Cancer Prevention: An Overview

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Introduction

Cancer is essentially a problem of abnormal cell growth. Under the influence of the chemicals, viruses and free radicals, normal cells are transformed to cancer cells that divide in an uncontrolled manner (Nwa for *et al.,* 2001). Cancer is common term for all malignant tumours. The term is derived from the Latin word "CRAB" means "CANCER". Cancer is mainly characterized by the formation of "TUMOUR" or "NEOPLASM" which can be defined as "A mass of tissue formed as a result of abnormal, excessive, uncontrolled, autonomous and purposeless proliferation of cell".

Cancer is the second leading cause of death in the world exceeded only by the diseases of the heart, followed by road accidents and AIDS (WHO Report, 1995). Each year, nearly 6 million people die from cancer, which is roughly 12 percent of the total number of deaths in the world and 10 million new cases are diagnosed. Nearly 8 lakhs of cancer cases are diagnosed every year in India and about 5 lakhs die. (WHO Report, 2003). WHO has predicted that number of cancer new cases will reach 15 million until 2020 (Tavakoli *et al.,* 2012).

Cancer is a major cause of morbidity and mortality in developing and developed countries (Ferlay *et al.,* 2013) in comparison to the other diseases. In many low-income and middle-income countries, including India, most of the population does not have access to a well-

organized and well-regulated cancer care system (Mallath *et al.,* 2014).

Several factors play a role in the induction of cancer:-

1. Physical factors like ionizing radiation (α, β, γ rays) and non-ionising radiation like ultraviolet radiation.
2. Chemical factors like polycyclic aromatic hydrocarbons (PAHs) present in the environment.
3. Biological factors i.e. viruses like adeno virus, papilloma virus [Human papilloma virus (HPV)], herpes virus [Epstein-Barr virus (EBV)], human T cell leukemia virus (HTLV) also play important roles.

One of the most potent and very common pollutants are the polycyclic aromatic hydrocarbon (PAHs). PAHs are ubiquitous environmental agents commonly believed to significantly contribute to human cancers. PAHs are formed in the process of incomplete combustion of organic material, for example, in engine exhaust, cigarette smoke, soil, water and food.

Carcinogenesis is a multistep process that converts normal cells into malignant cells and broadly divided into three phases: initiation, promotion and progression. In initiation, a carcinogen interacts with DNA, producing a fixed mutation. During promotion, the initiated cells proliferate. Progression is the phase between a premalignant lesion and the development of invasive cancer. (Slaga, 1989; DiGiovanni, 1990; Yuspa *et al*., 1994; Dragnev *et al*., 2000).

At present, Humans are constantly exposed to a large number of genotoxic environmental

chemicals. Of these, polycyclic aromatic hydrocarbons (PAHs) such as benzo(a)pyrene [B(a)P] and dibenzo(a,l)pyrene [DB(a,l)P] are emerged as potent human carcinogens (IARC, 1983; Searle and Teale, 1990).

More than 100 types of cancer have been recognized. Each cancer is classified according to cell type involved at first (Safarzadeh *et al.,* 2014). According to National Cancer Institute (NCI) classification, different types of cancer are classified into carcinoma, Leukemia, lymphoma and myeloma, central nerve system cancer (Jena, 2012). Nowadays cancer is considered as a human tragedy and causality prevalence resulting from cancer is increasing (Safarzadeh *et al.,* 2014).

CHEMOPREVENTION

Ultimate goal of cancer prevention is preferably to live without cancer or with cancer without suffering from symptoms until the natural termination of life. Cancer can be prevented by either avoiding life style related risk factors such as the smoking habit, a western diet, physical inactivity and carcinogen containing foods, or alternatively by increasing exposure to beneficial influences including intake of chemo preventive agents.

Since, cancer is one of the leading causes for mortality in humans; it is of serious concern to us. Various therapeutic modalities are available after the diagnosis of the dreadful disease which includes surgical removal, radiotherapy, chemotherapy, immunotherapy and others. But all these may delay the mortality for a span of time but in due course, they do cause toxicity to normal tissues.

Extensive researches are now being carried out in several research sectors in the world to evaluate the chemo preventive efficacy of various nutrient and non-nutrient dietary constituents of plant origin. They have evidence of chemoprevention by inhibiting and / or suppressing or reversing cancer incidence trend evoked by multitude of factors including environmental chemical carcinogens.

India is a country well known for its herbal medicinal concept, "Ayurveda" from ancient times. Traditional use of spices and many other plants parts as food ingredients may confer some protection from cancer reflected in lower incidences of certain forms of cancers in the country in comparison to the western countries (Gupta *et al*., 2004).

India has tremendous wealth of aromatic and medicinal plants. In current days medicinal plants are a pillar of traditional healthcare systems of medicine in many developing countries. Since from the ancient times, several drugs have been formulated using the bioactive compounds present in these medicinal plants (Rahmati *et al.,* 2015).

Epidemiological studies in the past few years has generated great interest in determining whether specific compounds from natural products consumed by the general population are responsible for the observed reduction in cancer rates (Wei *et al*., 1990). So, "prevention is better than cure". This old proverb stands true today, to decrease the incidence of cancer in humans.

Therefore, to prevent the so many lives from hazardous environmental pollutants like PAHs, Various medicinal plants have been discovered and more plants will be required to screen out these chemo preventive properties.

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Thus, the chemoprevention of cancer differs from therapy in that the goal of prevention is to lower the rate of cancer incidence. Naturally occurring or synthetic chemo preventive agents are also known as anticarcinogens and an ideal agent should have (i) little or no untoward or toxic effects, (ii) high efficacy against multiple sites, (iii) capability of oral administration, (iv) a known mechanism of action, (v) low cost, and (vi) human acceptance. With regard to naturally occurring agents, fruits, vegetables and common beverages, as well as several herbs and plants, have been identified as rich sources of cancer chemo preventive agents.

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