



CANCER MEDICINE IN AN AYURVEDIC PERSPECTIVE: A CRITICAL OVERVIEW

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FOREWORD

The initiative and the effort are diligently expressed by the members of the faculty at the Mahatma Gandhi Ayurved College, Hospital and Research Centre, Sawangi Meghe, Wardha a constituent unit of Datta Meghe Institute of Higher Education and Research (Deemed University). Sawangi Meghe, Wardha is indeed not only laudable but also praiseworthy for the very cause it has been undertaken.

It is a matter of established common knowledge that there is an imperative need for the creation of a genuine and meaningful book titled "**Cancer Medicine in an Ayurvedic Perspective: A Critical Overview**" for the learners of Ayurvedic Sciences at various levels studying in various Ayurvedic Schools across the country. The content embodied in the book, which caters to the need of the learners, teachers and professionals in a free flowing manner is the core necessity as of now, which has remained unattended for reasons more than one.

The initiative undertaken by the teaching faculty of Mahatma Gandhi Ayurveda College, Hospital and Research Centre, needs to be viewed with, in the context of its relevance and consequence. To my understanding, the notable effort undertaken is timely, apt and also meaningful in its own way.

It is really a very benign and genuine effort on the part of all the contributing authors to compile all the relevant intellectual inputs on a significantly vital area and render them in such a free-flowing manner, so that it is easy to understand, decipher, grasp and assimilate by the learner, teacher, professionals and a casual reader, as well.

This has been singularly achieved by the authors by virtue of their writings which are in the handy textual format and are appropriately aligned so as to render the desired grasp and much sought-after understanding of the subject in an easy yet immaculate manner, which turns out to be the unique feature of the dedicated authorship, which makes it look and feel different from the other available reading material on the subject in vogue.

The authors have painfully brought all that was needed, relevant and vital pertaining to the thematic depiction of the subject at hand in a very deserving, appropriate, chronologically lucid manner. The chapterization vividly brings out the continuum in a logical and chronological manner. The entire team effort is embodied in single-minded devotion and unparalleled dedication on their part, which speaks volumes about their intent to cater to the larger academic task and fill in the existing vacuum.

I am sure that this elegant piece of well-meaning and suitably documented scientific literature, appropriately illustrated by suitable diagrammatic and pictorial depictions wherever warranted embodied in the book format by the authors will make every user feel that he could avail himself all that he desired, needed and expected out of it.

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I have no hesitation in putting on record my deep sense of appreciation for the effort undertaken by the authors in terms of a loud statement that they have evolved a society centre towards quenching the 'inquisitional thrust' in the domain of Ayurvedic Sciences as a whole in a genuinely exemplary and emulative manner.

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PREFACE

When a cancer patient comes to an Ayurveda practitioner with hope, they are often in a dilemma for its management. Many times, I searched books for the queries I had. In such a discussion, all had the same thought of writing a book on Cancer, which gives the basic information on Cancer from Ayurveda's perspective.

In the present world of increasing cancer prevalence, it is essential to have some alternative to prevent it and take care of the side effects of current treatment.

To help the practitioner and Ayurveda academician clear the Ayurveda concepts about Cancer, we came up with the book Cancer Medicine in an Ayurvedic Perspective: A Critical Overview. This book comprises nine chapters. It covered the Ayurveda perspective of understanding the etiopathogenesis of Cancer and its preventive and curative aspect. We sincerely hope that this book will help build confidence in the Ayurved fraternity to help cancer patients.

We would appreciate it if any discrepancy/deficiency which might have remained is brought to our notice. We also welcome suggestions for further improvement of the book.

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CHAPTER 1

Cancer from Ayurveda Perspective

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Abstract: Cancer is a leading cause of mortality among the world's population. Worldwide, 19.3 million new cancer cases and almost 10 million cancer deaths occurred in 2020. Cancer-like conditions are described in Ayurveda texts under the nomenclature of Arbuda and Asadhya Vrana (Non-healing ulcers). Mithya Ahara and Vihara vitiate Tridosha, responsible for different types of Arbuda. According to dhatu involvement, various types of Arbuda are defined. If Arbuda is left untreated, it is altered into Asadhya Vrana. Acharya Sushruta has also advised multiple surgeries for Arbuda.

Keywords: Ayurveda, Arbuda, Asadhya vrana, Dosha.

INTRODUCTION

The term 'cancer' originated from the ancient Greek 'kapkivoc', which means 'crab' and 'tumor'. It includes various diseases involving abnormal cell growth with the capacity to spread to other parts of the body. Cancer can be correlated with the conditions described in Ayurvedic literature, such as Charak, Sushruta, *etc.* The diseases falling specifically under the category of cancer are Arbuda (lumps or swelling) and Asadhya Vrana (Non-healing ulcers) [1].

ARBUDA

According to Sushrut, it is a gradually increasing mass, spherical in shape, fixed with deeper structure, generally non-suppurative, occasionally painful, and can occur in any part of the body. It is caused due to vitiation of Tridosa and can involve Rakta and Mamsa Dhatu.

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Samprapti (etiopathogenesis) of Arbuda: Mithya Ahara and Vihara vitiate Tridosha involving various Dhatus (Rakta, Mamsa, Meda, *etc.*) result in different types of Arubuda. Though there is the involvement of Tridosha, Sushruta has mentioned the predominant involvement of Kapha Dosha, which is painless and non-suppurative.

Trauma has also been mentioned as another causative factor for the development of Mamsarbuda, such as Galaganda, Gandamala, Arbuda, Granthi, and Adhimamsa.

Classification of Arbuda

Arbuda can be classified according to:

1. Predominance of Dosha.
2. Involvement of Dhatu.
3. Site of Arbuda
4. Prognosis of Arbuda

According to the predominance of Dosha, there are four types of Arbuda. Vataja, Pittaja, Kaphaja, and Tridosaja are diagnosed based on symptomatology.

According to the involvement of Dhatu (tissue or cells): Arbuda is described as:

1. Medaja Arbuda (excess growth of fatty tissue).
2. Mamsaja Arbuda (excess growth of muscular tissue).
3. Raktarbuda (excess growth of blood cells).

Sushrut has mentioned various Arbuda as per the involvement of organs, such as Nasarbuda (Tumor of the nose), Karnarbuda (Tumor of the ear), Vartmarbuda (Tumor of the eyelid), Ostharbuda (Tumor of the lip), Galarbuda (Tumor of the throat), Mukharbuda (Tumor of buccal mucosa) and Sirarbuda (Tumors of head or brain). Arbuda of the genital organ has also been stated under "Shuka Dosha". It is caused due to the inappropriate use of various types of 'Linga vrddhikar Yoga'.

Based on the prognosis of the Arbuda, it is categorized as:

1. Sadhya (curable)
2. Asadhya (Incurable)

Mamsarbuda, Raktarbuda and Tridoshaj arbuda of any site are considered as Asadhya (incurable).

Sadhya Arbuda may develop into Asadhya Arbuda. It is described as “Adhyarbuda” or “Dvirarbuda”. If Arbuda is formed near the primary growth, it is called Adhyarbuda, whereas Dvirarbuda is a similar type of growth at different places. It can be considered metastasis.

ASADHYA VRANA

It resembles malignant ulcers as per the similarity in clinical features. Susruta has described the nature of Asadhya Vrana being chronic and having characteristics of raised edges and various types of discharge. Sometimes, other features are also present, such as painful respiration, anorexia, chronic cough, and cachexia, which suggest cancer metastasis [2].

The following diseases are also called Asadhya. Its manifestation is also similar to a malignancy.

1. Mamsaja Osthā is a thick bulging mass that may convert into lip ulcers. It can be considered lip cancer.
2. Alasa: It is deep-seated swelling of the tongue caused due to vitiation of Rakta and Kapha. It has a fishy odor discharge and destroys the surrounding structures. It resembles epidermoid tumors of salivary glands.
3. Mamsa Kacchapa: It is a big, painful palate swelling due to incurable vitiation of Kapha. It can compare with a tumor of the hard palate.
4. Galaudha: It is an extensive swelling in the throat due to the vitiation of Rakta and Kapha. It becomes fatal due to difficulty in swallowing and respiration. It can be correlated with malignant growth at the oropharynx.
5. Lingarsa is a growth of fleshy mass with blood discharge on the external genitalia. It closely resembles a papillary carcinoma.
6. Asadhya Pradara – It can be correlated with carcinoma of the uterus because of its clinical features of excessive vaginal discharge of various colors, consistency and odor, and associated emaciation.

Treatment Principle

According to Ayurveda, no disease can manifest without an imbalance of Tridosha. It is necessary to specify the involvement of type of Dosha, Dhatu,

CHAPTER 2**Overview of Cancer****Vaishali Kuchewar^{1,*}**

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Abstract: The characteristics of cancer cells are continuous cell growth due to their non-responding nature to the signals of stopping the growth or apoptosis, the ability to spread in other parts of the body, and immortality of cells because of their capacity to restore their telomeres. The clinical features depend on the size and location of cancer and the presence or absence of metastasis. Local and systemic symptoms rely on the tumor mass and the body's response to cancer, respectively. Cancer is classified according to the tissue involved, like Carcinomas, Sarcomas, Myeloma, Leukemia, Lymphoma, Germ cell tumor, and blastoma. The globally recognized standard to classify the extent of cancer spread is called T.N.M. Classification. It applies to many solid tumor cancers but is not relevant to leukemia and the central nervous systems tumor. The tumor can be diagnosed with tests like mammograms, Pap smears, Tumor markers, Bone scans, MRI, Tissue biopsies, and PET-CT scans. The treatment depends on the type and stage of cancer and the patient's overall health. Common treatment modalities are surgery, radiation, and chemotherapy. Other treatments are targeted/biological therapies, hematopoietic stem cell transplants, angiogenesis inhibitors, cryosurgery, and photodynamic therapy. Every treatment has its risks, benefits, and side effects.

Keywords: Blastoma, Cancer, Chemotherapy, Germ cell tumor, Leukemia, Lymphoma, Metastasis, Myeloma, Radiation, Sarcomas, Surgery, TNM classification.

INTRODUCTION

Cancer is the uncontrolled growth of abnormal cells in the body. It often forms a mass or a lump called a neoplasm or tumor. Every mass or lump is not cancerous. The non-cancerous lump is called benign. It is restricted and risky if it compresses vital organs like the brain. Malignant neoplasms are commonly called cancer. They invade and destroy the surrounding tissue. Cancer cells spread to other sites

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through the lymphatic system and the bloodstream. And, if left untreated or become unresponsive to treatment, they will generally prove to be fatal.

Following are the characteristics of cancer cells:

1. The continuous growth of cells due to their non-responding nature to the signals of stopping the growth or apoptosis.
2. Ability to occupy nearby tissue.
3. Ability to spread to other parts of the body.
4. Immortality of cells because of their capacity to restore their telomeres.

Causes

Genetic mutations cause 95% of cancers due to environmental and lifestyle factors. The other is due to inherited genetics [1].

Risk Factors

- Exposure to cancer-causing chemicals and radiation
- Excessive sun exposure
- Certain types of diet & physical inactivity
- Smoking
- Certain viruses like human papillomavirus (HPV)

Clinical Features

The clinical features depend on the size and location of cancer and the presence or absence of metastasis. Local and systemic symptoms depend on the tumor's mass and the body's response to cancer, respectively.

Standard clinical features are:

- Fatigue
- Pain
- Fever
- Unintentional weight loss or weight gain
- Lumps or tumors
- Difficulty in swallowing
- Changes in bowel or bladder function
- Persistent hoarseness or cough
- Unexplained bleeding or discharge

CATEGORIES OF CANCER

Cancer is further classified according to the tissue involved [2].

1. Carcinomas
2. Sarcomas
3. Myeloma
4. Leukemia
5. Lymphoma
6. Germ cell tumor
7. Blastoma

Carcinoma

Occurs in epithelial tissues. 80% to 90% of cancers are of this category. It includes cancer of the prostate, lung, colon, skin, breast, and most common skin cancers, *i.e.*, basal cell carcinoma and squamous cell carcinoma.

Sarcoma

Occurs in connective tissues like fat, blood vessels, bones, cartilage, and muscles. Osteosarcoma, Ewing sarcoma, Kaposi sarcoma, Rhabdomyosarcoma, and leiomyosarcoma are some examples.

Myeloma

It occurs in plasma cells in the bone marrow. In this condition, plasma cells grow out of control in the bone marrow damaging it and can destroy the bone.

Leukemia

It is also called blood cancer. Numerous abnormal blood cells are found in the bloodstream.

Lymphoma

It is related to the cells of the immune system. It includes Hodgkin lymphoma and non-Hodgkin lymphoma.

The Concept of Epigenetics in Cancer

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Abstract: Epigenetics is the term that comes before genetics. DNA is not able to determine the characteristics of a human being. The genotype corresponds to Prakriti by birth, and the phenotype corresponds to the psychophysiological constitution of Prakrit. The features and properties of RNA represent the Tridosha at the cellular level, which can be identified under the heading of mRNA, tRNA, and protein. There are four significant factors, *i.e.*, lifestyle and behavior, diet and digestion, stress, and environmental factors responsible for changes in the phenotype that led to changes in the genotypic expressions without changing the basic structure of DNA.

Nowadays, changing lifestyles, food habits, stress factors, uncontrolled pesticides used in the agricultural field, global warming, and undue environmental changes lead to epigenetic changes in humans. Ayurveda addresses solutions to the affecting factors by adopting the basic principles of Ayurveda, including daily routine, behavior, diet plan, exercise, meditation, medications, purification therapies, *etc.* The integration of the Indian system and the current medical system facilitates optimum health and stability for humanity. Further research on modalities, drugs, formulations, and herbs explained in Ayurveda for affective gene expression is needed to fulfill various cancers' desired management.

Keyword: Ayurveda, Cancer, Epigenetic, Prakriti.

INTRODUCTION

Epigenetics is the term that comes before genetics, which can regulate the organism preceding genetics. DNA is not able to determine the characteristics of a human being. Because the factors like environment, stress issues, nutrition, medicine, and many other surrounding stimuli influence organisms' responses like

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DNA, we can say that nature and nurture are equally important in humans' observed responses. Accordingly, humans are affected by both epigenetics and genetic factors. Various researchers observed that some diseases' causative factors are epigenetic influences like lifestyle, diet, habits, and addictions [1]. This means genetic factors are not the final repository responsible for the health status of human beings. In today's era, most diseases labeled as lifestyle disorders, which indicate faulty lifestyles, give rise to many problems. If the host body has a favorable environment, such types of conditions transpire in the body. More than ninety percent of diseases like cancer, cardiovascular, and diabetes are the consequences of a faulty lifestyle and not merely because of inheritance. Hence, it can be concluded that epigenetic factors could override genetic factors.

CONCEPT OF EPIGENETICS

In modern science, it is considered that epigenetic alterations or mechanisms have regulated gene expressions. These alterations include genomic DNA, methylation, and post-translational modification of histone tails, which should be within higher-order chromatin and non-coding RNAs that regulate the gene expressions. Disturbed epigenetic mechanism causes various human pathologies, but their role in mitochondrial pathogenesis is still undefined. The epigenome in the mitochondrial disease pathology is essential to the affected epigenetic mechanism. Some cancer research studies conclude that mitochondrial defects are associated with epigenetic alteration within the nuclear genome, which plays a confounding complex role linked with mitochondrial diseases [2].

Most of the activities in the body are controlled by epigenetics, which drives the changes in gene expression. Prakriti is the Ayurved psychophysiological constitution in the form of a phenotype related to DNA. 'Karma', *i.e.*, action, involves the process of epigenetics, represents Newton's Third Law of Motion: For every step, there is an equal and opposite reaction and also the idiom "As you sow, so shall you reap" for the epigenetics changes in DNA expressions and its transmutability in future progeny. The life-affecting factors like lifestyle and behavior, diet and digestion, stress, and environmental factors disturbed the gene expressions. If human beings control their actions positively, which keeps body physiology in harmony, it means in a balanced state and preventing Vikruti, *i.e.*, disease manifestation. The imbalance state affects both the phenotype and the expression of the genotype; by controlling the above-mentioned affecting factor, one can reverse unwanted changes in the genetic expression. Each individual has the responsibility of their health to follow the guidelines mentioned in the prevention system of Ayurveda regarding individual Prakriti, which can protect undesirable changes in the phenotype and gene expression [3].

Epigenetics in Cancer

DNA is the chromatin structure in the form of genetic information organized in the cell. This organization significantly influences the abilities of the genes regarding their activation or silence form. Recent studies regarding epigenetics conclude that human cancer cells shelter epigenetic abnormalities and many genetic alterations, interact in all stages of cancer, and encourage cancer progression. Decades ago, cancer was considered a gene origin, but current research suggests that epigenetic alterations may be the initiating factor in some cancers. Many scholars are taking the initiative to recognize the concept of epigenetics and its role in cancer progression [4, 5].

Epigenetics and Phenotype

Epigenetics studies transmissible alterations in gene expression (means activation and inactivation of genes) that do not change the DNA sequence. Still, they are accountable for phenotype changes without a change in the genotype, which is entirely responsible for affected genes read by the cells. Phenotype is the individual's characteristics like height, eye color, blood type, etc. The genetic contribution to the expression of the phenotype is known as the genotype. The determination of characteristics is done based on genotype and environmental factors. Epigenetics explores the dynamic association between the environment and gene expression. The gene expressions are controlled at the chromosome level, which means which part of the DNA is allowed to read (transcription) to produce proteins (translation). As a result, genes may turn on or off because of the external modification of DNA. These modifications cannot change the DNA sequence but can control the expressions of the genes. Epigenetic changes are the outcome of DNA methylation and interaction between DNA and protein, *i.e.*, Histone. In short, DNA methylation is nothing but the epigenetic alteration that is linked with the process of histone modification, chromatin structure, and RNA interference. All these processes regulate gene transcription from embryonic to the consequent development of the body [6].

The Underlying Philosophy of Epigenetics

Ancient science, Ayurveda, and Vedic knowledge offer a philosophical understanding of the creation, sequence, and alteration of the universe and the urges of nature. The human being consists of two basic features: never changing and ever-changing things. The body's physique and inner perception constantly alter things; however, the deep inner consciousness is entirely constant and not alterable. DNA is the silent core part like Prakriti, which can express genes. DNA is the genetic code with all information of an individual, and its expression is a part of its knowledge. In the process of expression, two strands of DNA divide to

The Concept of Prakriti in Perspective of Cancer

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Abstract: Currently, there is a lot of talk about cancer (arbuda) at all levels of society. It includes both benign and malignant tumors. Our body is made up of Tridosha, the three fundamental energies or principles that govern our body function on the physical and emotional levels. The three energies are known as Vata, Pitta, and Kapha. Each individual has a different constitution from others. Prakriti is a unique concept of Ayurveda that explains individuality and has a role in maintaining health & prevention, of diseases, and achieving longevity. Each person must know their Prakriti constitution to determine the correct food, exercise, yoga, lifestyle, and environment to remain healthy and achieve longevity. Our Prakriti in Ayurveda roughly resembles DNA or genes in western medicine. Most of the theories offered regarding cancer cause fall into the following categories: embryonic, bio-chemical, infectious agents, and genetic. Ayurveda can play a big role in the last causative factor, genetics. Cancer in each person differs according to the person's exposure to pathogens and Prakriti (genetic constitutions), assessment of Prakriti is very useful in prognosis & therapeutic management of cancer. It is also helpful in prescribing suitable Ahar, Vihar, Yoga & Rasayana therapy.

Keywords: Cancer, Genetic, Prakriti, Tridosha.

INTRODUCTION

Concept of Prakriti: “Prakriti” means “Swabhava,” or the nature of the individual. According to Ayurveda, every human being is a separate entity. Prakriti or Bio-typology is an extremely important concept in Ayurveda. Each person is not only different in size and shape, but his physical and psychological character are also different; It is because of predominant panchamahabhuta (five basic elements: Earth, Water, Fire, Air, Space), Dosha (three Bioenergy: Vata, Pitta, Kapha) and Triguna (psychological qualities - Satwa, Rajas, Tamas) at the time of birth which decides their constitution. It is a unique concept of Ayurveda

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that explains individuality and has a role in maintaining health, prevention, diagnosis, treatment of diseases, and achieving longevity. Each person must know their constitution to determine the correct food, exercise, yoga, lifestyle, and environment to remain healthy and achieve longevity. We have also explained the way to prevent the disease by selecting proper occupation. Prakriti is formed during the union of sperm and ovum and remains constant for that individual's entire life. It also shows a certain predisposition toward diseases. Hence this concept is also important for physicians.

Prakriti (constitution) assessment is a part of the diagnostic, preventive, and curative methods in the Science of Ayurveda. Ayurveda considers three basic constituents of life classified as three doshas Vata, Pitta, and Kapha. Considering the significant scope of Prakriti, little research has been conducted which highlights the scientific basis of this unique concept of Ayurveda. A few chosen kinds of research are presented here to enlighten the role of the Prakriti concept in modern science. With the help of clinical features of Vata, Pitta and Kapha, we can assess the Prakriti of that person. Hence these seven body types are described on the basis of predominance of doshas present at the time of conception; like the doshaja constitution, the mental constitution is also important. Mental constitution is determined by the relative predominance of Sattva, Raja, and Tama qualities. Sattvic, Rajasik, and Tamasik are the three main constitutions (Table 1) [1].

ROLE OF PRAKRITI IN THE PATHOGENESIS OF CANCER

A critical review of Samhitas reveal that granthi, arbuda, sarkararbuda, and valmika all indicate different diseases presently known as cancer. Genetics considers DNA as the main constituent of life. Also, the causative factor of the disease in cancer with mutations in DNA. So this creates interest in the search for the application of the philosophy stated by Ayurveda in terms of Modern era of Genetics. Cancer (Arbuda) is muscular swelling that is round, immobile, slightly painful, big, deep-rooted, grows gradually, does not suppurate, and can occur in any part of the body. There are six types of Arbuda described by Acharya Sushruta- 1) Vataja, 2) Pittaj, 3) Kaphaj, 4) Raktaja, 5) Mamsaja, and 6) Medaja. Cancer (Arbuda) forms as a result of the vitiation of Tridosha. Because of changes in dietary habits, lifestyle, pollution, and stress cause vitiation of Doshas and Dhatus. Aggravating factors of Tridosha are –the Vata aggravating factors are excessive intake of Katu, tikta, and kashay Rasas. The Pitta aggravating factors are excessive intake of Amla, Lavan, and Katu Rasas. The Kapha aggravating factors are excessive intake of Madhur, Amla, and Lavan Rasas.

Table 1. Types of Prakriti and appearance.

Kapha Prakriti	Vata Prakriti	Pitta Prakriti
		

Cancer in each person differs according to the person's exposure to pathogens and person's Prakriti (genetic constitutions), which make each react differently. According to ancient texts, the following are the main factors responsible for the vitiation of Doshas, which may be the causative factor/s in developing a cancer stage.

- a. Vata vitiating cause - excessive intake of bitter, pungent, astringent, dry foods and stressful conditions.
- b. Vata vitiating causes - excessive intake of sour, salty, fried foods and extreme anger.
- c. Kapha vitiating cause- excessive intake of sweet, oily food and sedentary lifestyle.
- d. Rakta vitiating causes - excessive intake of acid or alkali-containing foods, fried and roasted foods, alcoholic beverages, extreme anger or severe emotional upset, sunbathing or working under the scorching sun or near the fire and hot conditions, etc. are some other causes
- e. Mamsa vitiating causes- excessive use of exudative foods like meat and some dairy products. Behaviors leading to exudation, like sleeping during the day and overeating, are some of the causes of pathogens invading the fatty tissues.
- f. Medo vitiating cause - excessive intake of oily food, sweets, alcohol, and sedentary life.

Other factors causing cancer are cigarette smoking, alcohol, chewing tobacco, and pesticide. The vitiated Dosha vitiates the Mamsa Dhatu at any part of the body, and resulting in metabolic and nutritional derangement. The vitiated Dosha

Screening Tools for Common Cancers

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Abstract: In the present era, because of changing lifestyles and stress, various new diseases are emerging as a major health problem worldwide. Fields like medicine and technology are also getting more advanced, but mortality and morbidity rates are still increasing. In India, after cardiac diseases, cancer is the second leading cause of morbidity and mortality and mainly accounts for 9% of all deaths. Because of a lack of awareness, diagnostic facilities, and screening programs, nearly 75-80% of cancer patients approach hospitals at an advanced stage (stage 3-4). If cancer is detected in the early stage then it is treated easily. Screening is an essential and effective preventive measure in cancer control. The main aim of cancer screening is to detect cancer before the manifestation of symptoms. It is advised for various cancers like breast, cervical, colorectal, prostate, *etc.* Cancer screening is mainly helpful in cancer prevention, early detection, and subsequent treatment. Multiple tools like urine tests, blood tests, medical imaging or DNA tests, *etc.*, are mainly used for screening. They help to decrease the total number of people dying of cancer through its early detection and better treatment.

Keywords: Brush biopsy, Colonoscopy, Mammography, Pap smear, Prostate-Specific antigen, Screening tools.

INTRODUCTION

In the present era, there is a huge advancement in the management of cancer, but morbidity and mortality rate is still increasing. As per ICMR's National Cancer Registry Programme, cancer kills more than 1300 Indians daily.

Most cancer patients (75-80%) approach to the hospital in an advanced stage. It might be due to a lack of awareness, lack of diagnostic facilities, and lack of screening programs [1].

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Screening is an essential and effective preventive measure in cancer control. It is one of the components of the national program in India, but still, it has not taken root in most parts of the country [2].

Cancer screening can help to find the disease at the earliest, even before any symptoms start. Cancer may be easy to treat if diagnosed at an early stage.

Up to the 20th century, cancer was diagnosed on the manifestation of its features, and no treatment is effective in such cases [3].

CANCER SCREENING

Cancer screening aims at the early detection of cancer before its manifestation. It is used for various cancers like breast, cervical, colorectal, prostate, *etc.* Urine tests, blood tests, medical imaging or DNA tests, *etc.*, are mainly used for screening.

In the past, cancer screening was usually done for a single organ at a time for high-risk people. Currently, the American cancer society recommends guidelines for population screening. Population screening is recommended for the four most common cancers, *viz.* breast, cervix, colorectal and prostate. It is also known as mass screening or universal screening. It is done without selecting a specific population. While “selective screening” is for high-risk people with a family history of cancer.

However, it is nearly unjustifiable and non-recommended to screen the general population for a maximum of all cancers as no cost-effective intervention is available to detect cancer for a single organ. In contrast, high-risk people can be targeted to increase the prevalence of various single organ cancer types. For example, pancreatic cancer screening can be suggested for those with a strong family history, lung cancer screening may be recommended for those with heavy smoking, and screening for hepatoma is done for people with chronic liver disease. Above mentioned three cancers are the most prevalent and cause maximum deaths in various countries, including the USA. But still, no population-based strategy for screening is used for these cancers [4, 5].

TYPES OF SCREENING TESTS

Each type of cancer has its specific screening test. Following are the screening tests for common types of cancer shown in Table 1.

Table 1. Screening test for common types of cancer.

S.N	Type of Cancer	Name of Screening Tests
1.	Breast Cancer	1) Breast Self-examination 2) Clinical Breast Examination 3) Mammography 4) Digital Mammography
2.	Cervical Cancer	1) Pap smears 2) Colposcopy 3) Cervicography 4) HPV co-testing
3.	Colorectal Cancer	1) Fecal Occult Blood Testing (FOBT) 2) Stool DNA testing 3) Sigmoidoscopy 4) Colonoscopy 5) Double-Contrast Barium Enema 6) CT Colonography
4.	Prostate Cancer	1) Digital Rectal Examination (DRE) 2) Trans-Rectal Ultrasound (TRUS) 3) Prostate-Specific Antigen (PSA)
5.	Lung Cancer	1) Chest Radiograph 2) Spiral Computed Tomography/Low dose helical (CT or CAT) scan
6.	Oral Cancer	1) Complete Oral Examination 2) Brush Biopsy 3) Toluidine blue staining 4) Chemiluminescence 5) Tissue Fluorescence Imaging & Spectroscopy

The detail of the screening is as follows:

Breast Cancer Screening [6, 7]

A) Breast Self-Examination: The patients themselves can perform it. Mainly females of age above 40 years should perform breast self-examination. The patients, while performing breast self-examination, should stand in front of the mirror and perform it. It is the easiest method to identify any breast changes or lumps.

B) Clinical Breast Examination: The method used by the health professional to detect breast lumps or breast changes. Generally, breast examination is used along with mammograms for better diagnosis and results.

C) Mammography: Mammography is the examination of breast tissue with the help of a low dose of x-ray. It is used as a diagnostic as well as a screening tool.

Herbs for Cancer

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Abstract: In the present era of modernization, the new generation differs from the lifestyle maintained in the ancient period. A few decades ago, it was a regular practice of major community, *i.e.*, Early to bed and early to rise, where the body's clock and nature's clock were more or less similar. During this period of modernization, there was a tremendous change in lifestyle, including daily activities. This results in an early facing of severe problems. Modern medicines very well deal with such issues, but long-term regular use of such medication can affect vital organs in the future. Medicinal herbs have been used worldwide as supportive treatment to minimize the toxic effects of chemotherapy and radiotherapy. Many clinical studies have reported the beneficial results of herbs in combination with conventional therapeutics on the patients' survival, immune modulation, and quality of life. One such disease is cancer, wherein medicines have various side effects and immunity suppression effects. The present chapter deals with different herbs, their role in cancer treatment, and the side effects of their treatment. Here in this chapter, herbs are briefly reviewed that are used for treating various cancers. Different research work and clinical studies are mentioned here that showed the anticancer activities and their effect on various biological pathways. The use of a dietary regime along with medicinal herbs for better results is also a part of Ayurveda to be followed. The state of balance between doshas and dhatus is essential while using herbs in all aspects. This review may help to provide the utility of various herbs in various aspects of cancer and its treatment.

Keywords: Ayurveda herbs, Cancer, Chemotherapy, Radiotherapy.

INTRODUCTION

This chapter is devoted to the herbs which can be used to prevent cancer as a support in the treatment and to minimize the side effects of chemotherapy and radiotherapy.

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Following medicines have the potential against cancer.

Ashwagandha (*Withania somnifera* (Linn.) Dunal)

It is a flowering plant of the Solanaceae family. It is *Katu*, *Tikta Kashaya rasatmak*, *Katuvipak*, and *Ushnaveeryatmak*. There are 23 varieties of *Withania* in which only *W. somnifera* and *W. coagulance* are medicinally important. The root of *W. somnifera* is used for medicinal purposes. *W. somnifera* has 12 alkaloids, 35 withanolides, and several other sitoindosides. These compounds proved to act in apoptosis, angiogenesis, anti-inflammatory, immune response, stress response, and effectiveness against cancer [1]. Some studies showed that *W. somnifera* might reduce the growth of the tumor without damaging the normal cell. It has sedative effects and interferes with certain chemotherapy drugs [2]. It should be used cautiously in breast and prostate cancer as it can elevate DHEA and increase testosterone. Some researchers also show interference in the immunoassay of serum digoxin level measurement [3].

Guduchi (*Tinospora cordifolia* (Wild) Miers)

It is a deciduous, large climbing shrub of the Menispermaceae family and is distributed in tropical regions of India. Leaves are simple, alternate, and heart-shaped with long petioles. The most common part used for medicinal purposes is the stem and leaves. Still, its roots also contain many important and useful alkaloids. *T. cordifolia* helps to alleviate *Vata* and *Kapha* dosha and is also very beneficial in *raktaj vyadhi*. In *Ayurveda*, it is called *Amruta* for its capability to enhance vitality and longevity. *T. cordifolia* normalizes biological processes like proliferation, apoptosis, lipid metabolism, etc. by activating the human lymphocyte with the synthesis of Pro-inflammatory cytokines like TNF- α , interleukin beta (IL-1b), interleukin (IL-6,) IL-18, interferon's (IFN-c) [4]. *T. cordifolia* also reduces oxidative stress by increasing the tissue glycoprotein [5]. Glucosides, Glycoside, and alkaloids of *T. cordifolia* inhibits NF-KB and acts as a nitric oxide scavenger, proving its action against cancer. It also shows a chemo-radio protective role by improving patients' body weight, tissue weight, and tubular diameter. This herb's antioxidant and immunomodulatory properties also help protect during chemo or radiation therapy.

Kalmegh (*Andrographis paniculata* (Burm. F.) Nees)

Andrographis paniculata is a small annual herb belonging to the Acanthaceae family. Stem weak, and flowers are small, white, or purple colored. Fruits are small and round and contain pale brown seeds. Flowering and fruiting are seen from the spring season to the summer season. Plant extract shows anti-inflammatory, analgesic, immune enhancer, hepatoprotective, and anticancer

activities. Phytochemical compounds like Andrographolide and Neoandrographolide inhibit LPS and PGE2 synthesis and have potential cell differentiation-inducing activity on leukemia cells [6]. Flavonoids, quercetin, genistein, and baicalein derived from plant extracts show anti-tumor effects. The study shows increased proliferation of lymphocytes and production of IL-2 by the action of immunostimulatory activity of andrographolide. It also improved the factor of tumor necrosis α production and CD markers, increasing the cytotoxic activity against cancer cells [7].

Haridra (*Curcuma longa* Linn.)

Curcuma longa is a well-known herb widely used in *Ayurveda*. It is a perennial herbaceous plant having smooth, alternate, green, and tapering. The rhizomes of this plant are used for medicinal purposes, are cylindrical, and have a strong aroma. In practice, *C. longa* has received considerable attention for its antiseptic, analgesic, antioxidant, anti-inflammatory, and anticancer activities. This drug acts as an anticancer drug by causing mutagenesis, cell cycle regulation, apoptosis, and oncogene expression. *C. longa* acts on various biological pathways. The study shows the action of anticancer activities *via* its effect on various biological pathways responsible for apoptosis, cell cycle regulation, mutagenesis, tumorigenesis, oncogene expression, and metastasis. Curcumin inhibits NF- κ B, and downstream gene products (including c-myc, Bcl-2, COX-2, NOS, Cyclin D1, TNF- α , interleukins, and MMP-9) also act as an antiproliferative in multiple malignancies. Curcumin is the main compound of *C. longa*, the principal curcuminoid. Neutralizing lipid radicals has resulted from the chain-breaking antioxidant action of curcumin. In the initial stage of carcinoma, free radicals and antioxidant properties of *C. longa* plays a major role. The study shows the UV irradiation suppression activity, regulation of pro-angiogenic growth factor, bFGF, VEGF, angiopoietin 1, 2 COX -2, matrix metalloproteinase-9(MMP-9), AP-1, and NF- κ B responsible for carcinogenic effects. Curcumin stimulates DDR (DNA damage response) as a chemopreventive agent. By reversing the bile acid suppression of gene expression SOD-1, the herb shows chemoprotective effects in an effective esophageal cell exposed to bile acid [8 - 10].

Neem (*Azadirachta indica* Linn.)

Azadirachta indica is an evergreen tree that belongs to the Meliaceae family. The tree has simple opposite leaves short – straight trunk with white fragrant flowers found in tropical and subtropical regions of India. This herb contains various compounds like Nimbin, nimbinine, azadirachtol, azadirachtin, nimbadinol, β -sitosterol, *etc.* bioactive components of *A. indica*, such as azadirachtin, nimboldin, *etc.*, which show chemopreventive and anti-tumor effects. *A. indica* shows

CHAPTER 7

The Classical Ayurveda Anti-Cancer Formulations**Dhirajsingh S. Rajput^{1,*}**¹ *Central Council for Research in Ayurvedic Sciences (CCRAS), Ministry of AYUSH, New Delhi, India*

Abstract: Rasoushadhis are special Ayurveda pharmaceutical formulations prepared from metals, minerals, potent herbs, and animal products. These medicines are preferred for severe chronic illnesses which are difficult to cure and life-threatening. Cancer is one such disease that ancient seers of Ayurveda noted. Several Rasoushadhis with potential cytotoxic and cell growth inhibitor actions are recommended for cancer treatment. The present chapter aims to disseminate such formulations, the basis behind their activity, and relevant other formulations that Ayurveda practitioners use to manage Bhaishajya Ratnavali and Rasayogasagar are two important compendia of Ayurveda formulations. Therefore in the present work, the anti-cancer formulations narrated in these two texts are reviewed and compiled. It can be said that the prevalence of cancer in the ancient Indian population was far less, and this may be why the number of anti-cancer formulations is limited. The use of metals and minerals in the form of chelation therapy for cancer can be correlated with Ayurveda anti-cancer Rasoushadhis. Several modern kinds of research on metals, minerals, and herbs contain supportive evidence indicating the rightness of the classical claim of the anti-cancer effect of herbomineral preparation. Relevant information from such research is also presented here. This chapter may be a brief illustrator of the ancient wisdom of anti-cancer formulations.

Keywords: Anti-cancer formulations, Bhaishajya Ratnavali, Herbomineral preparations, Rasoushadhis.

INTRODUCTION

The history of disease is as old as humankind, and so are the efforts for its management. This is why several conditions narrated in ancient traditional healthcare systems are well noted in modern times. Rheumatoid arthritis, tuberculosis, asthma, hemiplegia, diabetes, urinary stones, various skin diseases, and cancer are some diseases the ancient seers of traditional medicine describe. The same are major categories of chronic conditions included in modern medic-

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ine. Cancer is one of the chronic diseases which have been noted cause of mortality in the Global Burden of Diseases by the World Health Organization [1].

The modern system has discovered several advanced technologies to deal with life-threatening diseases such as cancer; however, the unwanted health effects still force science to find a better cure [2]. On the other hand, the traditional system, such as Ayurveda, has dealt with cancer for thousands of years. It is understood that there is a difference between modern medicine and Ayurveda in the way of expressing knowledge and treating disease. For example, cancer has been narrated in Ayurved under the heading *Arbuda* (tumor), *Granthi* (glandular swelling), *Galaganda* (cervical lymphadenopathy) [3]. Therefore, the knowledge of Ayurveda anti-cancer treatment is not as widely known as the recent trend of chemotherapy. To understand the Ayurveda literature for cancer management, it is necessary to know the anti-cancer formulations narrated in Ayurveda and the concept behind the specific combination of ingredients.

In the context of cancer, it can be claimed that the prevalence of this disease was far less during the ancient time because of a healthy lifestyle, healthy diet, far fewer habits of addiction, and no or insignificant use of chemicals in food and cosmetics. Therefore, Ayurveda narrated literature has limited formulations, mostly herbs-mineral preparations. Bhaishajya Ratnavali and Rasayoga Sagar are the two texts of Ayurveda in which the maximum number of formulations from all available classical texts are compiled systematically. Hence in the present chapter, formulations from these two classical texts are taken along with relevant literature and research works.

FORMULATIONS FOR LOCAL APPLICATION

The formulations for local application can be divided into two categories, those which require to be applied with specific media or with particular procedures and the formulations which are like ointment and can be easily used on the site. The location application is preferable in a visible or palpable tumor condition. The generated heat locally and the absorbed phytochemical constituents through the skin may restrict the growth and fasten the decaying mechanism of tumor cells. Time, duration, and thickness for local application of these formulations are to be judged by the physician based on the *Arbud* and *Prakriti* patient type. Acharya Govinda Das has compiled 11 formulations for local application in his treatise *Bhaishajya Ratnavali*. These formulations are depicted in Table 1.

Table 1. Formulations narrated in Bhaishajya Ratnavali, Galagandadi Rogadhikar for local application in different types of cancer [4].

Sr.	Formulation	Application Media	Indication
1	HinstradiLepa	With Gopitta	Vatagranthi
2	Milk application	Jaloukavacharana and internal administration of Kakolivarga Kashaya	Pittaja Granthi
3	Vikankadi Lepa	*	Kaphaja Granthi
4	Dantimuladi Lepa	*	Kaphaja Granthi
5	Sajjiksharadi Lepa	*	Granthi Arbuda
6	Snigdhamansa Upanah	* (Followed by Nadisweda and Shrunga Raktamokshana)	Vata Arbuda
7	Udumbaradi Lapa	* (followed by Mrudusweda, Upanah, PittaghnaPathya, Virechana)	Pitta Arbuda
8	Mulibhasma and Shankhchurnalepa	*	KaphajArbuda
9	Upodikadi Lepa	*	Kaphaj Arbuda
10	Snuhyadi Lepa	*	All Arbuda
11	Haridradi Lepa	*	Medoarbuda

* Location application media is not required as the formulation is like ointment.

Herbo-Mineral Anti-Cancer Formulations

In Ayurveda pharmaceuticals, before the therapeutic utilization of metals and minerals, they are converted into herb-mineral complexes with nanoparticles [5]. Later, these nanoparticles are combined with herbs and utilized for intended purposes. In other words, the nanoparticle or nanomedicines of metal/mineral are the sources of developing desired formulations to treat a disease. Regarding cancer as a primary indication, only two formulations are mentioned in Ayurveda. (Table 2). However, in Rasayogasagar, 17 formulations are noted with a secondary indication as anti-cancer (Fig. 1).

Table 2. Two primary anti-cancer formulations.

S.N	Formulation	Dose	Anupana	References
1	Roudra Rasa	1 Gunja (125 mg)	Honey	Bhaishajya Ratnavali [6]
2	Arbudahara Rasa	1 Gunja (125 mg)	Honey or according to disease complications	Rasachandashu [7]

Application of Dincharya, Rutucharya and Yoga for the Prevention and Management of Cancer

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Abstract: Cancer is a group of diseases having an uncontrolled unregulated division of abnormal cells that tend to spread to all other parts of the body. It is observed that about 80-90 percent of the causes of cancer include unhealthy diet, behavioral habits, and environmental factors that can be prevented. Cancer is not described in Ayurveda, but in Brihatatrasya, there is a description of Granthi and Arbuda, which can be correlated with cancer due to the similarity in nature and clinical course. In Ayurveda, there are three major causes of any ailment: Kala Parinam, Pragyaparadha, and Asatmendriyarthasamyoga. All of this can be prevented by adopting a healthy lifestyle. Hence there is a need to focus on a healthy lifestyle to manage and prevent cancer. Concept of Primordial prevention: The holistic approaches of Swasthavritta like Healthy dietary and behavioral habits, Dincharya, Ritucharya, not restraining non-suppressible urges and holding suppressible desires, Good conduct, Yoga, Pranayama, Meditation, and Shatkarma purifying procedures, all come under primordial prevention. This is the prevention of the risk factors by optimizing lifestyles associated with cancer by following the holistic principles of Ayurveda. Various research studies also proved that these principles of Ayurveda are helpful in the prevention and recovery of cancer patients. On the basis of the conclusion from the literature and available research on cancer, it can be said that adopting the holistic principles of Ayurveda is beneficial in preventing the risk of various types of cancers.

Keywords: Arbud, Ahar, Cancer, Diet, Dincharya, Exercise, Granthi, Meditation, Nidra, Pranayama, Ritucharya, Stress, Yoga.

INTRODUCTION

There is an intimate association between an individual's lifestyle and the state of health and disease. Lifestyle is a way of living that is a routine activity of an individual, which mainly involves dietary (*Aahar*) and behavioral (*Vihara*) that is both physical as well as mental practices. According to W.H.O. (1948), "Health is

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a state of complete physical, mental, and social well-being and not merely an absence of disease or infirmity” [1]. *Acharya Sushruta* stated that “*Swastha* (Health) means an individual having balance and normal activities of the *Tridoshas*, *Agni* (digestive power), seven *Dhatu* (body tissues), *Malas* (excretory products) with having calm *Atma* (Soul), *Mana* (Mind) and *Indriya* (sense organs).

Cancer is a cluster of ailments having an uncontrolled unregulated division of abnormal cells that tend to spread in all other parts of the body. An unhealthy lifestyle, environmental factors, family history, and genetics are risk factors for the occurrence of cancers. Free radicals, natural byproducts of metabolism, are responsible for oxidative stress, which damage the normal cellular structure and function. The continuous process of generating these natural byproducts in the body is going on, and the factors mentioned above accelerate their production. The antioxidant defense system in the body protects the body if these are within normal physiological levels [2]. This antioxidant defense system of the body can be increased by following Ayurveda's holistic principles, which help prevent cancer. Worldwide, cancer is the second most important cause of death. In old times, cancer was believed to be originating from unknown reasons. Still, nowadays, due to progress in medical science, it is observed that about 80-90 percent of the causes of cancer include unhealthy diet, behavioral habits, and environmental factors that can be prevented [3]. Cancer is not described in Ayurveda, but in *Brihatatrayi*, there is a description of *Granthi* and *Arbuda*, which can be correlated with cancer due to the similarity in nature and clinical course. In Ayurveda, there are three major causes of any ailment: *Kala Parinam*, *Pragyaparadha*, and *Asatmendriyatha Samyoga*. *Kala Parinama* refers to the *Samyaka* and *Asamyaka Yoga* of different seasons. All of this can be prevented by adopting a healthy lifestyle. Hence, there is a need to focus on a healthy lifestyle to manage and prevent cancer. In Ayurveda, lifestyle is described in the form of *Dinacharya*, *Ritucharya*, and *Sadvritta*. These are designed based on balancing functions of '*Doshas*', *Dhatu*, '*Agni*', and '*Mala*'. *Acharya Charak* described the three *Upastambhas* (supporting pillars), *Aahar* (Food), *Nidra* (Sleep), and *Brahmacharya* (Celibacy) for the maintenance of good health [4].

THE PREVENTIVE MEASURES FOR CANCER

The Role of Aahar (Diet) in Preventing Cancer

Aahar is considered important among all three *Upastambhas*; hence it has been given the first place. Inappropriate and unhealthy dietary practices lead to the majority of diseases. If an individual had not taken food properly, it will lead to *Mandagni*, which is a root cause of all diseases. *Acharya Charaka* described that

the quantity of food depends on the strength of *Agni* (digestive fire), *Ritu* (Seasonal changes), and *Vaya* (age) of a person. *Viruddha Aahar* (Incompatibility of food) is a unique concept described by Acharya Charaka. According to this, *Aahardravyas* become incompatible due to their mutually contradictory qualities of 18 types [5]. One should avoid consuming incompatible food, which is one of the major dietary factors responsible for cancer pathogenesis.

Acharya Charak described *Ashta Aahar Vidhi Viseshayatana* that is the eight aspects of Dietetics, the factors responsible for the wholesome and unwholesome effect of the *Aahar*, and methods of *Aaharsevana* (rule for the intake of diet) that should be considered before taking food [6]. Thus food taken in proper quantity by following all laws and regulations stated in Ayurveda will help balance dosha, dhatu, and mala, thereby keeping us healthy, which is important in preventing cancer-like diseases.

Acharya Charaka described *Aahar Vidhi Vidhana*, the general principles of taking *Aahar*, and stated that all should follow these rules while consuming the food to remain healthy and enhance the span of life. For maintaining the equilibrium of *Doshas*, consumption of all six *Rasas* in proper quantity is essential. Excess or less consumption of particular *Rasa Aahar* leads to aggravation and vitiation of *Doshas*. As per Ayurveda, the imbalance of doshas is one of the major causes of the pathogenesis of cancer-like diseases. Therefore, *Shadras Aahar* is considered the best. Improper dietary habits lead to the formation of free radicals in the body, which cause damage to DNA and other parts of human cells leading to a risk of cancer. *Pathyapathya* is another concept described in Ayurveda. *Pathya* (wholesome) *Aahar* that is *Hitkar* and *Apathya* (unwholesome) *Aahar* that is *Ahitakar* should also be considered while taking food. In case of cancer, high caloric fat diet, red meat, canned food, beverages, refined sugar, and excess salt should be avoided. Food rich in plant sources like fruits and vegetables high fiber diet should be consumed [7].

Globally it is estimated that 20-60% of cancers are mainly caused due to dietary factors, and around one-third of mortality is due to cancer in Western countries. The World Health Organization stated that avoiding risk factors and implementing proven preventive measures can help reduce the occurrence of cancer by up to 30-50%. As per the 2012 American Cancer Society (ACS) Guidelines, among these evidence-based measures, there is a close relation between healthy dietary habits and a reduction in deaths due to cancer. Numerous observational studies recommended that an unhealthy diet is an important risk factor for cancer. Evidence from these researches indicated that increased fruit, vegetable, and grain consumption reduces the risk of cancer. Various research studies have recognized the above 500 dietary components as possible modifiers

Applied Aspect of Dooshivisha in the Perspective of Cancer

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Abstract: Agadtantra is a specialized Ayurveda branch that deals with toxicity management. This specialized branch has given the novel concept of Dooshivisha. It is a transformable state of *Visha* (poison) which any type of poison can attain if it is not eliminated from the body completely. Today every individual is frequently exposed to many toxic substances, mostly carcinogenic. Polycyclic hydrocarbons, nitrosamine, pyrogenic compounds and many others are now known to be potent mutagens and carcinogens. These carcinogens enter the body through air, water, radiation, drugs, cosmetics and reflect deposit in the body as a Dooshivisha and slowly vitiate all the Doshas & saptadhatu (seven Dhatu). After studying the etiological factor of cancer in the context of Ayurveda and modern medicine, it is seen that most of the etiological factors and pathology of cancer come under these headings. Radiotherapy and chemotherapy are the only lines of treatment for cancer, but they produce harmful toxic effects along with their beneficial effects. Management of cancer is made easy by adopting a therapeutic approach of Dooshivisha. Various Agadkalpas are useful to reduce or vanish latent toxicity. The integrated system of modern medicine with Dooshivisha management means the application of Agada will be helpful for prevention, minimizing the side effects of conventional therapies, and improving the quality of life of cancer patients.

Keywords: Agad, Cancer, Dooshivisha, Visha.

INTRODUCTION

CONCEPT OF *DOOSHIVISHA*

In Ayurveda, three sources of poisoning are explained in the context of Agadtantra. It is categorized as Sthavar (vegetative), Jangam (animate), and Krutrim (artificial poison). Along with this, ancient seers mentioned a novel concept of poisoning, *i.e.*, Dooshivisha, which means the transformable stage of any poison. It is defined as poison from any source, if not fully eliminated from

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the body, gets transformed into another form and retains in the body for a longer period [1]. This poison does not produce any immediate symptoms as Kapha Dosha envelops it due to its low potency. It lays dormant condition and gets spread slowly all over the body. After absorption, it vitiates *Dosha* and then vitiates *saptadhatu* (cells/tissue). In the concept of *Dooshivisha*, the normal functioning of Dhatu gets disturbed (cellular change), and physiological changes are seen in terms of signs and symptoms in a particular system or organ (Table 1).

Table 1. Causes of cancer concerning Visha (poison).

Source as per Ayurveda	As per Modern
SthavarVisha	Algae, Moulds (<i>Aspergillus Flavus</i> & <i>Aspergillus parasiticus</i>) - Aflatoxine
	Pteridiumaquilinum - Ptaquiloside
Artificial poison	Insecticides -Organophosphate, Carbamate, DDT, Fungicides – Pentachlorophenol, Creosote Rodenticides, Herbicides
	Industrial chemical – Hydrocarbons, Alcohol, Aldehydes, Metals, Aromatic amines, Nitro compounds

PATHOPHYSIOLOGY OF CANCER

Due to industrialization and modernization, people are exposed to a large amount of many harmful chemicals every day. Environmental exposure is one of the most significant causes of cancer; as per the WHO and IARC (international agency of cancer research) report, it is estimated that 7-19% of cancer are due to exposure to toxic substances. In the late 1700s, a link between cancer and chemical was found by English surgeon Percival Pott. He observed that chimney soot contains polycyclic aromatic hydrocarbons, and many chimney sweeps suffer from scrotum cancer by exposure to soot [2].

A wide range of physical, chemical, and biological agents have been associated with increased cancer risk. As per the toxicological point of view, all these agents come under the artificial poison category. Common examples are coal tar products, arsenic, radon, asbestos, formaldehyde, and benzene. The body gets exposed to these agents by the air that we breathe, the food that we eat, the water that we drink, and our lifestyle choices. After exposure to the carcinogenic agents, they may be absorbed and distributed all over the body, retained in the transformable stage, or converted into inert form and excreted from the body. The agent that gets absorbed possesses the ability to interact with our genomes in multiple ways and can affect cancer initiation, progression, and aggression. This means these agents can induce genetic and epigenetic alterations in the host tissue.

Hence the process of carcinogenesis evolved over a while. The time from the first cell change to the time the cancer is detected is called a latency period.

CLASSIFICATION OF CARCINOGEN [3]

Based on the mechanism, a carcinogen is of two types: one is genotoxic, and the second is epigenetic. Genotoxic is direct-acting which alters the genes through the interaction with DNA. Epigenetics does not act directly on genetic materials. Genotoxic is further classified into three groups, Direct or primary carcinogen-chemicals now work without any bioactivation; Procarcinogen –chemicals that, after biotransformation, become carcinogenic; Inorganic carcinogenic. Epigenetics is also categorized into subgroups; Co-Carcinogen –these chemicals increase the effectiveness of carcinogen when they are administered together; Promoter- it will not induce cancer itself but increase the response of carcinogen when applied after it; Solid-state –works by an unknown mechanism but physical form vital to effect, Hormone- it alters the endocrine balance and acts as a promoter, or Immunosuppressors (Fig. 1).

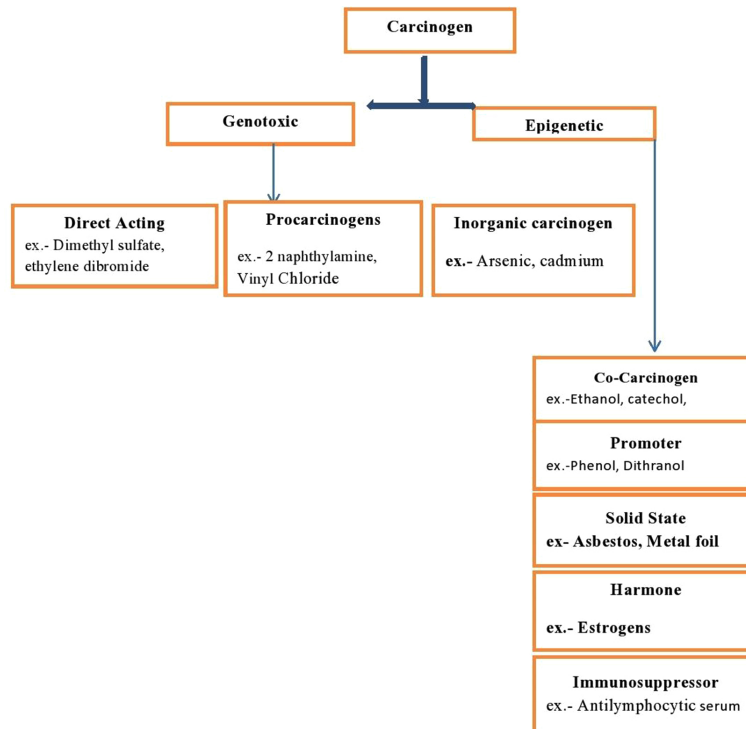


Fig. (1). Classification of carcinogen.

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