Introduction

The term “pharmacognosie” was used for the first time, in 1811, in Lehrbuch der Materia Medica by Johann Adam Schmidt. The word is derived from the two Greek words pharmakon and gnosis, which mean “drug” and “knowledge”, respectively (Samuelsson 2004). The common and original definition of pharmacognosy is the scientific study of drugs derived from nature. However, the focus of pharmacognosy has shifted numerous times: the classical botanical aspects have successively been deemphasized in favour of a more modern pharmacognosy, dealing more with natural product chemistry and pharmacology (Bruhn and Bohlin 1997; Bohlin et al., 2007). An expanded model of pharmacognosy that incorporates a broad range of areas has recently been proposed (Larsson 2007).

Natural product chemistry

The rich structural diversity and complexity of natural products have resulted in numerous new drugs and inspired chemists to produce synthetic analogs with enhanced bioactivity (Faulkner 2000a). Although most of the drugs currently in development are results of either semi- or complete synthesis, natural products continue to play a significant role in the discovery and development of new pharmaceuticals, as was recently highlighted (Faulkner 2000a). Scientists have only scratched the surface of many unconventional natural product sources (Tulp and Bohlin 2004). Of all drugs developed between 1981 and 2006, 28% were either natural products or derived from them. Another 20% can be categorized as natural product mimics (NM). This label is somewhat controversial, as it can be interpreted as exaggerating the roles natural products play in NM development. However, one can argue that nature played an inspirational role in the initial development stage. Immunosuppression, antiinfection, oncology and metabolic diseases are regarded as the predominant therapeutic areas of natural product-derived drugs (Butler 2004).

In the 1990s the pharmaceutical industry in practice selected lead compounds exclusively on the basis of Lipinski’s rule of five, although the rule is not directly
applicable to natural products (Lipinski et al., 1997; Macarron 2006). As a consequence of the rigorous application of this rule, natural products were deprioritized or even eliminated from the drug discovery process. The concept of the discovery process has since then gradually changed and a renewed interest in natural products has resurfaced. Natural sources offer excellent opportunities for finding leads for novel targets (Tulp and Bohlin 2002). Today there is a growing awareness that natural products tend to occupy a wider chemical space than do synthetic compounds – a fact the scientific community is starting to take into account in the early drug discovery process (Feher and Schmidt 2003; Larsson et al., 2007).

**Marine natural products**

The ocean represents a unique resource providing a diverse array of natural products. The greatest biodiversity is found in ecosystems, such as rocky coasts, kelp beds and coral reefs, where species diversity and population density are exceedingly high (Haefner 2003). In fact, 34 of the 36 phyla of life are represented in the marine environment, implying chemical evolution along many separate lineages. Only a fraction of marine organisms have so far been investigated, but even so over 12,000 novel compounds have been discovered (Donia and Hamann 2003), with hundreds of additional compounds being discovered annually (Faulkner 2002). Properties in the marine environment force aquatic organisms to produce molecules that can differ substantially in structural terms from terrestrial substances. Physical conditions, such as lack of light, low temperature, high salinity or extreme pressure force marine organisms to produce secondary metabolites to overcome these obstacles.

Despite four decades of intense research, marine pharmacognosy is still considered a relatively young field compared to terrestrial pharmacognosy. Originally, pharmacognosy dealt exclusively with the study of drugs derived from terrestrial plants and animals. However, in the 1950s, marine organisms were identified as an excellent source of new biologically active compounds (Blunt et al., 2007). It was not until 20 years later, however, that systematic investigation of the marine environment was initiated. There are several profound
differences between the marine and terrestrial environments for which scientists must account, such as the sources of the natural products in question. Marine invertebrates and microorganisms have yielded substantially more bioactive natural products than seaweeds have, unlike the terrestrial environments, where plants are considerably richer in secondary metabolites (Proksch 1994; Faulkner 2002).

Several sessile invertebrates have intimate, symbiotic relationships with microorganisms and several natural products isolated from marine invertebrates are suspected to be of microbial origin; however scientific evidence for this is often scarce and incomplete (Proksch et al., 2002). The last decade of marine natural product research has witnessed a gradual shift of focus from invertebrates and other macroorganisms to microorganisms.

Cancer

Cancer, after cardiovascular disease, is the second leading cause of death in the world (Jemal et al., 2007). Worldwide about 10 million people per year are diagnosed with cancer and more than 6 million die of the disease and over 22 million people in the world are cancer patients (Steward and Kleihues, 2003). It accounts for about 23 and 7% deaths in USA and India, respectively. The world’s population is expected to be 7.5 billion by 2020 and approximations predict that about 15.0 million new cancer cases will be diagnosed; with deaths of about 12.0 million cancer patients (Bray and et al., 2006). The prevalence of cancer in India is estimated to be around 2.5 million, with about 8, 00,000 new cases and 5, 50,000 deaths per annum (Nandakumar, 1990-96). According to 1991 Indian census data, about 609000 cancer cases have been observed. This number had drastically increased to 806,000 by the end of the last century; with 96.4 and 88.2% age standardized rates for males and females; out of 100,000 cases analyzed (Rao et al., 1998).

During last one decade, about 70% cancer cases have been diagnosed and treated with survival of a few patients (Dinshaw et al., 1999). It is believed that in near future the number of cancer patients will increase in the developing and under developed countries, which may rise up to 70%; a serious issue for all of us. The
magnitude of cancer problem in the Indian Sub-continent (sheer numbers) is increasing due to poor to moderate living standards (Wynder et al., 1974) and inadequate medical facilities. Most frequently observed cancers in Indian population are of lungs, breast, colon, rectum, stomach and liver (Murthy et al., 2004). Nowadays, India is growing with a good progress rate and probably will become a developed country within a few decades resulting into its participation in the world development. Therefore, it is important to study the status of cancers in India so that advance measures may be taken to control this havoc in near future. In view of these facts, attempts have been made to study the status of cancers in India including its causes, preventive measures, effect on Indian economy and comparison with global scenario.

**Cancer scenario in India**

Based on the increasing trends of cancer patients during the last few decades, the numbers of cancer patients have been predicted by the end of 2015 and 2020 in India. These compiled data show that the number of male, female and the total cancer patients in 2004 were 390809, 428545 and 819354 respectively. The number of male and female cancer patients increased continuously up to 2009, with 454842, 507990 and 962832 cases for male, female and total cancer patients, respectively. Similarly, 462408 male cancer patients and 517378 female cancer patients were recorded, with a total number of 979786 patients in 2010. Thus, it is clear from this Figure that the number of cancer cases has increased gradually with time. Moreover, a prediction of cancer patients in 2015 and 2020, respectively, has also been made (Parkin et al., 2000).

**Predominant cancer types of India**

Lung cancer was rare in the beginning of the last century (Parkin et al., 2000) but later on it was diagnosed in various patients. Banker et al., (1955) reported about 9210 consecutive autopsies of lung cancer patients in 1970, which were 14.4% of all cancer types. But, nowadays, it has become almost epidemic resulting in greater
number of deaths than those caused by colorectal, breast and prostate cancers (Khuri et al., 2001). The data collected by the National Cancer Registry Program of the Indian Council of Medical Research; from six different parts of the country including both rural and urban areas; showed varying degrees of incidence in different areas (ICMR, 1988-89). The most common forms of malignancies in males during 1989 in Bombay, Delhi, and Bhopal were cancers of trachea, bronchi and lungs. These cancers were also reported in other cities in the order of Madras > Bangalore > Barshi. These sorts of cancers were rare in females except in Bombay and Bhopal, where they ranked at sixth and seventh positions of malignancies, respectively. Efforts have also been made to find out the total number of cancer cases in five metro cities of India (New Delhi, Bombay, Chennai, Bhopal and Bangalore) during 2008.

Breast cancer is the most common malignancy type diagnosed in women in developed countries and the second most common type diagnosed in developing countries. Breast cancer has been described as an alarmingly health problem in India (Yeole et al., 2003). According to the reports, breast cancers have badly attacked women population in India. A survey carried out by Indian Council of Medical Research (ICMR) in the metropolitan cities viz. Delhi, Mumbai, Bangalore and Chennai; from 1982 to 2005; has shown that the incidences of breast cancer have doubled. Over the years, the incidences of breast cancer in India have steadily increased and as many as 100,000 new patients are being detected every year (Yip et al., 2006; Michael et al., 2003). A 12% increase has been registered by cancer registries from 1985 to 2001, which represented 57% rise of cancer burden in India (Yip et al., 2006; Hadjiiski et al., 2006).

Stomach is one of the most essential organs of human body, which frequently gets cancer and stands at fifth position (Parkin et al., 1999). South East Asian countries including India were reported to have lower rates of stomach cancers. However, the prevalence of stomach cancer was found to be quite high in Mizoram, North East India. Reports from the National Cancer Registry Programme suggested that stomach remained the leading site of cancer in males in Chennai from 1990 to 1996 with Age Adjusted Rate [(AAR)=13.6/105], followed by Bangalore (9.5/105),
Mumbai (6.4/105), Delhi (3.9/105), Bhopal (3.4/105) and Barshi (1.2/105). In Mizoram, AAR of stomach cancer has been found to be high in both males (39.1/105) and females (14.4/105) as compared to other parts of India. On the basis of the prevalence of stomach cancer Mizoram occupied the first position among Indian states. Moreover, this state comprised fifth position globally (Phukan et al., 2004).

Gall Bladder Cancer (GBC) was first diagnosed during laparotomy or laparoscopy procedures, which were expected to confirm the presence of benign gall bladder diseases (Misra et al., 1997). Almost 2% gall stone patients were diagnosed with GBC. Gall bladder cancer is the most common abdominal malignancy in northern parts of the country (Singh et al., 2004). An incidence rate of 4.5 and 10.1% per 100,000 population of males and females, respectively, has been reported by the Indian Council of Medical Research Cancer Registry in some northern parts of India (ICMR, 1996). The highest incidence of GBCs in India has been reported along the Ganges delta (Kaushik et al., 1997). Gallstones associated with gallbladder carcinoma have been reported in 70-90% of patients with GBC. Approximately, 0.4% of all patients with gallstones have GBC (David et al., 1997).

The most susceptible site of cancer in women in the developing countries is cervix (Parkin et al., 1992). During last few decades, it has been observed that the number of cervical cancer cases in women has decreased in India. One case study of Bangalore city supported this observation. In 1982, 32.4% cervical cancer cases per 100,000 populations were reported every year in Bangalore, which decreased to 27.2, 18.2, and 17.0% in 1991, 2001, and 2005 years, respectively. Similarly, in 1988, 25.9 new cases of cervical cancer per 100,000 women population were reported in Delhi, which decreased to 19.1 and 18.9 in 1998 and 2005, respectively. Accordingly, Mumbai recorded 17.9% new cervical cancer cases per 100,000 populations in 1982 followed by 12.7% in 2005. During these 24 years (1982-2005) Chennai recorded a fall of about 50% in cervical cancer cases. According to the reports 41% cases per 100,000 populations were reported in Chennai in 1982, which decreased to 33.4 and 22.0% in 1991 and 2005.
In 2003, Indian Council of Medical Research (ICMR) reported that oral cancer is very common in India (ICMR, 1992). There has been a substantial increase in the incidences of oral sub-mucous fibrosis; especially among youngsters; which further increased the incidence of the oral cancer (Gupta et al., 1998). Presently, oral cancer is the fourth common type of malignancy after lung, stomach and liver in males. It is the fifth common cancer after cervix, breast, stomach and lung cancer in females (Park, 1997). Regional Cancer Centre (RCC) Kerala reported about 14% oral cancer patients out of which 17.0 and 10.5% cases were in males and females, respectively (Padmakumary, 2000). A significant number of oral cancer patients have been reported in Agra, Allahabad, Mainipuri, Varanasi and Moradabad belt of Uttar Pradesh (Wahi et al., 1965).

Besides these, some other sorts of cancers have been observed in India. The incidence of esophageal cancer in India is moderately high; associated with diets and lifestyles. According to a data from cancer registries in India, esophageal cancer is the second most common cancer among males and the fourth most common cancer among females (Gajalakshmi, 2001). Colorectal cancer is a disease that usually affects individuals of age 50 years or more (Anthony, 1998). There is a sharp increase in the incidence rate of colorectal cancer after the age of 45 years and 90% of cases are found in persons over the age of 50 years. Head and Neck Neoplasia (HNN) are major forms of cancers in India, which account for nearly 23 and 6% in males and females, respectively (ICMR, 1992). The five year survival of the disease varied from 20 -90% depending on the sub-site of origin and the clinical extent of the disease (Mehrotra et al., 2005). India is known to have the world’s largest reported incidences of HNN in women (Sankaranarayan et al., 1998). Nearly 0.2 million head and neck cancer cases are diagnosed in the country annually and approximately 4.5 million globally.
Causes of Cancer

Diet

About 70% colorectal cancer cases are believed to be due to imbalanced diet. The role of diet towards cancer varies greatly according to the type of cancers. As per the International correlation studies, overwhelming positive associations between dietary fat, red meat consumption and colorectal cancer incidence and mortality have been observed. The heavy consumption of red meat is the main cause of several cancers including gastrointestinal tract and colorectal (Bingham et al., 2002; Chao et al., 2005; Hogg, 2007), prostate (Rodriguez et al., 2006), bladder (Garcia-Closas et al., 2007), breast (Tappel, 2007), gastric (Hanlon, 2006) and oral cancers (Toporcov et al., 2004).

Most probably, it is due to the production of heterocyclic amines (most potential carcinogens) during cooking of red meat. Pyrolysates are produced by charcoal cooking or smoke curing of meat, which exert a cancerous effect on our body cells (Lauber et al., 2007). Almost 20% of total mutagenicity of fried beef is due to the presence of PhIP (2-amino-1-methyl-6-phenyl-imidazo[4,5-b]pyridine), which is the most abundant mutagen by mass in cooked beef. Food kept in plastic containers turns out to be carcinogenic because bios-phenol from the plastic containers gets dissolved and migrates into the food; resulting into the risk of breast (Durando et al., 2007) and prostate (Ho et al., 2006) cancers. A low intake of fresh fruits and high cooking temperatures in Indian dishes may account for low levels of vitamin C; resulting into higher risks of stomach, mouth, pharyngeal, esophageal. Recently, the case control studies carried out in Asian Indian immigrants to U.K. and U.S.A. found high levels of homocysteine as a risk factor for the breast, ovarian and pancreatic cancers (Wu et al., 2002).

Vegetarianism; practiced by a large population of Indians (particularly Hindus); has been associated with lower risks of prostate cancer (Rajaram et al., 2000). A comparison of non-vegetarian and vegetarian diets and alcohol and tobacco uses in India was carried out through case control studies. It was observed that vegetarians have a lower risk of esophageal (Roa, 1997), oral (Roa et al., 1994)
and breast cancers (Jain et al., 1999). Beans, chickpeas and lentils are the principal components of vegetarian diet—-a rich source of proteins; and pulses have been significantly associated with reductions in cancer (Jain et al., 1999; Mills et al., 1989). An increased risk of cancer has been observed with diets with high saturated fats. Middle class people in India and some of the rural areas have a high intake of ghee, which may create an increased cancer risk (Ghafoornissa, 1998; Law, 2000).

The Indian diet containing adequate quantities of vegetables, fruits, and fibre rich grains provides protection against the increased risk of colon and breast cancers (World cancer research fund, 1997). Furthermore, Figure 4 depicts that improper lifestyle and poor dietary habits, which are the key factors for the prevalence of breast and cervical cancers in the female population of Goa. High incidences of throat and food pipe cancers in Andhra Pradesh and Assam were attributed to improper diets (Lammers et al., 1998).

**Tobacco**

The consumption of tobacco is the leading cause of cancers in India. The regular use of tobacco via smoking, chewing, snuffing etc. in some areas of the country, which is responsible for 65 to 85% cancer incidences in men and women, respectively. The various cancers produced by the use of tobacco are of oral cavity, pharynx, esophagus, larynx, lungs and urinary bladder. It has been observed that women in Bangalore are known to have the highest rates of cancers of esophagus in the world (around eight per 100,000). Contrarily, men in Bhopal have the highest rate of tongue cancer in the world (nine per 100,000) (Bobba et al., 2003). Smoking is the most notorious factor for the causation of lung cancer (Hammond et al., 1958). Approximately, 87 and 85% males and females have been found to have lung cancer due to tobacco smoking in the form of bidi (a thin South Asian cigarette type structure filled with tobacco flake and wrapped in a tendu leaf, tied with a string at one end) (Behera et al., 2004) and cigarette in India (Notani et al., 1974). The severe carcinogenic nature of bidi has been proved by the studies of Jussawalla and Jain (Jussawalla et al., 1979) and (Pakhale et al., 1985). They observed that the unrefined
form of tobacco used in bidis (WHO, 1999) and the frequency with which a bidi needs to be puffed per minute may be responsible for its relatively higher carcinogenic effects as compared to cigarettes (Bano et al., 2009). Bidi smoking at two puffs per minute produces about equal amounts of carcinogens (steam volatile phenols, hydrogen cyanide and benzopyrene) as produced by one puff per minute of unfiltered cigarette (Pakhale et al., 1990). Hookah (a special cigar used in India using raw tobacco) smoking causes lung cancer; as reported by Nafae et al., (1973). Recently, Gupta et al., (2001) reported 80 and 33% lung cancers in men and women chain smokers, respectively, as compared to controlled subjects where these numbers were 60 and 20%. Besides, Figure 4 shows that cigarette smoking and Hookah are the main causes of lung cancer in Indian states; especially in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Manipur, Tripura and some parts of Sikkim. Similarly, bidi and hookah smoking are responsible of oropharyngeal cancers in male population of Haryana. Bidi and cigarette smoking are thought to be etiological factors for the causation of cancers in Andhra Pradesh. In some north-eastern states of India such as Arunanchal Pradesh, Nagaland and Sikkim, high incidences of stomach cancer are attributed to the consumption of smoked meat and chewing of tobacco. High incidences of stomach cancer in Mizoram are the result of the excessive use of tuibur (water filtrate of tobacco). Similarly, high incidences of oral cancers in Orissa and Madhya Pradesh are owing to the consumption of beetle leaves and tobacco in different forms. The relatively high incidences of oesophageal cancers in certain parts of Karnataka are because of heavy consumption of tobacco in various forms.

The exceptionally high incidences of oral cancer in some parts of Uttar Pradesh and Gujarat are due to the consumption of Pan Masala, Dohra and Zarda. Similarly, the consumption of Beetal, Nut, Pan Masala, Opium and Bhang (leave and flower powder of female cannabis plant) has been recognized as the major cause of mouth cancer in Rajasthan. Oral cancer being the common malignancy in Allahabad is attributed to the chewing of Dohra; an indigenous preparation of tobacco and slaked lime. The daily consumption of the number of beetle leaves by an individual is
about 15-25 in Allahabad and Varanasi districts, which continuously acts as an irritant to the buccal mucosa (Mehrotra et al., 2003). One of the most important factors responsible for the oropharyngeal malignancy in Agra and Mainpuri belt of Uttar Pradesh is the chewing of beetle nut (Wahi et al., 1965). Among various risk factors for the occurrence of esophageal cancer in India, betel quid chewing carries a relative risk of 1.5 to 3.5%. The salted tea made by adding sodium bicarbonate has shown to possess a high methylation activity and may lead to the endogenous formation of nitrosamine (Malkan et al., 1997).

**Alcohol**

Alcohol consumption has been considered as one of the major causes of colorectal cancer as per a recent monograph of WHO (Baan et al., 2007). Annually, about 9.4% new colorectal cancer cases are attributed to the consumption of alcohol, globally (Parkin et al., 2002). An increased risk of 10% was observed with consumption of more than two drinks per day, which suggests a causative role of alcohol consumption in colorectal cancer (Toriola et al., 2008). Recently, a study revealed that an increased risk of colorectal cancer was limited to consumption of more than 30.0 g of alcohol per day (Longnecker et al., 1990). Relationship between alcohol consumption and high risk of oesophageal cancer was first known in 1910 (Tuyns, 1979). However, chronic alcohol consumption has been found to be a risk factor for the cancers of the upper respiratory and digestive tracts, including oral cavity, hypopharynx, larynx and esophagus as well as liver, pancreas, mouth and breast cancers (Tuyns, 1979; Maier et al., 1994; Seitz et al., 2004). A 10.0 g/day intake of alcohol by a woman increases its relative risk of breast cancer by 7.1% (Doll et al., 1981). The mechanism of carcinogenesis due to alcohol consumption is not exactly known, however, it is thought that ethanol being a co-carcinogen might play a crucial role in the carcinogenesis (Poschl et al., 2004). The metabolic products of ethanol are acetaldehyde and free radicals. The free radicals are responsible for alcohol assisted carcinogenesis through their binding to DNA and proteins, which destroy foliate leading to secondary hyper proliferation (Anand et al., 2000).
Radiation

In the developed and developing countries, the radiations are also notorious carcinogens. About 10% cancer occurrence is due to radiation effect, both ionizing and non-ionizing (Belpomme et al., 2007). The major sources of radiations are radioactive compounds, ultraviolet (UV) and pulsed electromagnetic fields. The main series of cancers induced by exposure to the adequate doses of the carcinogenic radiations include thyroid, skin, leukemia, lymphoma, lung and breast carcinomas. The most common source of ionizing radiation exposure is Radon, which is a radioactive element. Radioactive nuclei of radon, radium and uranium are found to be associated with an increased risk of gastric cancer in rats. High risk of breast cancer among girls at puberty is due to chest irradiation of X-rays (used for diagnostic and therapeutic purposes). The major risk factor for various types of skin cancers viz. basal cell carcinoma, squamous cell carcinoma and melanoma is the exposure to ultraviolet light, which is a non-ionizing radiation (Anand et al., 2000). The underground testing of nuclear weapons may be the major cause of digestive system, liver and kidney cancers, as radiations have been reported in ground water of the nuclear weapon testing area. Moreover, Moses Samuel Rajan et al (2014) a,b.

Miscellaneous pollutants

It is estimated that about 90% cancer is owing to the environmental contaminants (Anand et al., 2000). Various types of cancers are believed to be due to ill effects of the polluted environment. The risk of lung cancers is increased by a number of outdoor pollutants such as poly aromatic hydrocarbons. Long term exposure to PAHs (polyaromatic hydrocarbons) in air was found to increase the risk of deaths associated with lung cancer. Indoor environmental pollutants such as volatile organic compounds and pesticides increase the risk of leukemia and lymphoma, brain tumors, Wilm”s tumors, Ewing”s sarcoma and germ cell tumors. An increased risk of cancer has been observed in people using chlorinated water for drinking purposes for a long time. N-Nitroso compounds (mutagenic in nature) are
formed from nitrates present in drinking water and increase the risk of lymphoma, leukemia, and colorectal cancer and bladder cancers (Belpomme et al., 2007). High level of air pollution is responsible for the prevalence of lung cancers in Delhi and some other parts of West Bengal including Calcutta. The low socio-economic conditions related to poor hygiene, poor diet or infections of viral origin are also responsible for various types of cancers (Mehrotra et al., 2003).

**Preventive measures of cancer in India**

As per the proverb, “prevention is better than cure” the prevention strategies are crucial in cancer eradication. This approach offers a great public health concern and inexpensive long term method of cancer control. National Cancer Control Programme (started in 1975-1976 in India) led to the development of Regional Cancer Centers (RCCs), a number of oncology wings in Medical Colleges; supported the purchase of teletherapy machines. District Cancer Control Programme was also initiated but could not result into sustainable and productive activity (National Cancer Control Programme). The education should focus on harmful effects of tobacco and discourage its use. Besides, we should create awareness among public about physical activities, avoiding obesities, healthy dietary practices, reducing occupational and environmental exposures, reducing alcohol uses, immunization against hepatitis B virus and safe sexual practices for avoiding cancer genesis. The same approach should be included in adult education programme. Several state wise programmes like Kerala (Ten year action plan), Tamil Nadu (Kancheepuram Cancer Screening Programme) and opportunistic programmes in social regions have been implemented by some State Governments and Regional Cancer Centers (RCCs) for an early detection of different cancers in India. The predicted results were not materialized in most of the programmes except RCC programme in Trivandrum as the health service system could not support such activities due to deficiencies in health system management and non-availability of human resources (Cytologists /Pathologists) and absence of integration with multi-sectoral groups. Unfortunately, a little population
got aware of cancer havoc, which might be spread to the population of the whole country (National Cancer Control Programme).

As discussed above tobacco is the most notorious agent for cancers, which must be banned to eradicate the prevalence of tobacco related cancers. India should give the highest priority to tobacco control programme due to its acute carcinogenic nature (WHO, 2002). It has been predicted that a ban on tobacco use can prevent up to 30% cancers in India (Central Statistical Organization, 2003 -04). Alcohol consumption is responsible for the occurrence of colorectal cancer. About 25% population is consuming alcohol in India, which must be minimized or avoided to eradicate this havoc. Government needs to impose a ban on the public sale of alcohol. Seminars and public health camps should be conducted to create awareness of alcoholic harmful effects among Indians. Radiations are silent and serious carcinogens that cause a number of cancers and, hence, the strategies that reduce the exposure of people to these notorious radiations should be fully practiced to reduce the incidence of cancers. India being one of the nuclear power nations needs to build safe equipped nuclear plants with greater protection from the hazardous nuclear radiations. Nuclear reactors should be well constructed with good quality shields to provide more protection to the people at work. Nuclear tests should be carried out at safe places away from human populations to avoid exposure to these radiations.

Environmental pollution is a serious issue and has become a challenge for all of us as it is responsible for the genesis of various types of cancers. Air pollution is the most notable cause of lung cancer in the metropolitan cities of India. The harmful gases such as carbon monoxide (CO) and sulphur dioxide (SO2) produced by combustion of fuels in automobiles and several industrial processes, respectively, cause lung cancer, respiratory, digestive, ocular and skin carcinomas. Automobiles that run on compressed natural gas (CNG) should be encouraged; at least in the metropolitan cities of the country to avoid air pollution. The use of chlorofluorocarbons (CFCs), methyl halides, carbon tetrachloride and carbon tetrafluoride is the main cause of the depletion of ozone layer, which protects us from the
harmful UV-rays. The use of such chemicals should be minimized in order to reduce
the incidence of skin cancer caused by the harmful effects of UV-rays. The sewage
discharged by several industries and municipalities is polluting Indian water resources
due to insufficient water treatment plants; leading to various types of cancers. Therefore, these wastes should be treated prior to their discharge to land or river.

Due to over growth of Indian population, farmers are compelled to produce
more cereals and vegetables to meet out public requirements. This pressure forces
farmers to use excessive fertilizers and pesticides, which are being transported into
our body via food and water causing various sorts of cancers. Farmers should be
encouraged to use eco-friendly organic manures and biocides to reduce cancer
incidences. India is a developing country and gradually adopting modern life styles
involving the use of various kinds of chemicals in terms of medicines, cosmetics,
cloths, utensils, mobile phones and other luxurious items. The use of such items may
cause different sorts of cancers. That is why during past few decades the incidences of
cancers have increased. It is urgent to emphasize that Indians should be aware about
their life styles particularly the use of synthetic products, fabric dressing, and mode of
sex, abuse of drugs and excessive use of mobile phones. Besides, an increased fashion
of fast food in this country is also responsible for this havoc. Indians should adopt a
healthy food habit having sufficient quantities of vitamins, minerals, proteins, fibers,
carbohydrates etc. The healthy and proper foods are important aspects to control
different cancers. The consumption of whole grains, vegetables and fruits antagonize
the development of some cancers. Briefly, there are no uniform standardized
information programs, education and communication (IEC) strategies for cancer
prevention in this nation. Besides, limited diagnostic and treatment infrastructures in
the country are the serious issues, which must be increased on urgent basis. The
government and other NGOs should come forward to initiate the above programs for
controlling this havoc so that the present and coming generation of the country may
lead healthy life.
Effect of cancer on Indian economy

As per nominal Gross Domestic Product (GDP), the economy of India stands on eleventh position in the world, while it is fourth largest by Purchasing Power Parity (PPP) (CIA- The World Fact book, 2009). Indians are at high risk of acquiring cancers due to high rates of smoking, tobacco use, occupational risks, and unhygienic residential living conditions. The prevalence of cancer in India is affecting the economy of the country. The data on the effect of cancer on Indian economy is not available; however, Popkin et al., (2001) assessed the impact of cancer of diet related health conditions in terms of health spending and on income losses experienced by households (Popkin et al.,2001). The estimation of expenditures of cancer patients includes both direct medical and non-medical costs. The direct costs include buying medicine, hospitalization, pathological tests, medical practitioner consultancy, travel, lodging while the indirect costs are loss of income during treatment, premature death and affect on the income of other family members etc. Abegunde et al., (2007) calculated the effect of cancer deaths on Indian economy. Furthermore, they assessed the economic impact of mortality from chronic diseases on Gross domestic product (GDP) (Abegunde et al.,2007).

Briefly, Indian economy has been affected by the alarming rise of cancers in the last decade. It is still being affected due to continuous increase of cancer patients. An estimation of the effect of cancer on the Indian economy has been carried out. The economical loss was calculated by considering all the factors viz. both direct medical and non-medical costs. This also shows that the total number of cancer patients in 2004 was 819354 with a total loss of 215.16 million US $. The number of cancer patients and economic loss are continuously increasing, which have become 962832 and 274.10 million US $ by the end of 2009, respectively. Similarly, the total cancer patients in 2010 were 979786 with total economic loss of 270.06 million US $. 
Natural medicine and Cancer

A variety of approaches have been employed in cancer chemoprevention. These include changes in diet, supplementation with specific vitamins and minerals, or administration of pharmacologic compounds. Investigators have identified approximately 400 drugs, vitamins, hormones and other agents that might help in preventing cancer. Clinical trials are underway to investigate an increasing number of agents. Most of these trials involve healthy people with a higher-than-average risk of cancer (Dunn and Ford, 2001; Amin and Buratovich, 2007). To sum up, adequate nutrition is a key element of a healthy lifestyle and is associated with a lowered risk for chronic illnesses. The consumption of five portions of fruits and vegetables per day is proposed to sustain optimal health and especially coloured food items are recommended. Data from epidemiological studies consistently show an inverse correlation between the intake of fruits and vegetables and the incidence of several diseases such as cardiovascular, ophthalmological, gastrointestinal or neurodegenerative disorders and some types of cancer (Van Duyn and Pivonka, 2000). It has been postulated that among the different dietary components of fruits and vegetables, secondary plant constituents (such as phytochemicals) play a major role in disease prevention (Stahl and Seis, 2005; Al-Akhras et al., 2007).

The Arabian Gulf region is one of the birthplaces of herbal therapy (Hasan et al, 2000). Herbal medicine occupies a significant part of this region’s heritage and until recently functioned as the main health care system. Despite the wide variety of herbal species in the region with about 600 species in UAE (Jongbloed, 2003), 1204 in Oman (Ghaznafar, 1994), 2250 in Saudi Arabia (Migahid, 1990), 2088 in Egypt (Tackholm, 1974) and 2367 in Palestine (Zohary, 1973) (most of the species present in the two later countries are also recorded in the Gulf region), only less than 10% of these species have been screened for their medicinal uses. Initially, many medicinal plants and their applications were documented in the Middle East and the Arabian Gulf and in such countries as in the United Arab Emirates (UAE) (El-Ghonemy, 1993), Qatar, Oman (Ghaznafar, 1994), Saudi, Jordan and Egypt (Bolous, 1983). Most of the available literature is based upon information
collected from local informants and as it lacks proper laboratory investigations, most of these reports are of dubious value. Since, medicinal plants represent an important health and economic component to Gulf region biodiversity, it is essential to furnish a complete inventory of the medicinal components of the flora of any country for purposes of conservation and sustainable use. At the present time, the high public demand for unconventional therapies has led many countries in the region to devote time and money to the exploration of the potential of their medicinal flora.

**Anticancer potential of sponges**

An extract of a sponge *Dysidea herbacea* showed high activity in a cytotoxicity assay. Five constituents have been isolated and identified. Four of them were found to be known diterpenes, ambloiofuran, 3,7,11,15-tetramethyl-6,10,14-hexadeca-enoic acid, 2-tetraprenyl-1,4-benzoquinol, and 4-hydroxy-3-tetraprenylbenzoic acid (Walker and Fulkner, 1981). The fifth compound was new and characterized to be 20,24-dimethyldeoxoscalarin-3-one by spectroscopic analysis including COSY and COUX experiments. The relative stereochemistry of this was secured by NOE study. Although the diterpenes are among the classes of compounds found in *Dysidea* spp., the bishomosesterterpene skeleton is typical to the metabolites of some species of *Carrerwongiu* (Phyllospongium) but not to *D. herbacea* (Bergquist and Wells, 1983). Except for ambloiofuran which was weakly cytotoxic, four other compounds were moderately cytotoxic against P388, A-549 human lung carcinoma, and HT-29 human colon adenocarcinoma cells. The quinol was most active at the level of IC, 0.3 pg/mL. Chromatography of an acetone extract of *Hulichondria sp.*, collected in Kerama, Okinawa, yielded nine sesquiterpenes of theonellin (Nakamura, 1984) class (bisabolene skeleton) and dimers. Among the compounds were dimers and were cytotoxic, and also showed weak immunosuppressive activity. Recent report on the antitumor effect of some marine carotenoids such as halocynthiaxanthin prompted us to examine carotenoid pigments often encountered during separation of some sponge extracts. Chromatography of an intensely colored
extract from the bright orange sponge *Phakellia stellidem* afforded two red pigments, 19-hexanoyloxyzymitoxanthin and 19'-butanoyloxyzymitoxanthin.

A methylene chloride-2-propanol extract prepared from the specimen of *Axinella* collected in Palau provided a 101 % increase in life span (at 100 mg/kg) against the PS leukemia with ED$_{50}$ 2.5 μg/ml. By means of P 388 lymphocytic leukemia cell line guided bioassay a new PS inhibitory peptide axinastatin 1 (ED$_{50}$ 0.21 μg/ml) was isolated from this sponge. Extended bioassay directed separation of the more difficult accessible cytotoxic components of this sponge was resulted in the discovery of two cycloheptapeptides; axinastatins 2 and 3. Axinastatin 2 exhibited strong *in vitro* cytotoxicity against the murine leukemia P388 cell line (ED$_{50}$ 0.02 μg/ml), while axinastatin 3 also possessed significant cytotoxic activity (ED$_{50}$ 0.4 μg/ml) against the PS leukemia cell line and showed a higher level of activity than axinastatin 2 against human ovarian, lung, and colon cell lines. As a continuation of this research marine sponge; *A. carteri* from the Republic of the Comoros was investigated and a cell growth inhibitory cyclopeptide called axinastatin 4, (P 388 lymphocytic leukemia cell line, ED$_{50}$ 0.057 μg/ml) was isolated (*A. carteri* from the western Indian Ocean yielded a cell (human and murine) growth inhibitory cyclooctapeptide, axinastatin 5 (GI 0.3-3.3 μg/ml). In another study, the alkaloids; debromohymenialdisine, hymenialdisine, and 3-bromohymenialdisine of *A. carteri* collected from tropical region were tested for their cytotoxicity in vitro using L5178y mouse lymphoma cells.