Prevention and Cure of Chemo-Radiotherapy Induced Toxicity through Ayurveda

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ABSTRACT
Chemotherapy and Radiotherapy are mainly used for the treatment of cancer but it also kills the normal body cells including W.B.C., R.B.C., Platelets and others along with cancer cells. These short term and long term hazards of chemotherapy or radiotherapy are called as acute or chronic toxicity, respectively. Febrile neutropenia, nausea, vomiting, diarrhoea, stomatitis, hair loss, fatigue, allergic reaction, peripheral neuropathy these are the clinical manifestation of acute toxicity of chemotherapy while anemia, nausea, vomiting, diarrhoea, non-infective cystitis, are the acute toxicity of radiotherapy. Osteoporosis, avascular necrosis, Cataract, Neuropsychiatric deficits, Neuropathy, Cardiomyopathy, Pulmonary dysfunction, Hepatorenal dysfunction and Infertility, are the chronic toxicities due to chemotherapy. Ayurveda has a potency to prevent and treat these toxicities by using basic principles of Ayurveda. SarivadiHima, Mouktikayuktakamdudha, Padmakadighruta, ShatavariKalpahelp to treat the toxic effect of chemo-radiotherapy while vomitab, Bilvachuran, Dadimastakchuran, Haridrati tail, Yastimadhu powder mouthwash, Nalpalmadi oil, Drakshavahlay, Urtiplex capsule and lotion, Bhumayamalki and Atibalachuran will help to relieve the toxicity symptomatically. Asthisanjharadichuran, Panchtiktsheervasti, Sukhavativarti, Kalyanakghrit, Amritaghyatalam, Soma churan, PunarnavadiKawath, Rohitakadivati, Kapikachaudichuran, Phalghritand Khjuraditalam should be given to treat the chronic toxicity of chemotherapy. AyurvedicRasayanalike Baladi, Nagabala, Vijyasaradi, Triphala, Shankpushpighrta, Aindra, Medhya, Neelkanth, Chyawanprash, Gokshuraka, Punarnava, Guduchiya, Shishukanjdrumghrita and Lauhabhasmadi, which may be helpful for preventions of the toxicity caused by chemotherapy. Thus, Ayurveda may play the major role to prevent and treat the acute and chronic toxicity of chronic-radiotherapy.

KEYWORDS Chemo-toxicity, Radio-toxicity, Vishakta, Ayurveda
INTRODUCTION

Chemotherapy is the use of any drug to treat any disease but the word chemotherapy means especially the treatment of cancer by cytotoxic & other drugs. Cancer is one of the leading causes of morbidity and mortality worldwide. According to National Cancer Institute, in 2016, there were an estimated 15.5 million cancer survivors in the United States\(^1\). In 2017, 1,688,780 new cancer survivors and 600,920 cancer deaths are projected to occur in the United States\(^2\). In 2018, an estimated 1,735,350 new cases of cancer patients will be diagnosed in the United States and 609,640 people will die from the disease\(^3\). The number of cancer patients is expected to increase to 20.3 million by 2026\(^4\). New data show that India now has the third highest number of cancer survivors among women after China and the United States\(^5\). Though chemotherapy plays a major role in the treatment of cancer but it gives potentially dangerous hazards which may be acute or chronic to the patient of cancer. The studies have shown that cancer survival rates after receiving chemotherapy can be as startlingly low as 2.1\(^6\). Chemotherapeutic agents are not specific for cancer cells, however, and the side effects of treatment are a result of their antiproliferative actions in normal tissues such as the bone marrow, skin and gut. Most cytotoxic drugs can have significant adverse effects having a narrow therapeutic window or index. Considerable supportive therapy is often required to enable patients to tolerate therapy and achieve benefit. Myelosuppression is common to almost all cytotoxics. This not only limits the dose of drug, but also can cause life-threatening complications\(^7\).

AIMS AND OBJECTIVES

1. To elaborate, evaluate and discussions of toxicity of Chemotherapy and Radiotherapy as per Ayurveda and modern science.

2. To elaborate, evaluate and discussions the role of Ayurveda to prevent and cure of chemo-radio induced toxicity.

METHODOLOGY

A thorough literary survey has been done to collect the compatible matters of this fundamental research. The text of Ayurveda including Brihatrayi, Laghutrayi, its concerned commentaries and modern textbook of medicine were referred to collect, evaluate, elaborate and to prepare the Ayurvedic clinical protocol for prevention and management of Chemo-Radio induced toxicity.
**CONCEPTUAL STUDY**

A. The Assessment of Acute Toxicity of Chemotherapy

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Assessment of Acute Toxicity of Chemotherapy (NCI 2012):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>Mild – 01</td>
</tr>
<tr>
<td>1. Neutrophils</td>
<td>$&lt; 1.5 \times 10^9 /L$</td>
</tr>
<tr>
<td>2. Febrile</td>
<td>Poor appetite without alteration in eating habits</td>
</tr>
<tr>
<td>Neutropenia</td>
<td></td>
</tr>
<tr>
<td>3. Nausea</td>
<td>Less than4 stools per day over baseline, mild increase in ostomy output compared with baseline</td>
</tr>
<tr>
<td>4. Vomiting</td>
<td>One episode in 24 hours</td>
</tr>
<tr>
<td>5. Diarrhea</td>
<td>Inflammation of the mucous membrane</td>
</tr>
<tr>
<td>6. Mucositis</td>
<td>Drug-induced fever (upto38°C), along with Transient flushing or rash, intervention not indicated</td>
</tr>
<tr>
<td>7. Hair loss</td>
<td>Fatigue relieved by rest</td>
</tr>
<tr>
<td>8. Fatigue</td>
<td>Asymptomatic, clinical or diagnostic observations</td>
</tr>
<tr>
<td>9. Allergic</td>
<td></td>
</tr>
<tr>
<td>Reaction</td>
<td></td>
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<tr>
<td>10. Anaphylaxis</td>
<td></td>
</tr>
<tr>
<td>11. Peripheral</td>
<td></td>
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<tr>
<td>Motor Neuropathy</td>
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</tbody>
</table>
12. **Peripheral sensory neuropathy**  
Asymptomatic, loss of deep tendon reflexes, or paresthesias  
Moderate symptoms limiting instrumental ADL  
Severe symptoms limiting self-care ADL  
Life-threatening consequences, urgent intervention indicated

13. **Extravasation**  
Erythema including associated symptoms like edema, pain, induration, phlebitis.  
Necrosis or Ulceration, severe tissue damage, operative intervention indicated  
Life-threatening conditions which need urgent intervention indicated

14. **Injection site reaction**  
Tenderness with or without associated symptoms (eg, warmth, erythema, itching)  
Ulceration or necrosis, severe tissue damage, operative intervention indicated  
Life-threatening consequences, urgent intervention indicated

ADL = Activities of Daily Living

**B. The Assessment Toxicity of Radiotherapy**

<table>
<thead>
<tr>
<th>Table 2 Assessment Toxicity of Radiotherapy</th>
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<tbody>
<tr>
<td><strong>Grade</strong></td>
</tr>
<tr>
<td>1. Anemia</td>
</tr>
<tr>
<td>2. Nausea</td>
</tr>
<tr>
<td>3. Vomiting</td>
</tr>
<tr>
<td>4. Diarrhoea</td>
</tr>
<tr>
<td>5. Cystitis non infective</td>
</tr>
</tbody>
</table>

**C. Ayurvedic Management of Chemotherapy-Induced Acute Toxicity**

I. **(Cold infusion): Sarivadi Hima**

<table>
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<tr>
<th>Table 3 Ingredient of SarivadiHima</th>
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<td><strong>Sr</strong></td>
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<td>7</td>
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</tbody>
</table>

_Hima_ is the cold infusion of fragrant or cold potency herbs which are intended to be used for _Pitta_ problems. _Himakalpa_ is mentioned by _Aacharya Sushruta_ in which all active ingredients are cold in potency. _Sarivadi Ganas_ prepared by immersing 10 gm (1 part) of each drug in 3 parts of water for 4 – 6 hours and then filtered and administered.

_Dose_- 40 ml (Internal)

**II. Mouktikayukta Kamdudha**

1. _Praval_ (Coral)-Madhur(Sweet), Amla (sour), Kashay(Astringent), Sheeta (Cold)
   - Madhur(Sweet) Pittashamak, KaphaghnaRasayan, Jwaraghna, Rakta-pittahar, Vishbadhahar
2. _Mouktika_ (Pearl)-Madhur(Sweet), Kashay (Astringent), Sheeta(Cold), Madhur(Sweet) Tridoshshamak, Dahashamak, Balya
3. _Shanka_ (Conch shell)-Tikta (Bitter), Ushana (Hot), Madhur(Sweet), Kaph-Pitashamak, Chhradighna
4. _Shauktika_ (Peral Shell)-Katu(Pungent), Sheeta(Cold), Madhur(Sweet), Vat-Pittagghna, Arochakahahar, Chhardighna
5. _Kapardika_ (Cowrie shell)-Katu(Pungent), Sheetoshna, Madhur(Sweet), Vat-Kaphaghna

6. _Guduchi_ (Tinosporacordifolia)-Tikta, Kashay, Ushna, Madhura, Tridoshshamak, Deepan, Pachak, Pittasarak, Balya, Raktashodhak, Jwaraghna, Dahaprasrama

7. _Gairik_ (Red Lumber Stone)-Madhur, Kashay, Sheet, Madhur, Pittashamak, Vishhara

**III. Padmakadi Ghruta**

1. _Padmak_ (Kamal)
   - Swaras(Nelumbo Nucifera)-Madhur, Kashaya, Sheet, Madhur, Pitta
   - Kaphanashak, Trushna(Thirst), Daha (Burning all over body), Visphot (Boils), Visha(Toxicity), Visarpa (Herpes), Raktapitaa (Bleeding through openings of body) Dahaprasahan, varnya, Chhardighna,
   - Trushnanirgrahan, Stambhan, Mutravirajaniya, Mutravirechaniya, Vishghana, Balya
2. _Durva Swaras_ (Cynodontadactylon Pers)-Madhur, Tikta, Kashaya, Sheet, Madhur, Pitta
   - nashak, Kaphanashak, Trushna (Thirst), Arochak (Loss of taste), Vanti (Vomiting), Visarpa (Herpes), Daha (Burning sensation), TwakRog (Skin disease) Prajashtapana, varnya, ropana, Dahprasahan, Stambhan.
3 **Anantmool** (HemidesmosIndicus)-
Madhur, Sheet, Madhur, Tridoshashamak, 
Agnimandya (Loss of appetite), Aruchi 
(Loss of taste), Kasa (Cough), 
Visha(Toxicity), Jwar (Fever), 
Atisar(Loose motion), Raktapitta(Bleeding 
through openings of body), Pittashamak, 
Rakatprasadak, Sthanyashodhan, 
Vishghna, Dahaprashaman, Jwarhar, 
Purishsangrahamiana 

4 **Goghrut**-Madhur, Sheet, Madhur, 
Vatshamak, Pittashamak, Vishanashak, 
Rasayan (Rejuvenator), Visarpa(Herpes), 
Daha(Burning all over the body), 

**Agnimandya** (Loss of appetite), 
Balvardhan, Agnidipan 

**IV. ShatavariKalpa**

1 **Shatavari** (Asparagus racemosus)-
Madhurtikta, Sheet, Madhur, Vat- 
pittashamak, Grahani (Irritabile bowel), 
Arsha (Piles), Kshay (Tuberculosis), Gulm, 
Atisar(Diarrhoea)Balya, Vayasthapan, 
Pittashamak, Rasayan, Netrya, 
Sthanyakar, Shothhar, Medhya, Rudhya, 
Vrashya, Agnivardhan 

2 **Sugar**-Madhur, Sheet, Madhur-Pitta 
shamak, Tarpan, Balya 

D. Symptomatic Ayurvedic Treatment of Chemotherapy Induced Acute Toxicity 

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Toxicity</th>
<th>Ayurvedic Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nausea Vomiting</td>
<td>Vomiteb Syrup&lt;sup&gt;14&lt;/sup&gt;: Adults: 10 ml three to four times a day. Child: 5 ml three to four times a day</td>
</tr>
<tr>
<td>2</td>
<td>Diarrhea</td>
<td>Bilva Churna&lt;sup&gt;15&lt;/sup&gt;: 3 gm + Dadimastaka churna&lt;sup&gt;16&lt;/sup&gt;: 3 gm</td>
</tr>
<tr>
<td>3</td>
<td>Stomatitis</td>
<td>Haridradi Tail ‘Gandoosh’, every 4 hourly and application of Yastimadhu powder with honey or herbal mouthwash in the oral cavity. 8 g of F. caryophylli, 6 g of F. schisandrae, and 4 g each of R. glycyrrhizae, M. officinalis, and H. menthae were extracted twice with 80% ethanol. Extracts were concentrated, mixed with 200 mL water, and packaged in plastic bottles or freshly prepared curcumin mouthwash&lt;sup&gt;17&lt;/sup&gt;.</td>
</tr>
<tr>
<td>4</td>
<td>Hair loss</td>
<td>Nalpamaradi oil for External Application&lt;sup&gt;18&lt;/sup&gt;</td>
</tr>
<tr>
<td>5</td>
<td>Fatigue</td>
<td>Drakshavaleha&lt;sup&gt;19&lt;/sup&gt;: 10 gm with Milk</td>
</tr>
<tr>
<td>6</td>
<td>Allergic reaction</td>
<td>URTIPLEX Capsule&lt;sup&gt;20&lt;/sup&gt;: Adults: 2 caps twice a day and Child: 1 cap twice a day along with Urtiplex Anti Itch Lotion locally. Urtiplex Lotion&lt;sup&gt;21&lt;/sup&gt;: Apply on the affected area as per requirement gently twice a day.</td>
</tr>
<tr>
<td>7</td>
<td>Peripheral motor &amp; sensory neuropathy</td>
<td>Bhumyamalaki Churna: 3 g twice a day and a decoction prepared from 10 g of Aitbalamula twice a day&lt;sup&gt;22&lt;/sup&gt;.</td>
</tr>
<tr>
<td>8</td>
<td>Extravasation</td>
<td>Refer to Surgical Management</td>
</tr>
<tr>
<td>9</td>
<td>Injection site reaction</td>
<td>Refer to Surgical Management</td>
</tr>
<tr>
<td>10</td>
<td>Febrile neutropenia</td>
<td>Decoction of Giloyas Musta&lt;sup&gt;23&lt;/sup&gt; + Amalaki&lt;sup&gt;24&lt;/sup&gt; and Brahма rasyana 10 grams&lt;sup&gt;24&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1. **Vomiteb Syrup**: It is a herbal syrup thereby preventing gastroesophageal reflux. Hedychiumspicatum and Zingiber officinale in VOMITEB regulate the gastrointestinal motility which is safe and effective herbal anti-nauseant, anti-emetic. Elettariacardamomum protects the gastric mucosa. 2. **BilvaChurna** reduces the frequency of bowel movements and calms intestinal spasms and pain.
3. Dadimashtakachurnam is used to correct indigestion and to treat malabsorption syndrome and diarrhoea. It is also ideal for people who have to take the trouble of passing stools many times in a day. Used to correct indigestion and to treat malabsorptionsyndrome, diarrhoea and IBS.

4. Haridradi Tail 'Gandoosh', every 4 hourly and Oral application of Yastimadhu powder with honey

5. Nalpamaradi oil- It is effective on Pittaja skin disorders and Hair Loss due to Chemotherapy

6. Drakshavaleha is one of the widely used herbal products for Fatigue. It is an herbal jam.

7. Urtiplex Cap: Conch shell calx 60 mg, cowrie shell calx 30 mg, rubiacordifolia 300 mg, acacia catechu 300 mg, emblicaofficinalis 250 mg, picrorhizakurroa 300 mg, tinosporacordifolia 150 mg, adhatodavasica 300 mg, curcuma longa 150 mg, andropogonmuricatus 120 mg, berberis aristata 75 mg, hemidesmusindicus 60 mg, nardostachysjatamansi 60 mg, zingiberofficinale 30 mg. It is a herbo-mineral capsule which is best for itching and rashes.

8. Urtiplex Lotion- Kumariel (Aloe barbadensis) 10 %, Marigold oil (Tageteserecta) 0.1 %, Sarson oil (Brassica campestris) 1 %, Peppermint (Menthol, Menthapiperata) 0.25 %, Powders of Yashadabhasma (Zinc oxide) 1 %, Kokambutter(Garciniaindica) 2 %. It is a natural antiallergic and anti-itch formulation. Kumari gel (Aloe Vera) is very potent herb known for its skin soothing, antiinflammatory as well as antibacterial activity. Marigold oil (Tageteserecta) and Sarson oil (Brassica campestris) help in relieving itching and reducing the flare-ups as it possessesantiinflammatory and antioxidant activity. Due to cooling nature and antipruritic property, menthol is beneficial for urticaria. Zinc oxide and Kokum (Garciniaindica) butter help to soothe skin.

9. The Decoction of Giloya + Musta + Amalaki for Fever and Brahma Rasayana10 grams in the morning with the half glass of warm milk or warm water, half an hour before breakfast proved beneficial to prevent Febrile neutropenia.

E. Ayurvedic Management of Radiotherapy Induced Toxicity

Table 5 Ayurvedic Treatment of Radiotherapy Induced Toxicity:

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Toxicity</th>
<th>Ayurvedic Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anaemia</td>
<td>PunarnavaMandoor25</td>
</tr>
<tr>
<td>2.</td>
<td>Nausea and Vomiting</td>
<td>Vomiteb Syrup26 - Adults: 10ml three to four times a day and Child: 5 ml three to four times a day</td>
</tr>
</tbody>
</table>
F. Ayurvedic Method of Prevention and Management of Chronic Toxicity of Chemotherapy

Table 6 Chronic Toxicity of Chemotherapy Drug on Various Organs and its Effect on Srotas

<table>
<thead>
<tr>
<th>DRUG</th>
<th>ORGAN</th>
<th>Chronic Toxicity</th>
<th>Clinical Features</th>
<th>SrotasVikriti(Affected Systems)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucocorticoids</td>
<td>Bone</td>
<td>Osteoporosis, Avascular necrosis</td>
<td>Increased risk of bone fractures, acute and chronic pain</td>
<td>Ashthi-VahaSrotas (Skeletal system)</td>
</tr>
<tr>
<td></td>
<td>Eyes</td>
<td>Cataracts</td>
<td>blurry vision, loss of vision</td>
<td>Indriya-VahaSrotas (Sensory- organ)</td>
</tr>
<tr>
<td>Methotrexate, cytarabine</td>
<td>Brain</td>
<td>Neuropsychiatric deficits, Cognitive</td>
<td>Deficits in overall intelligence, mental illness</td>
<td>Mano-VahaSrotas (Psychological system)</td>
</tr>
<tr>
<td>Vincristine, platinum, taxanes</td>
<td>Peripheral nerves</td>
<td>Neuropathy, Hearing loss</td>
<td>numbness, tremor, impairment of balance, and gait abnormality</td>
<td>Vata-VahaSrotas (Nervous system)</td>
</tr>
<tr>
<td>Anthracyclines, Trastuzumab</td>
<td>Heart</td>
<td>Cardiomyopathy</td>
<td>fatigue, shortness of breath, irregular heart beat and fainting</td>
<td>Prana-VahaSrotas (Respiratory and cardiovascular system)</td>
</tr>
<tr>
<td>Bleomycin</td>
<td>Lung</td>
<td>Pulmonary fibrosis</td>
<td>Shortness of breath, particularly with exertion, Chronic dry, hacking</td>
<td>Prana-VahaSrotas (Respiratory and cardiovascular system)</td>
</tr>
<tr>
<td>Methotrexate</td>
<td>Pulmonary</td>
<td>Hypersensitivity</td>
<td>coughing, Fatigue and weakness, Chest discomfort including chest pain</td>
<td>Mutra-VahaSrotas (Excretory system)</td>
</tr>
<tr>
<td>Platinum, others</td>
<td>Kidney</td>
<td>Decreased function, hypomagnesemia</td>
<td>Oligourea or anuria</td>
<td>Anna-VahaSrotas (Digestive system)</td>
</tr>
<tr>
<td>Various</td>
<td>Liver</td>
<td>Altered function</td>
<td>Stomach pain, Nausea, Loss of appetite, Jaundice (yellow skin and eyes).</td>
<td></td>
</tr>
<tr>
<td>Alkylating agents, others</td>
<td>Gonads</td>
<td>Infertility, premature menopause</td>
<td>Abnormal sperm production or function, impair female fertility.</td>
<td>Sukra-VahaSrotas (Reproductive system)</td>
</tr>
<tr>
<td>Various</td>
<td>Bone</td>
<td>Aplasia, myelodysplasia</td>
<td>Anemia, Pallor, Weakness, Lethargy</td>
<td>Rasa-VahaSrotas (Lymphatic system)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Anemia, paleness (pallor), unusual bruising or bleeding, petechiae</td>
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</tr>
</tbody>
</table>
Secondary Leukemia

Anemia, Easy bruising or bleeding, Paleness of the skin, Excessive fatigue, Bone pain

The chemotherapy and chemotherapeutic agents have somewhat similar to *Kshara-karma* and *Kshara-dravya* (caustic alkalies) respectively. Because their properties, mechanisms of action and toxicities are similar. There are two types of *Kshara-karma*, first is *Bahyaparimarjana* (External application) and second is *Abhyantaraparimarjana* (Internal application)\(^{32}\).

These drugs (*Kshara-dravya*) possesses the predominance of *Katu* (pungent) *rasa*, *Lavana* (salt) *rasa*, *Tikshna* (penetrating) and *Ushna* (hot) in potency and causes *Dahana* (burning), *Pachana* (digesting), *Avadharana* (tearing), *Vilayana* (dissolving), and *Sodhana* (cleaning)\(^{33}\).

It has also indicated for as excision, incision, extraction and scarifications in various conditions such as *Nashaarsha* (nasal polypi) and *Arbuda* (malignant tumors).

Ayurveda has also mentioned the contraindication of *Kshara-Karma* (chemotherapy) in phobic, weak, emaciated and *vata* and *Pitta* vitiated patients. It is also contraindicated in the patients of facial paralysis, hyperpyrexia, diarrhoea, anaemia, *Shiroroga* (disease of the head) and heart disease, *Prameha* (diabetes), *Akshipaka* (inflammation of eyes), cataract and anorexia. It cannot be given also the patients who under gone emesis and purgation during menstruation, pregnancy and having inflamed ovary, vagina and alcoholic patients\(^{34}\).

**G. Ayurvedic Management of chronic toxicity of Chemotherapy:**

1. **Management of Ashthi – VahaSrotasVikriti**--

   6 gm *Asthisanharadi* churna\(^{35}\) twice a day along with ghee should be given.

**Procedure\(^{36}\).**

*PanchatiktaKsheerBasti* containing *Ksheer, Ghritaa* and *Tiktatmaka Rasa dravya* (*Guduchi, Nimba, Vasa, Kantakari* and *Patol*) should be given in morning after breakfast for 30 days per rectally in the treatment of *Asthikshaya*.

**Eat a calcium-rich diet**, which includes milk, cheese, yoghurt, broccoli, spinach and soy like products. It has been revealed that Vitamin D stimulates the absorption of calcium into the body\(^{37}\).

2. **Management of Indriya – VahaSrotasVikriti**–

   External application of *Sukhavativarti*\(^{38}\) should be used on eye
twice a day with 10-20 ml oral medications including *Mahatriphala Ghrita*³⁹.

3. **Management of Mano-VahaSrotasVikriti**–

10-20 ml *KalyanakaGhrita*⁴⁰ twice a day should be given in Mano-VahaSrotasVikriti.

4. **Management of Vata-VahaSrotasVikriti**–

10-20 l*Amritaghyatabilam*⁴¹ twice a day should be given in Vata-VahaSrotasVikriti.

5. **Management of Prana-VahaSrotasVikriti**–

3-6 gm *Soma Churna*⁴² twice a day should be given with warm water in Prana-VahaSrotasVikriti.

6. **Management of Mutra-VahasrotasVikriti**–

Niruhabasti of *PunarnavadiKvathashould be given per rectally for 30 days with 20-40 ml oral medications including *PunarnavadiKvatha*⁴³,⁴⁴.

7. **Management of Anna-VahaSrotasVikriti**–

500mg-1000mg *RohitakadiVatisould be given orally twice a day with KarelaSwaras(Bitter Gourd juice)⁴⁵.

8. **Management of Sukra-VahaSrotasVikriti**–

- **Male Infertility**- 3-6 gm*Kapikachhuadichurna*⁴⁶ should be given twice a day with cow’s milk
- **Female Infertility**- 6-12 gm*Phala Ghrita*⁴⁷ should be given twice a day with warm milk or warm water

9. **Management of Rasa-VahaSrotasVikriti**–

5-10 gm *Kharjunadileha* should be given twice a day with Madhu and Ghrita⁴⁸.

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<thead>
<tr>
<th>Table 7 Preventive Measure in Chemotherapy</th>
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<td>Sr.no</td>
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</tbody>
</table>
10. Punarnava Rasayana Rasa

Punarnava Rasayana or Gokshuraka Rasayana should be used in renal failure caused by chronic toxicity of Chemotherapeutic agents like Platinum.

11. Gokshuraka Rasayana

Some chemotherapeutic agents cause chronic toxicity in the form of hepatic dysfunctions and jaundice which can be prevented by given Guduchi Rasayana along with that chemotherapeutic agent.

12. Guduchiyadi Rasayana

Gokshuraka Rasayana

The infertility will be found in male while premature menopause along with infertility will be found in females due to the chronic toxic effect of chemotherapeutic agent like Alkylating agents which can be prevented by using Shishukalpdrum Ghritta Rasayan.

13. Shishukalpdrum Ghritta

Lauhabhasmadi Rasayan

the form of anaemia due to bone marrow failure caused by induction of chemotherapeutic agents which can be prevented by giving Lauhabhasmadi Rasayan along with chemotherapy.

H. IPD Nursing Care for Chemo-Radio Therapy Patient

1. Surface Cleaning -The floors and counter surfaces, bedroom, drawing room, dining room kitchen and the bathroom should be kept clean and neat. A simple disinfectant such as Lysol or another household product that has a disinfection claim on the label should be used regularly. Vacuum the house regularly using a vacuum with a HEPA filter (High-Efficiency Particle Arrestor).

2. Hand Washing – Hand washing is the most important thing to be done by the patient and the family. The Antimicrobial scrub should be used instead of regular soap and water. Hands must be washed for 30 minimum seconds. Paper towels should be used to wipe the hands in the bathroom and in the kitchen.

3. Sick Friends or relatives - During times when the patient has low blood counts, friends or relatives that are sick, or friends or relatives that have family members living with them that are sick should not come.

4. Masks - Masks should be worn by the parent only if the parent is sick or feels a cold coming on. Masks are not generally needed unless someone who has to be with the patients has a cold. Hand washing is also essential before applying the mask.

5. Dishwashing - It is necessary that all dishes and eating utensils washed in hot water with soap after eating. A dishwasher is preferred if possible. During the low blood counts, there is a high chance of infections so clean and neat dishes and silverware should be used. Paper plates, utensils, and napkins may be used alternatively.

6. Washing fruits and vegetables - Fresh fruits and vegetables should always be washed and scrubbed in running water. All dirt and other matter should be removed before eating. The fresh juices should be
pasteurized before use. Though peeled fruit is the safest; oranges and apples should be carefully peeled with antiseptic precautions. Berries, melons, and peaches are generally a higher risk for mold, and should be inspected very carefully or avoided; canned fruit may be an alternative for these.

7. Mold (Fungus) – The mold, sources of mold and other things which are using by the patients of chemotherapy may be very dangerous. So all mold and sources of mold should be cleaned and/or removed. Water stagnation, leaks or other potential mold hazards should be fixed and kept dry.

8. Air filter - An air filter is not normally necessary unless patient is in a high mold or dust area, or there is another known airborne hazard; however, if you do decide to use an air filter, a HEPA filter is necessary.

9. Raw Foods - Raw eggs and raw cookie dough are not recommended for eating, and raw eggs should not be added to smoothies that are made. All types of meat should be cooked properly so that no portions are raw. All milk should be pasteurized.

10. Clothes Washing - All clothes should be washed regularly with detergent, and preferably after every wearing, and with warm or hot water. Commercial laundry facilities should not be used.

**DISCUSSION**

Cancer cases as well as mortality are increasing rapidly. Though the Chemotherapy and Radiotherapy are the treatment of cancer at present. But both therapies give potentially dangerous hazards which are intolerable in most of the cases. Sometimes patients are died due to Chemotherapy rather than cancer. Febrile neutropenia, Nausea, Vomiting, Diarrhoea, Stomatitis, Hair loss, Fatigueness and Allergic reaction etc are the clinical manifestation of acute toxicity of post Chemotherapy. This qualitative data can be measured by giving gradations like mild, moderate, severe and life-threatening for prognosis purpose. Anaemia, nausea, vomiting, diarrhoea and non-infective cystitis these are some clinical manifestation of acute toxicity of post radiotherapy. These can be also asses by giving gradations like mild, moderate, severe and life threatening to decide prognosis. SarivadiHima contains Sariva, Madhuk, Chandan, RaktaChandan, Padmak, Gambhari, Ushir which having Raktpittahar, Pittajawarhar and Dahashamak properties. Hence, it can play a major role to calm down the post...
Chemotherapy and Radiotherapy toxicity. 

*MouktikayuktaKamdudha* contains *pisti* of *Praval* (Coral), *Mouktika* (Pearl), *Shankha* (Conch shell), *Shauktika* (Peral Shell), *Kapardika* (Cowrie shell), *Guduchi* (Tinosporacordifolia) and *Gairik* (Red Lumber Stone) which having *Pittashamak* property. Hence it can be used to counteract the toxicity. 

*PadmakadiGhruta* contains *Padmak* (NelumboNucifera), *DurvaSwaras* (CynodondactylonPers), *Anantaol* (HemidesmosIndicus), Goghrt which can be also used to calm down the toxicity of chemotheray and Radiotherapy. 

*ShatavariKalpa* can be used to reduce chemotherapy and Radiotherapy induced debility as it having *Rasayan* property. Syrup Vomitab, Bilvachurna,Dadimashtakachurna, DrakshAvaleha, BhumyamalakiChurna and AtibalaChurna will be used to give symptomatic relief from chemotherapy induced nausea, vomiting, diarrhoea, fatigue, neuropathy and neropathy respectively. *Haridradi Tail* for ‘Gandoosh’ and *Yastimadhu* powder with honey for oral application will be helpful to reduce chemotherapy induced stomatitis if it is used along with herbal mouthwash. *Nalpamaradi oil* can be used for hair loss while urtiplex lotion and capsules can be used for allergic reaction due to chemotherapy.

The decoction of *Giloye, Musta* and *Amalakimay* be useful to reduce mild febrile neutropenia. Surgical management should be given in chemotherapy induced extravasation and injection reaction at the site. Osteoporosis, avascular necrosis, Cataracts, Neuropsychiatric deficits, Neuropathy, Cardiomyopathy, Pulmonary dysfunction, Hepatorenal dysfunction and Infertility are the common chronic toxicity due to chemotherapeutic agents like glucocorticoids, Vincristine, platinum, Taxanes Methotrexate, cytarabine, Anthracyclines, Trastuzumab, Bleomycin, Alkylating agents respectively. 

*AsthivahaSrotas* (Skeletal System), *IndriyavahaSrotas*(Sensory Organ), *ManovahaSrotas* (Psychological System), *VatavahaSrotas*(Nervous System), *PranavahaSrotas* (Respiratory and cardiovascular system), *MutravahaSrotas* (Excretory System), *AnnavahaSrotas* (Digestive System) and *SukravahaSrotas* (Reproductive System) will be affected due to chronic toxicity of chemotherapeutic agents. 

*Asthisanharadichuran* and *Panchtiktaksheer* should be given to reduce the osteoporosis due to Chemotherapy along with calcium-rich diet. 

*Sukhavativarti, Kalayanakghrut,*
Amritaghyatalam and Soma churan should be given to manage cataract, psychosomatic disorder, neuropathy and pulmonary disorder. Niruha vasti of Punarnavadi kawath will be useful to improve the renal function while Rohitakadivati will be useful to improve hepatic function. Kapikachua dichuran and Phalghrit will be given to manage male and female infertility respectively. Khajuradileha will be beneficial to manage bone-marrow dysfunction. Some Ayurvedic Rasayana like Vijyasaradi, Baladi, Nagabala, Triphala, Shankhpushpigriti, Aindra, Medhya, Neelkanth, Chyawanprash, Punarnava, Gokshuraka, Guduchiyadi, Shishukalpdrumghrita and Lauhabhasmadi, these are the Rasayana described in the Ayurveda texts should be given along with chemotherapy to prevent the toxicity of chemotherapeutic agents. The special care should be taken to prevent external infections during the period of induction of chemotherapy and radiotherapy as the immunity of patient during this therapy goes to downward. Surface cleaning of the room of patients should be cleaned by vacuum cleaner to avoid airborne infection by respiratory tract. Hand washing of patient and the family member is necessary to control the infections inserted by hand. Sick friends and relatives should be avoided during and after the chemotherapy & radiotherapy to avoid the cross infections. Use of clean & neat food dishes is essential to avoid transmissions of utensil infections. The food and vegetables should be used after running wash. All mold and sources of mold should be cleaned and removed properly as it is very dangerous to the chemotherapeutic patient. The air filter or mask should be used to avoid airborne infections. The raw foods should not be recommended. Thus, the patients of acute or chronic toxicity of chemotherapy and radiotherapy can be managed by using holistic approach and basic principles of Ayurveda.

CONCLUSION

The acute or chronic toxicity of Chemotherapy and Radiotherapy has been well known for its morbidity and mortality in cancer patients. Sarivadi Hima, Mouktikayukta Kamdudha, Padmakadi Ghruta and Shatavari Kalpa can be helpful to counteract the toxicity of chemotherapy and radiotherapy along with symptomatic treatment. Ayurveda may play a major role to prevent the toxicity if it will be given during the therapy. Thus, Ayurveda has a potency to prevent and
cure the toxicity of chemotherapy and radiotherapy.
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