dadimastakachurna- Shatavari (*Asparagus racemosus*), Gokshura (*Tribulus terrestris*), Bala (*Sida cordifolia*), Vamsha, Kankola (*Piper cubeba*), Madhusnuhi (*Chopachini Smilax glabra*), etc	• It cures Irritable Bowel Syndrome	[42]
Oedema	• Poonarnava (*Boerhavia diffusa*) with sandal wood (*Santalum album*) powder, turmeric (*Curcuma longa*) and water • Eucalyptus (*Eucalyptus globules*), mint (*Mentha sp.*), lemon (*Citrus limon*) oil and water	• Improves the blood circulation in the capillaries and reduces the swelling	[43]
Fatigue	• Ashwagandha ghrita • Satavari (*Asparagus racemosa*)	• Increases muscle recovery • Works on anaemia which causes fatigue	[44, 45]
Male Infertility	• Gokshuradi modaka- Gokshura (*Tribulus terrestris*),Guggulu (*Commiphora mukul*), Maricha, Sunti, Pippali, Amla, Bibhitaki, Haritaki, Mustak (*Cyperus rotundus*).	• Helps to cure erectile dysfunction	[46]
Female infertility	• Brihatashatavari Ghrita- Shatavari (*Asparagus racemosus*)	• The phytoestrogen performs directly binds to the estrogen receptor with out enhancing the endogenous estrogen levels	[47]
Hepatotoxicity	• Panchagavya ghrita- cow milk, clarified butter from cow milk, cow urine, curd from cow milk, and cow dung juice • Rohitaka ghrita- Ronitaka (*Tecomella udumata*), Sunti, Maricha, Pippali, Haritaki, Vibhitak) etc.	• Used as a hepato protectant	[48]
Mucositis	• Mouth gargles with kalaka churna mixed with liquids such as water and honey- Tarkshya (*Berberis aristata*), Pata (*Cyclea peltata*), Sunti, Maricha • Yashtimadhu	• Acts as mucosal protectant	[49]
Nausea and Vomiting	• Powder of haritaki mixed with honey or the Juice of resins or cold water processed with tender leaves of "mango" (*Mangifera indica*) and jamun(*Syzygium Cumini*) • Kalyanaka Grita, Jivaneeya Ghrita for vomiting- Haritaki, Vibhitak and Amla, Devadaru (*Cedrus deodara*) etc. • Khandkushm and avaleha	• They have antiemetic property	[10]
Pharyngitis	• Khadiradi vati for chewing- Khadira (*Acacia catechu*), Arimeda (*Acacia leucophloea*)	• It acts as oral antiseptic, anti-inflammatory, astringent and expectorant	[50]
Pain	Massage with Til Tail (*Sesamum indicum*)	• palmitic, stearic, oleic, linoleic acids reduce the levels of prostaglandins and leukotrienes and thus decrease the pain. But the actual pathophysiology is not	[51]

		known.	
Sleep problem	• Whole-body massage • Taking Bath • Taking rice with curd or ghee or milk etc. • Listening soft and pleasant Music • Sleeping in a comfortable bed • Cuddling before sleeping	• All the processes calm the body and help to sleep	[52]
Skin changes	• Massage with bala(*Sida cordifolia*)taila (oil)	• It heals wounds and smoothens skin	[53]

CONCLUSION

The existing scientific shreds of evidence are loud and clear about the role of Ayurvedic therapy in the effective management of side effects that occur due to chemotherapy and radiotherapy. It may be concluded that the valuable information related to overcoming the side effects using the concept of Ayurveda may be beneficial for the researchers and health practitioners to develop better treatment strategies for the near future.

ACKNOWLEDGEMENT

Authors would like to express a special thanks to Assam downtown University for providing facilities and resources to carry out an extensive literature survey on the presented topic.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING SOURCE

No external funding source has been disclosed.

DATA AVAILABILITY

Not declared.

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