

Fighting cancer through an informed society

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ABSTRACT

Social perceptions play an extremely important role in the lives of cancer patients and survivors. Society is a machinery which can dictate the behavioral pattern of a patient, the kind of treatment he/she seeks or believes in, and the treatment he/she finally takes. Proper education of the society, in general, with regard to various aspects of cancer and its treatment can make things easier for patients, their families and the treating physicians alike. False social beliefs create unsurmountable hurdles for both patients and their families. When families of cancer patients visit a doctor, very often they tend to describe the experience of one or more of their close or distant family members with cancer. They start reliving the same experience if it was bad, or they may develop a false sense of security about the curability if it was good. In both situations, it becomes difficult for them to understand that each cancer is different from the other, cancer being a heterogenous disease. Moreover, what the patients and their families hear from friends and their social support system about cancer in general makes them depressed, anxious, and vulnerable. The information they get from the Internet and print media is mostly unregulated and may present extreme views which compound their problems. In this review, we have analyzed some of the common perceptions and myths which we come across in clinical practice and have presented scientific data to refute or support these beliefs wherever suitable.

Key words: Cancer, myths, social perceptions, society

INTRODUCTION

Society is a machinery which if well-informed can serve as a solution to several problems of an individual while if ill-informed and misguided can increase an individual's problems manifold. Cancer is an individual problem but is heavily influenced by social perceptions.^[1] It has always been regarded as some sort of a taboo, and sometimes, people link it to a human's deeds in the present or past life. Human beings can react in strange ways to something they do not understand fully and may devise any kind of explanations to make it sound easier and less overbearing to the mind.^[2] A diagnosis of

cancer is a huge burden on the affected family and the society as a whole. Hence, informing the society about what is true and what is questionable about cancer and its treatment is extremely important to counter the challenges posed by it.^[3] Through this article, we wish to focus on the common myths associated with cancer and its treatment. Although the topic is extensive, we as clinicians would be focusing on the common queries we face in daily practice.

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How to cite this article: Mehta P, Bhajoni PS, Mehta SP. Fighting cancer through an informed society. J Soc Health Diabetes 2016;4:57-66.

Access this article online

Quick Response Code:



Website:
www.joshd.net

DOI:
10.4103/2321-0656.187996

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There was a time when the doctor announcing a diagnosis of cancer to a patient meant that he was pronouncing a death sentence. It is no longer so.

WHAT IS “CURE”?

Cancer is a heterogeneous disease; the only thing common to all cancers is abnormal cell growth, else each cancer is different from the other [Table 1]. The survival and treatment strategies defined for pancreatic cancer cannot be compared to the same parameters for breast cancer. Similarly, the survival and treatment for acute myeloid leukemia cannot be compared to Hodgkin lymphoma. Even within the same disease, the survival can vary drastically.^[4] A “luminal A” type of breast cancer, which is hormone receptor positive, is very different from a triple negative (hormone receptor negative and Her 2 neu negative) breast cancer as regards the biological behavior and treatment strategies.^[5]

When families of cancer patients visit a doctor, very often they tend to describe the experience of one or more of their close or distant family member with cancer. They start reliving the same experience if it was bad, or they may develop a false sense of security about the curability if it was good. In both situations, it becomes difficult for them to understand that each cancer is different from the other. No two patients are the same and no two cancers are the same.^[6] Therapy has to be individualized in every case based on the pathology, general condition (Eastern cooperative oncology group performance status), organ function, molecular targets available, comorbidities, age, gender, ethnicity, socioeconomic status, compliance, tolerability, and pharmacogenomic profile.^[7]

Similarly, “cure” can mean different things for different cancers and different patients. A 70-year-old patient who develops chronic lymphocytic leukemia (CLL) may actually

never die of CLL but may die due to an unrelated cause. Further, many patients with CLL do not require any treatment late into the course of disease. Patients with stage 4 colorectal cancer may still get cured while the same cannot be said of lung cancer.^[8]

The diagnosis of cancer is still a traumatic experience. Patients are shattered psychologically, lose belief in themselves and are often doubtful of therapeutic outcomes. In such a scenario they need the kindness and counseling a good clinician can provide. During this time of despair, they turn to anything, any source of information, any kind of hope that is provided by laymen, or glitzy advertisements in electronic media, paper, pamphlets claiming to cure the disease with miraculous drugs or herbs.^[34] Add to that, recollections of things that they may have heard about cancers in general in the society, the variety of opinions thrust on them by their kins, neighbors, friends, etc., and some bad experiences with cancer in someone they knew, it becomes a gargantuan task for the treating physician to take away the ugly perceptions which patients already have before they come to seek treatment and advise. Doubtless, this period is confusing to most patients and their families. Here, we look at some of the myths associated with cancer and chemotherapy which we commonly get to hear.

GENERAL PERCEPTION OF THE DISEASE

- Cancer is incurable and diagnosis of cancer is equivalent to a death sentence
Cancer is not a death sentence. Some very aggressive cancers such as pancreatic cancer are considered incurable if advanced.^[30] Many cancers (retinoblastoma of childhood, choriocarcinoma and other germ cell tumors, Hodgkin lymphoma, acute lymphoblastic leukemia) are completely curable.^[10,12,14,35] Most of the common cancers have seen quite a jump in 10-year

Table 1: Examples of type of cancer based on the type of control achieved

Cancers which can be completely eradicated ^[9-14]	Cancers which can linger on without threatening life for years (indolent cancers) ^[9,15-24]	Cancers which may be rapidly life-threatening and generally have a short survival ^[9,24-33]
Prostate cancer	Chronic lymphocytic leukemia/small lymphocytic lymphoma)	Neuroendocrine carcinomas
Thyroid cancer	Marginal zone lymphoma	Mantle-cell lymphoma
Testicular tumors	Follicular B-cell indolent type	Primary central nervous system lymphoma (rapidly life-threatening but can still be cured)
Melanoma	Waldenstrom macroglobulinemia	Mesothelioma
Breast cancer	Metastatic prostate cancer	Small cell lung cancer
Retinoblastoma	Follicular dendritic cell sarcoma	Pancreatic cancer
Wilms tumor	Kaposi sarcoma	Cancer of the gallbladder
Hodgkin lymphoma	Mantle-cell lymphoma (indolent subtype)	High-grade glioma
Diffuse large B-cell lymphoma	Low-grade neuroendocrine tumors	Acute myeloid leukemia (rapidly life-threatening but can still be cured)
Acute lymphoblastic leukemia in children		

life expectancy rates. For example, 10-year survival rate for one of the most common cancers, cancer of the prostate, is 98%.^[36]

- We have made no progress in fighting cancer
We have made tremendous progress in cancer therapy. For breast cancer, 10-year survival rates were 40% during 1971–1972 and have increased to 78% in the present time.^[37]
- Cancer is genetic, so nothing can prevent it whether or not one is diagnosed
Only about 5–10% of all cancers result directly from genetic defects (called mutations) inherited from a parent. The early detection of cancer improves survival. Early diagnosis means that the spread of cancer from its primary site to distant organs can be prevented by early intervention.^[38,39]
- Cancer is God’s punishment
Cancer is not God’s punishment to humankind. In 5–10% of all cancers, it is the result of genetic defects (harmful mutations) inherited from a parent. In all other cases, it is because of the interaction of the individual with the environment and genes (harmful sporadic mutations).^[38,39]
- Cancer is a man-made, modern disease? Early people had access to pure, uncontaminated water, pure food, pure air, and that is why they did not have cancer
Cancer is not a man-made disease. It was described thousands of years ago by Egyptian and Greek physicians. Even dinosaurs had cancer.^[40,42]
- Cancer is contagious
Cancer is not contagious. Some cancers, such as cancers following organ or tissue transplantation, cancers occurring after *Helicobacter pylori* (a bacteria), or human papillomavirus (a virus) infection, have an infectious etiology, but the cancer *per se* is not contagious. For example, transplant-related cancers may occur in 2 cases out of 10,000 organ transplants.^[43] For transmissible cancers, the reader is directed to NCI (National Cancer Institute) website.^[44,45]
- Cancer is a fungus – and sodium bicarbonate is the cure
Cancer is not a fungus and sodium bicarbonate is not a cure for any type of cancers.^[46,47]

FOOD AND FOOD PRODUCTS

- Acidic diets cause cancer
Acidic diets do not cause cancer. This misconception arose from the study of cancer cells in the laboratory. Cancer cells were found to produce an acidic microenvironment around themselves by producing acidic molecules. This misconception led to the belief

that acidic diets cause cancer and alkaline diets can cure cancer.^[48] However, the human body is always alkaline, and cancer cells thrive in the alkaline human body.^[49] This alkaline pH is maintained by the kidneys within a very narrow and healthy range around 7.4. If acidic food is ingested, the urine becomes acidic and the excess acidity is get rid of. Similarly, if alkaline food is ingested, the urine becomes alkaline and the excess alkalinity is taken care of. Acidic or alkaline food cannot change pH of the body if the kidneys are functioning normally. Acidic or alkaline diets cannot change anything, neither the body’s slight alkalinity nor the acidic microenvironment around the cancer cells.^[49,50]

- Cancer has a sweet tooth and eating sugar makes cancer worse
The answer is, may be true. Sugary diets (diets rich in simple sugars) may be associated with an increased risk of pancreatic and colon cancers.^[51-53] Obesity is also associated with an increased risk of cancer, and weight should be kept within normal range with adequate exercise.^[54]
- Artificial sweeteners cause cancer
The short answer is no. There are many different artificial sweeteners. Saccharin and aspartame have been shown to cause increased number of cancers in rats when fed in high amounts. Others, such as acesulfame, sucralose, neotame, and tagatose did not show the same tendency in animals. However, no artificial sweetener has shown any increased cancer risk in humans. Stevia/rebaudioside A is generally not recommended.^[55,56]
- Antiperspirants or deodorants cause cancer (especially breast cancer)
The answer is no. In 2002, a study was done with 813 women with breast cancer and 793 women without. The results did not show any increased risk for breast cancer in women who reported using an underarm antiperspirant or deodorant. The study also showed no increased breast cancer risk for women who reported using a blade razor and an underarm antiperspirant or deodorant or for women who reported using an underarm antiperspirant or deodorant within 1 h of shaving with a blade razor. However, some other poorly designed studies showed conflicting results.^[57]
- Hair dye use increases the risk of cancer
The short answer is no. Some studies have shown an increased risk of developing bladder cancer with the use of earlier permanent type of dyes (dyes manufactured before the 1980s). However, no such association has been found with the use of modern dyes.^[58,59]

- Drugs used in treatment of diseases can cause cancer
The answer is partially true. Evidence is there that hormone replacement therapy given to elderly women, naphthalene, anticancer drugs such as busulfan, chlorambucil, and thiotepa, some ointments such as Elidel (active ingredient pimecrolimus) used for atopic dermatitis may cause cancer. Patients should talk to their doctors if they are in doubt.^[60-62]
- Alcohol is good for cancer/alcohol is bad for cancer
Alcohol has been associated with cancer. Certain substances in red wine, such as resveratrol, have anticancer properties in the laboratory. Grapes, raspberries, peanuts, and some other plants also contain resveratrol. However, there is no evidence that resveratrol is effective in preventing or treating cancer in humans. People should not drink alcohol to get resveratrol.^[63-65]
- Herbal products/superfoods can cure cancer
Use of herbal products is generally not advocated by doctors. There is no conclusive scientific evidence to prove that herbal supplements, drugs, are effective in cancer cure or mitigation of cancer symptoms. They can lead to dangerous interactions with the chemotherapy drugs causing the principal drug to be either ineffective or more toxic. Many people use high-dose antioxidant supplements thinking that they are only going to protect normal cells, but antioxidants such as Vitamin E may protect both normal and tumor cells and scientific data also support this. The silver lining is, while many herbs have been shown to interfere with chemotherapy, some may actually improve its efficacy. It is not known which herbal or other supplements are helpful or harmful and in what quantities. Adequate data are lacking. For this reason, doctors do not advise taking herbal drugs or supplements with proven anticancer drugs.^[66]
- There is a miracle cancer cure and Big Pharma is suppressing it
The answer is, false and actually absurd. If there was any such a treatment available, the people in the know such as the scientists, researchers, and rich people would never die of cancer. Moreover, that would mean that they are dying every year (many doctors and scientists die of cancer) and sacrificing the lives of their loved ones to keep the cure a secret.^[67-70]
- Sharks do not get cancer and shark oil, shark gelatin, and shark cartilage are the cure for cancer
It is a hoax. Sharks do get cancer. *Sharks Don't Get Cancer* (subtitle: *How Shark Cartilage Could Save Your Life*) is a 1992 book written by I. William Lane and Linda Comac and published by Avery Publishing. William Lane used to sell extracts of shark cartilage

as a treatment for cancer. When one comes to think of it, it becomes obvious that he first wrote the book claiming that sharks do not get cancer, then went on to sell shark and shark products. In 2004, Dr. Ostrander *et al.* from the University of Hawaii published a survey of the Registry for Tumors in Lower Animals. Already in collection, they found 42 tumors in *Chondrichthyes* species (cartilaginous fish that includes sharks, skates, and rays). These included at least 12 malignant tumors and tumors throughout the body. Two sharks had multiple tumors.^[71-74]

CELL PHONE AND ELECTRONIC EQUIPMENT

- Cell phones, power lines, computer use cause cancer
The short answer is no. The International Agency for Research on Cancer (IARC) is a part of the World Health Organization. Its major goal is to identify causes of cancer. The IARC has classified radiofrequency fields as “possibly carcinogenic to humans,” based on limited evidence of a possible increase in risk for brain tumors among cell phone users and inadequate evidence for other types of cancer.^[75] A large prospective (forward-looking) study of nearly 800,000 women in the UK examined the risk of developing brain tumors over a 7-year period in relation to self-reported cell phone use at the start of the study. This study found no link between cellphone use and brain tumors overall or several common brain tumor subtypes, but it did find a possible link between long-term cell phone use and acoustic neuromas (It is a benign tumor not cancer).^[76]

Cordless telephones emit less energy than cell phones.^[77] Several studies have analyzed the combined data from multiple studies of power line exposure and childhood leukemia. A pooled analysis of nine studies reported a twofold increase in risk of childhood leukemia among children with exposures of 0.4 μT (μT is a unit of radiation energy) or higher. Less than 1% of the children in the studies experienced this level of exposure.^[78] A meta-analysis of 15 studies observed a 1.7-fold increase in childhood leukemia among children with exposures of 0.3 μT or higher. A little more than 3% of children in the studies experienced this level of exposure.^[79]

More recently, a pooled analysis of seven studies published after 2000 reported a 1.4-fold increase in childhood leukemia among children with exposures of 0.3 μT or higher. However, less than one-half of 1% of the children in the studies experienced this level of exposure.^[80]

For the two pooled studies and the meta-analysis, the number of highly exposed children was too small to

provide stable estimates of the dose–response relationship. This means that the findings could not be interpreted to reflect linear increases in risk, a threshold effect at 0.3 or 0.4 μT , or no significant increase.^[78-80]

For a 400 kV power line, the exposure level falls below 0.3 μT at a 600 m distance. For reference, in homes not located near power lines, this background field may be up to about 0.2 μT .^[81]

Exposure from electrical appliances contributes less to a person’s total exposure to magnetic fields because most appliances are used for only short periods of time.^[82]

Exposure to Wi-Fi is not considered to pose any health risk to humans.^[83] No data on relation between exposure to cell phone base stations and cancer are available.^[84] Prolonged computer use can cause spinal problems such as backache, eyestrain, obesity, and sleep disturbance. No adequate data on computer use and increase in cancer incidence are available. Laptop computers if held close to the body exposes the body to significantly higher radiation compared to desktop computers.^[85]

ALL OR NONE MYTHS

- Does patient’s attitude (positive or negative) determine his/her risk of, or likely recovery from, cancer?
Positive attitude helps in dealing with cancer and its fallout. A person with positive attitude will be healthier compared with a person with negative attitude even though both may have same cancer at the same clinical stage. However, positive attitude has no effect on overall survival.^[86]
- If someone in the patient’s family has cancer, he/she is likely to get cancer. If no one in the patient’s family has had cancer, does that mean he/she is risk-free?
A person who has no family members with cancer can develop cancer. Contrarily, a person who has many family members with cancer may not have cancer and can live to ripe old age.^[87]

BREAST CANCER MYTHS

Any type of cancer is a psychological blow to the patient. Breast cancer especially is a huge blow to women though men can also have breast cancer.

- Men do not get breast cancer; it affects women only
Men do get breast cancer. Approximately 1% of all breast cancer cases are found in men. Men have less breast cancer because men have less breast tissue compared to women. Men also have less amount of estrogen in the body, excess amount of which may

drive breast cancer growth.^[88]

- Finding a lump in breast means it is a breast cancer
The answer is no. A lump may indicate a benign (noncancerous) condition such as fat necrosis and mastitis (inflammation of the breast).^[89]
- Regular mammograms prevent breast cancer
Regular mammograms do not prevent breast cancer. Mammograms have no relation whatsoever with occurrence of breast cancer but can aid in early diagnosis. Mammograms can only detect whether any benign or cancerous lesion (which are detectable by mammogram; there are some conditions of the breast which are not detectable by mammogram or magnetic resonance imaging [MRI]) is in the breast.^[90]
- A mammogram can cause breast cancer to spread
Mammograms do not make breast cancer spread.^[90]
- If one has a family history of breast cancer, one will develop breast cancer
Cancer or breast cancer depends on many factors. Having a family member does not mean one is going to get breast cancer. For only one first-degree female relative with breast cancer, the relative risk is slightly more than the average rate in the general population. However, if the number of first-degree relatives with breast cancer is more than one, the risk increases dramatically and screening is recommended in such cases.^[91]
- Breast cancer is contagious
The answer is no. Breast cancer is not contagious.^[92]
- If mutation in BRCA1 or BRCA2 gene is detected in DNA, one will definitely develop breast cancer
Only deleterious mutations of BRCA1 or BRCA2 lead to an increased risk of breast cancer. BRCA1 or BRCA2 genes can have some mutations that in fact decrease the risk of breast cancer. Approximately 50–65% of women born with a deleterious mutation in BRCA1 will develop breast cancer, and 35–46% will develop ovarian cancer by the age of 70. Approximately 40–57% of women with a deleterious mutation in BRCA2 will develop breast cancer, and 13–23% will develop ovarian cancer by the age of 70. Conversely, 35–50% of women born with a deleterious mutation in BRCA1 will not develop breast cancer, and 54–66% will not develop ovarian cancer by the age of 70. Moreover, approximately 43–60% of women with a deleterious mutation in BRCA2 will not develop breast cancer, and 77–87% will not develop ovarian cancer by the age of 70.^[93]
- MRI is better than mammography because it finds more cancer
The answer is yes and no. MRI is more sensitive than mammography but also gives more false positive results. Mammography is less sensitive but gives less false

positive results. Both MRI and mammography may miss some cancers. Further, mammography is cheaper. All these reasons make mammography the gold standard and MRI, a supplemental test at present. Therefore, as a routine procedure, doctors advise mammography though MRI also has its place in the diagnosis of breast cancer in high-risk patients (e.g. patients with first-degree relatives with breast cancer, BRCA mutants, history of radiation to chest wall).^[94]

- In terms of survival, removing the entire breast is better than just cutting cancer out and getting radiation
Mastectomy (removal of the whole breast) and breast conservation surgery followed by radiation are equivalent in terms of overall survival and disease-free survival for breast cancers <4 cm in diameter. Removal of the whole breast is not superior to lumpectomy/breast conservation surgery, followed by radiation for small cancers.^[95]
- The risk of developing breast cancer cannot be reduced
Breast cancer risk can be reduced with these healthy habits:^[96]
 - Healthy weight
 - Regular exercise
 - Adequate nighttime sleep
 - Cessation of drinking or limiting alcoholic drinks to no more than 1/day
 - Avoiding exposure to carcinogens
 - Limiting exposure to radiation from medical imaging tests such as X-rays, computed tomography scans, and positron emission tomography scans if not medically necessary
 - Consulting once doctor if a person is taking, or have been advised, hormone replacement therapy or oral contraceptives (birth control pills)
 - Breastfeeding if possible
 - Talking to doctors more about risk factors for breast cancer and ways to reduce them.
- Bras cause breast cancer
Bra wearing does not cause breast cancer. No aspect of bra wearing, including bra cup size, average number of hours/days worn, wearing a bra with an underwire, or age of initiating wearing a bra, was associated with risks of either invasive ductal carcinoma or invasive lobular carcinoma.^[97]
- Larger breasts are associated with an increased risk of breast cancer
Larger breasts are not associated with an increased risk of breast cancer. However, obesity is associated with increased breast cancer risk. What this means is that a woman with large breasts but with no obesity has the same breast cancer risk as that of the general population. However, large breasts also present its own problems, viz., small tumors may be missed

on breast examination, mammography, or MRI or ultrasonography.^[98]

Therapy

- Cancer is extremely painful
Some cancers are painful, and some are not. Suitable drugs are available that can treat cancer pain.^[99]
- If the physician prescribes chemotherapy, it means the illness is terminal
The answer is, false. For breast cancer, which almost always requires chemotherapy during treatment, 10-year survival rates were 40% during 1971-1972, which has now increased to 78%.^[36,37]
- Chemotherapy is painful, chemotherapy causes unbearable nausea, and chemotherapy drugs are always toxic
Chemotherapy is not painful. Some chemotherapy drugs cause nausea. Some chemotherapy drugs are toxic. However, cancer chemotherapy has improved tremendously over the years. It has increased overall survival, disease-free survival while at the same time, becoming less toxic.^[100] Modern chemotherapy is not a single drug therapy any longer. Multiple drugs are used. If the primary chemotherapy drug is likely to cause nausea, powerful antiemetics (drugs that prevent nausea and vomiting) are used. Aprepitant and palonosetron are newer drugs which are extremely effective in suppressing chemotherapy-induced nausea and vomiting to almost negligible levels.^[101,102] When a tumor is killed by chemotherapy drugs, it may release large amounts of uric acid and give rise to symptoms of hyperuricemia which is harmful for the body, especially kidneys. It can be prevented by prophylactic use of rasburicase, a uric acid metabolizing enzyme.^[103] The current chemotherapy has not remained the same as it was in the 1940s. It has become so much easier on the patients with the least toxicity and maximum efficacy and has increased overall survival. It has also become easier on the doctors as the medicines can be given on a day-care basis and the patients can be sent home after getting the medicines during the day.^[104]
- Treatment of cancer is worse than the disease
Treatment of cancer has been proven to be better than the disease. Treatment means longer disease-free, symptom-free, disability-free life.^[105]
- Everybody loses their hair
Thirty-five percent patients do not lose their hair. Moreover, in majority of cases of hair loss, it grows back 4-6 months after stopping chemotherapy.^[106]
- Immunity is compromised during chemotherapy

Immunity may be compromised depending upon the cancer type, the drugs used. However, other drugs are used to mitigate the decreased immunity.^[107]

- Chemotherapy is not worth it (too much pain, with no hope of recovery)

Chemotherapy is worth it. Pain if present can be treated with analgesics. Moreover, chemotherapy and other therapies for cancer have been steadily increasing the number of years a patient can live a disease-free healthy life.^[36,37,90,94]

- One can be too old for cancer treatment
Nobody is too old for chemotherapy. All parameters including patient's age are taken into consideration when chemotherapy is given.^[108]

- Cancer treatment means that the patient is confined to the hospital and will not be able to live at home, work, or go about his/her usual activities. Chemotherapy will completely disrupt patient's life

Today's cancer treatment in majority of cases is administered on a day-care basis. This means that patients go home after the medicines have been given during the day and can enjoy doing almost whatever they want to do. Doctors generally advise rest for a day or two. Furthermore, chemotherapy is given in cycles. In the time between cycles, the patient is generally free to do what he/she likes.^[104]

- A patient going through chemotherapy can contaminate others

The reverse is true. Adequate care should be taken so that the patient is not unnecessarily exposed to infection risk.^[109,110]

- One cannot get pregnant during chemo/one will never be a father or mother again

One can get pregnant during chemo, but doctors advise against it because of the risk to the fetus. One can become a father or mother after chemotherapy is over. However, depending on cancer and drugs used, doctors may advise the patient for ova harvesting (for female patients) or sperm banking (for male patients).^[111-113]

- Cancer surgery, tumor biopsy, needle biopsy causes cancer to spread in the body?

Cancer surgery, tumor biopsy, needle biopsy does not cause cancer to spread to other parts of the body. Cancer surgery is generally followed by other modalities of treatment such as radiation therapy or chemotherapy and any residual cancerous cells left in the body are killed.^[114]

- People with cancer should "rest" as much as possible
It is not necessary. Doctors generally advise rest only for a day or two.^[115,116]
- Supplements and herbs can cure cancer

The answer is no. Only chemotherapy, surgery, radiation therapy, targeted therapy, and immunotherapy, or their combinations have been proven to cure cancer. The claims of herbal and other such alternative products have not been substantiated till now, and there is no clinical trial data to show that such therapies actually work in the real-world scenario.^[117-119]

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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