



# CANCER NEWS

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Focus Area:  
**PREVENTIVE ONCOLOGY**



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### *From the Desk of Director Research*

By definition, preventive oncology is any measure that is taken to prevent development or progression of malignant process. Cancer is the most dreadful of all the illnesses. Etiology lies in a genetic predisposition modified with environmental exposure. Around one third of cancer deaths are due to the 5 leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use and alcohol use. More than 60% of world's total new annual cases occur in Africa, Asia and Central and South America. These regions account for 70% of the world's cancer deaths. It is expected that annual cancer cases will rise from 14 million in 2012 to 22 within the next 2 decades. Therefore, prevention is a better strategy.

Cancer prevention occurs at 3 stages: Primary prevention: Before the development of disease by modifying or averting the risk factors; Secondary prevention: Before onset of the clinical symptoms or signs and tertiary prevention: After development of disease by decreasing complications and recurrence of the disease. Michael Shimkin, M.D., of the University of California, San Diego, declared the new specialty, Preventive Oncology in 1975. For the prevention of cancer, we must know the etiology, know the risk groups and then apply the tools and strategy for risk reduction or prevention. Individuals are at increased risk because of modifiable or non-modifiable risk factors and are mainly targets for the preventive strategy. Genetic and hereditary risk factors play a role in 10% of cancers where mutations in susceptible genes are found as a part of hereditary cancer syndromes.

Tobacco use-cigarettes, bidis and shisha or smokeless forms (gutkha, quid, mava and snuff etc) leads to cancers. To fight the mammoth, measures like de addiction, replacement with variety of pharmacological substances, ban of tobacco selling and related legislature are applied. Exposure to UV rays is also directly related to melanoma and non-melanoma skin cancers. Avoiding sun exposure and protective sun screens like oxybenzone, avobenzone, titanium dioxide, or zinc oxide must be used in a proper way. Diet and exercise are 2 life style factors which can be modified to reduce the cancer risk. Sedentary lifestyle is responsible for approximately 5% of cancer death. Obesity is responsible for 10-40% of colorectal, endometrial, renal, esophageal, and postmenopausal breast cancers and weight reduction decrease the risk by 60%. Occupational exposures to chemicals such as coal-tar-based products, benzene, cadmium, uranium, asbestos, or nickel can significantly increase cancers like bladder cancer, lung cancer and mesothelioma. This can be prevented with avoiding such agents by spreading public awareness, legislature against use of the substances and adopting sustainable industrial growth. Approximately 17% of cancers occurring worldwide may be attributed to an infectious etiology. The prevention lies in 3 steps: Public health intervention, treatment of hepatitis B/C with anti retroviral therapy and early detection.

The common sites for cancer in India are oral cavity, lungs, oesophagus and stomach in males and cervix, breast and oral cavity among females. It has been suggested that given the socio-economic realities of a developing country such as India and the unsuitability of mammography, CBE may be an attractive screening procedure for breast cancers. The VIA-VILI combination test may be an acceptable simple technological tool for cervix cancer screening in resource poor countries like India. In India, it can always be debated whether introduction of cervical cancer screening programme at this juncture is at all practicable or we should straightaway settle for a HPV vaccine based primary prevention strategy.

The present issue of the Cancer News highlights the newer advances in the field of Preventive Oncology and features the regular articles, such as Special Feature, Guest Article, Perspective and In Focus. We are grateful to Dr Roopa Hariprasad, Scientist D; Prof Ravi Mehrotra, Scientist G & Director, National Institute of Cancer Prevention and Research, WHO, Noida for the "Guest Article"; Prof G K Rath, Chief, Dr BR Ambedkar Institute, Rotary Cancer Hospital, Dr Ajeet Kumar Gandhi, Senior Resident, Dept of Radiation Oncology, AIIMS, New Delhi for the "Perspective", Dr Prakash C Gupta, Healix-Sekharia Institute for Public Health, Navi Mumbai for the "In Focus".

Suggestions/comments from the readers are welcome.

*Dr D C Doval*

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## SPECIAL FEATURE

### CANCER SCREENING SAVES LIVES

At least one-third of all cancer cases are preventable. Prevention offers the most cost-effective long-term strategy for the control of cancer. Research suggests that only five percent of cancers are hereditary. That means the non-inherited causes of cancer - the lifestyle choices we make, the foods we eat, and our physical activity levels - have a direct impact on our overall cancer risk. By 2020, the world population is expected to have increase to 7.5 billion; of this number, approximately 15 million new cancer cases will be diagnosed, and 12 million cancer patients will die.

To combat cancer, the world's major national and international health organizations are strongly advocating for prevention. The focus on prevention clearly makes sense - globally, the most common cancer, lung cancer, is also the most obviously preventable one. Many other major cancers are strongly linked to preventable risk factors, such as an unhealthy diet, obesity, and lack of physical activity. Cancer researchers and public health officials have come to a consensus that cancer, in many, if not most cases, is a preventable disease. While there is no question that we need better cancer treatments, if we really want to win the war on cancer, then we need to prevent the disease and not just treat it.

Lifestyle factors play an important role in the development of cancer. Only 5–10% of all cancers are due to an inherited gene defect. Although all cancers result due to multiple mutations, these mutations are due to interaction with the environment. Cancer prevention occurs at 3 stages: Primary prevention: before the development of disease by modifying or averting the risk factors; Secondary prevention before onset of the clinical symptoms or signs; and Tertiary prevention - after development of disease by decreasing complications and recurrence of the disease.

**Primary Prevention:** The purpose of primary prevention is to limit the incidence of cancer by controlling exposure to risk factors or increasing individuals' resistance to them.

**Secondary Prevention:** Screening is the presumptive identification of unrecognized disease or defects by means of tests, examinations, or other procedures that can be applied rapidly. A number of factors should be

taken into account when the adoption of any screening technique is being considered:

- **Sensitivity:** the effectiveness of a test in detecting a cancer in those who have the disease;
- **Specificity:** the extent to which a test gives negative results in those that are free of the disease;
- **Positive predictive value:** the extent to which subjects have the disease in those that give a positive test result;
- **Negative predictive value:** the extent to which subjects are free of the disease in those that give a negative test result;
- **Acceptability:** the extent to which those for whom the test is designed agree to be tested.

### Breast Cancer Screening

The components of a breast screening evaluation include breast awareness (i.e., patient familiarity with her breasts), physical examination, Screening mammography and screening breast Magnetic Resonance Imaging (MRI) in selected cases.

**Self breast examination:** Data from a large randomized trial of breast self-examination (BSE) screening has shown that instructions in BSE has no effect on reducing breast cancer mortality. In this study, 266,064 women were randomly assigned to either receive instruction in BSE or not. Compliance was encouraged through feedback and reinforcement sessions. After 10 to 11 years of follow-up, 135 breast cancer deaths in the instruction-group and 131 in the control group were observed and the cumulative breast cancer mortality rate was not significantly different between the two arms.

**Risk Assessment:** Women can be stratified into two basic categories for the purpose of screening recommendations: those at average risk and those at increased risk. Women with a lifetime risk of breast cancer less than 15 percent are considered to be at "average risk" and those with a lifetime risk greater than 20 to 25 percent are considered to be at "increased risk."

The modified Gail model assesses the risk of invasive breast cancer as a function of age, menarche, age at first live birth or nulliparity, number of first-degree relatives with breast cancer, number of previous benign breast biopsies, atypical hyperplasia in a previous breast biopsy, and race. The Gail model should not be used for women with a predisposing gene mutation, a strong family history of breast or ovarian cancer suggestive of a genetic predisposition, women with a prior history of thoracic radiation, or for those with LCIS.



## Colorectal Cancer Screening

Most colorectal cancers (CRCs) arise from adenomas, many of which are polyps that progress from small to large (>1 cm) polyps, and then to dysplasia and cancer. The malignant transformation may result from acquired and/or genetic syndromes. Some colon cancers arise from nonpolypoid adenomas that are flat or depressed and account for 22 to 36 percent of identified adenomas. Removal of adenomatous polyps prevents cancer. It is difficult for non polypoid adenoma. Risk factors include family history, age, geographic area, race, gender, dietary habits, and smoking.

Currently, risk factors other than age and family history are not taken into account in most screening recommendations. There are high-risk genetic syndromes like lynch syndrome (hereditary nonpolyposis colon cancer) and familial adenomatous polyposis. There are basically 2 methods of testing: stool based detecting abnormality at earlier stage and radiological testing having an advantage of simultaneously removing the polyps.

Screening with FOBT has been demonstrated to reduce mortality from colorectal cancer in randomized trials. Other endoscopic and radiographic tests include Optical colonoscopy, Double- Contrast Barium Enema (DCBE), CT Colonography (formerly referred to as “virtual colonoscopy”). In the larger trial involving 170, 432 participants between the ages of 55 and 64 years, one-time screening with sigmoidoscopy, compared with no screening, led to a 23 percent decrease in the incidence of CRC and a 31 percent decrease in CRC mortality after a median follow-up of 11.2 years.

Multi-Society Task Force guidelines, US Preventive Services Task Force (USPSTF) guidelines, American College of Gastroenterology guidelines, National Comprehensive Cancer Network consensus guidelines and Council of the European Union all differ regarding the standard screening approach. The USPSTF recommends three screening options for adults age 50 to 75 years:

- Annual Fecal Occult Blood Testing (FOBT) a sensitive test
- Flexible sigmoidoscopy every five years, with FOBT every three years
- Colonoscopy every 10 years
- Screening people at increased risk

For Familial Adenomatous Polyposis (FAP), Screening of gene carriers or at-risk family members, flexible sigmoidoscopy or colonoscopy every 12 months starting around age 10 to 12 years and continuing until age 35 to 40

years if negative. Colectomy is suggested near the time of initial diagnosis in patients with profuse polyposis, multiple large (>1 cm) adenomas, or adenomas with villous histology and/or high-grade dysplasia. Patients with sparse, small (<5 mm) adenomas can usually be followed endoscopically. Recommendations for extra intestinal lesion in FAP have also been suggested.

Annual clinical examination of the thyroid and a baseline thyroid, ultrasound in adolescent age group is recommended for all patients with FAP. Other benign conditions like desmoid tumors, adrenal tumors and osteoma also need screening in appropriate way.

**Individuals with Lynch syndrome should undergo screening for CRC and extracolonic cancers:** Annual colonoscopy should start between the ages of 20 and 25 years, or two to five years prior to the earliest age of CRC diagnosis in the family. Genetic testing for MSH6 or PMS2 mutations is done as indicated.

Annual screening for endometrial and ovarian cancer with pelvic examination, endometrial biopsy, transvaginal ultrasound may be done beginning at age 30 to 35 years, or three to five years earlier than the earliest age of diagnosis of these cancers in the family.

## Cervical Cancer

**Cervical cancer is one of the most preventable cancers today:** In most cases cervical cancer can be prevented through early detection and treatment of abnormal cell changes that occur in the cervix years before cervical cancer develops. We now know that these cell changes are caused by human papillomavirus, commonly known as HPV. The traditional test for early detection has been the **Pap test**. For women age 30 and over, an **HPV test** used along with a Pap. HPV tests can find any of the high-risk types of HPV that are commonly found in cervical cancer.

## Pap Smear

Low-grade lesions and atypical squamous or glandular cells are better detected by the liquid-based technique and that the same specimen may be used for the pap smear and for HPV testing. Sensitivity and specificity of this test vary substantially. Estimates of the sensitivity range from 30% to 87%, whereas specificity is reported as 86-100%.

## HPV Testing

Out of various HPV genotypes infecting the genital tract mucosa, types 16 and 18 are responsible for about 70% of cervical cancers and 50% of cervical precursor lesions.

There is a high prevalence of HPV infection in sexually active women, particularly in younger women. Most young women will clear the HPV infection within 8 to 24 months. The prevalence of cervical HPV infection decreases after the age of 30, but the likelihood of persistent infection increases.

HPV testing, either alone or in combination with cervical cytology, is more sensitive than cervical cytology alone in detecting cervical histopathology, including adenocarcinoma. Randomized trials have demonstrated a decrease in the overall incidence of cancer with HPV testing, although a mortality benefit has not been demonstrated. Strategies that include HPV testing increase the number of positive results and colposcopies performed and long-term outcomes are uncertain.

- **Cervical cancer testing should start at age 21.** Women under age 21 should not be tested.
- **Women between the ages of 21 and 29** should have a pap test done every 3 years. HPV testing should not be used in this age group unless it's needed after an abnormal Pap test result.
- **Women between 30 and 65 years of age** should have a pap test plus an HPV test (called "co-testing") done every 5 years. This is the preferred approach, but it's OK to have a Pap test alone every 3 years.
- **Women over age 65** who have had regular cervical cancer testing in the past 10 years with normal results should not be tested for cervical cancer. Once testing is stopped, it should not be started again. Women with a history of a serious cervical pre-cancer should continue to be tested for at least 20 years after that diagnosis, even if testing goes past age 65.
- **A woman who has had her uterus and cervix removed (a total hysterectomy)** for reasons not related to cervical cancer and who has no history of cervical cancer or serious pre-cancer should not be tested.
- **All women who have been vaccinated against HPV** should still follow the screening recommendations for their age groups.

Some women - because of their health history (HIV infection, organ transplant, DES exposure, etc.) - may need a different screening schedule for cervical cancer.

### Lung Cancer Screening

Lung cancer is the second most cancer killer in men. Following facts about lung cancer make it an attractive disease for screening: The at-risk population is known, the prevalence is high, morbidity and mortality is high, detection at early stage leads to better outcome.

PLCO Cancer Screening Trial, Mayo Lung Project, National Lung Screening Trial, NELSON trial and UKLC trial have evaluated various screening modalities. X-ray of chest alone is not good screening test as it does not alter the mortality or morbidity.

### Risks and benefits of Lung Cancer Screening

- Effective lung screening may prevent more than 12,000 premature lung cancer deaths per year.
- The NLST results showed that annual Low Dose CT Scan (LDCT) decreased the RR of death from lung cancer by 20%.
- Quality of life improves and reduction in disease and treatment related morbidity is observed.
- The risks involved in screening are false-positive results, false-negative results, futile detection of small aggressive tumors or of indolent disease and radiation exposure with LDCT. Shared decision making may be recommended in view of all the harms.

### Ovarian Cancer Screening

The US Preventive Services Task Force (USPSTF) recommends against screening for ovarian cancer, with their initial recommendation reaffirmed in 2008 for women in general.

For women at increased risk like those with possible inherited breast-ovarian cancer syndrome, genetic counseling and genetic testing for BRCA-1 and BRCA-2 and Lynch mutation is recommended. National Comprehensive Cancer Network (NCCN) recommends screening every six months with CA 125 and TVUS beginning between the ages of 30 and 35 years or 5 to 10 years earlier than the earliest age of first diagnosis of ovarian cancer in the family.

### Risks of Screening

Screening tests can help doctors find a cancer at an earlier, more treatable stage. This may help improve survival. However, cancer screening also has a number of risks. These risks include:

**Overdiagnosis:** Screening tests may find slow-growing cancers that would not have caused any harm during a person's lifetime. As a result, some people may receive potentially harmful, painful, stressful, and/or expensive treatments that they did not need.

**False positives:** Sometimes a screening test will suggest that a person has cancer when does not.

**Increased testing:** Doctors may run additional tests that a person may not need because of over diagnosis and

false positives. These tests can be physically invasive, costly, and cause unnecessary stress and worry.

**False reassurance:** Sometimes a screening test will suggest a person does not have cancer when they actually does. As a result, the person may not get the treatment he or she needs.

### Screening Recommendations

A number of organizations provide guidelines on cancer screening tests. Sometimes these guidelines suggest different things. Recommendations vary on:

- Which type of cancer people should be screened for
- Which tests should be used to screen for a particular type of cancer
- What age screening should begin and end
- How often screening tests should be done

Talk with your doctor about your personal risk of developing cancer. You and your doctor can decide on an appropriate screening schedule based on your age and personal and family medical history.

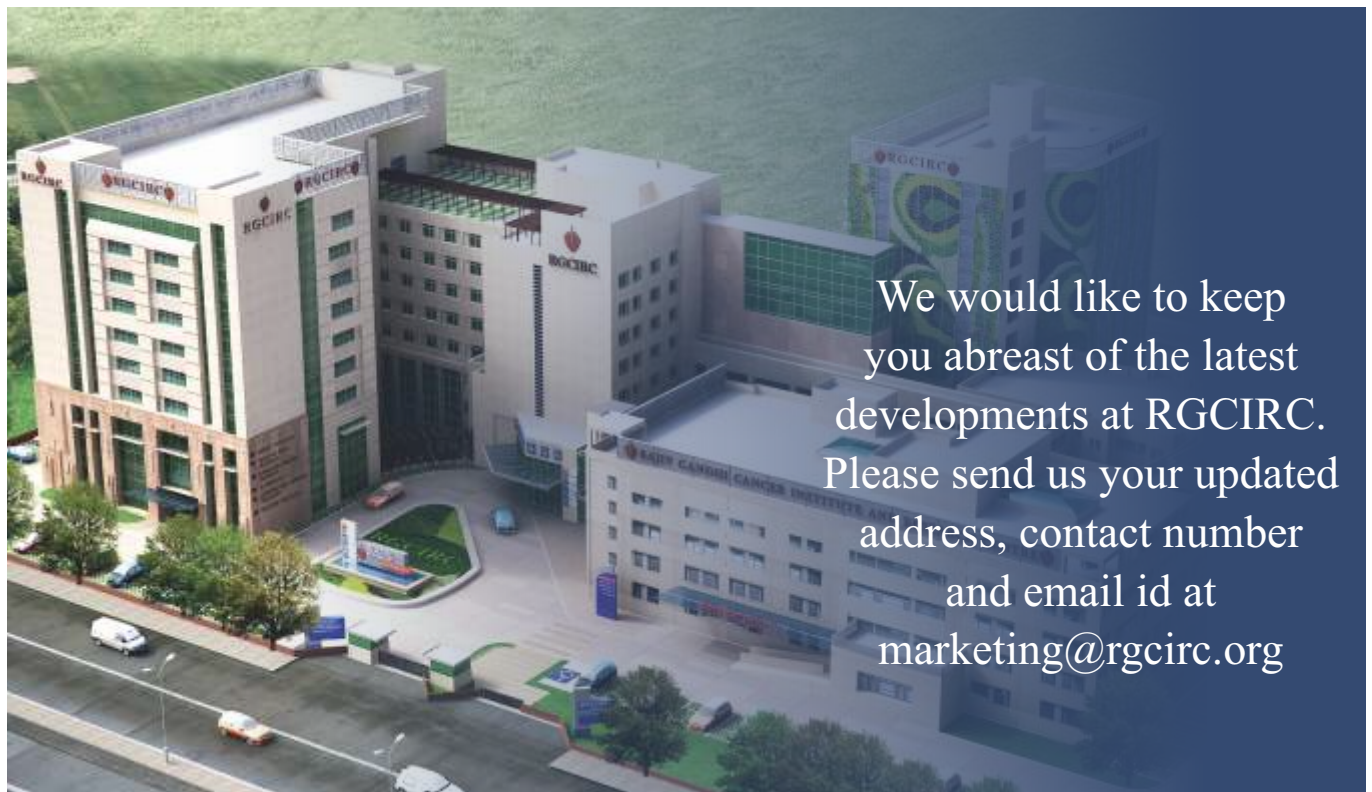
**New approach to cancer prevention and early detection:** Research into the prevention and early detection of cancer is entering a new era. With greater understanding of how cancers develop and, far too often, flourish-and with the availability of powerful new technologies-the approach to

preventing cancer, how to screen for it, and how to manage very early-stage disease is now more refined.

Identifying cancer at the earliest stages has long been a critical area of research. Effective screening tests-where the established benefits outweigh the potential harms, are available for only a handful of cancers, and, in many cases, it's still unclear whether screen-detected cancers (and those detected as a result of an unrelated medical exam) always need to be treated. There is ample evidence in prostate cancer, for example, that routine screening has led to many cases of over diagnosis and over-treatment, cases where people were diagnosed and treated for a cancer that likely never would have harmed them.

The focus now is to analyze the cellular and molecular makeup of precancerous lesions and screen-detected tumors (and of the cells and other components in their immediate surroundings, the "tumor microenvironment") and identify features-such as mutated genes or the expression of specific proteins-that distinguish slow-growing cancers that may not need to be treated immediately, if at all, from those that are aggressive or likely to become aggressive and thus need immediate treatment.

*(Dr A K Dewan, Chief of Head & Neck Services & Medical Director; Ms Swarnima Jaitley, Principal Research Officer; Research Dept, Rajiv Gandhi Cancer Institute & Research Centre, New Delhi)*



We would like to keep you abreast of the latest developments at RGCIRC. Please send us your updated address, contact number and email id at [marketing@rgcirc.org](mailto:marketing@rgcirc.org)



## GUEST ARTICLE

### FOLLOW-UP OF PATIENTS IN COMMUNITY BASED CANCER SCREENING PROGRAMS

#### Introduction

There is an estimated burden of over 1 million individuals, diagnosed with cancer in India in 2012<sup>1</sup>. The three most commonly occurring cancers in India are those of the breast and uterine cervix, together accounting for approximately 34% of all cancers in India<sup>2</sup>. These are usually detectable at an early stage and have precancerous stages that are amenable to secondary prevention. Screening and early detection of these cancers will help to markedly reduce the cancer burden in India. Countries which have adopted organized cancer screening programs have achieved significant decline in cancer incidences and mortality<sup>3</sup>. Due to financial constraints and lack of trained manpower, it has not been possible to implement screening programs in our country. There is a need to introduce opportunistic screening programs, till such time the national program for screening is launched. It will definitely help to reduce the burden to some extent, even though it will not be as effective as organized screening programs. National Institute of Cancer Prevention and Research has provided evidence-based recommendations in the review published recently which can act as a guide for policymakers, clinicians, and public health practitioners who are developing and implementing strategies for cancer control in India for oral, breast and cervical cancer<sup>4</sup>.

Community-based screening, using existing health workers in the health facilities appears to be a feasible approach in the present scenario. It is very important to reach out to people in the rural areas through camp approach where the awareness level is very low and the concept of prevention is unknown. Community settings can have unique advantages for individuals who lack access to medical care.

#### Barriers in Community Screening Program

Screening coverage in our country is extremely low. Understanding the potential barriers which can prevent women from participating in the screening program will help overcome this and plan strategies as per the needs of the population.

The barriers to cancer screening are multi-factorial. Some of the barriers listed in the literature are lack of knowledge about the disease, lack of access to services,

fear of a vaginal examination, fear of death from cancer, lack of trust in healthcare system, lack of support from family, and lack of familiarity with the concept of prevention<sup>5</sup>. The concept of The concept of screening is unfamiliar in our country. The commonest misconception among the Indian women includes the association of abnormal Pap smear with cancer and death. People often mistake HPV (Human Papilloma Virus) for HIV (Human immunodeficiency virus), which deters them from participating due to the fear of being labeled as having sexually transmitted disease. Lack of privacy in few hospitals/PHCs, inaccessible services (too far, lack of transportation, adverse climatic conditions) and inconvenient timings of healthcare have been a few of the system related barriers. The responsibility for change lies with healthcare providers and the health care delivery system.

#### Challenges in Follow-up of Screened Individuals

Coordination of follow-up remains a logistic challenge. Success of a screening program depends on number of screen positives being evaluated and treated. Returning for follow-up care after screening positive can be a challenge for individuals due to socio-cultural, financial, practical, and logistical barriers. Reasons for not returning for follow-up visits may be because they do not properly understand the importance of further evaluation or are afraid of receiving bad news about their condition and due to embarrassment or a fear of diagnosis or treatment<sup>6,7</sup>. Default rates in programs designed for cancer screening are usually very high, ranging from 5-20% in high income countries and 20-41% in low income countries<sup>8,9</sup>.

A study carried out in Nigeria to investigate the magnitude of default and factors associated with default from follow-up care after screening positive to cervical precancerous lesion using direct visual inspection concluded that the rate of default was high (47.2%) as a result of unaffordable transportation cost and limited time to keep the scheduled appointment<sup>10</sup>. The findings from this study contributed to the growing body of evidence, indicating that the current strategy of opportunistic testing and outreach for cervical cancer screening program is associated with high rates of default. The multiple visits associated with the present screening strategy makes it burdensome and unattractive to poorly educated women residing in remote areas. The distance from the community to the clinic and the time spent travelling and waiting for services is another barrier found to keep women away from follow-up appointment.

### Strategies to Increase Participation in Screening and Minimize Loss to Follow-up

Evidence indicates that screening, treatment, and follow-up services need to address women's cultural, emotional, practical needs and concerns<sup>11</sup>. A study conducted at Osmanabad district of Maharashtra, showed that good participation levels for cervical cancer screening can be achieved by adapting strategies to reduce the main barriers to screening, including the poor quality of health resources, economic and social inaccessibility, lack of knowledge about preventing cervical cancer, paying capacity for services and the social stigma associated with reproductive health problems<sup>8</sup>. A follow-up strategy must be determined and usually can be accomplished by a letter or phone call to patients in case of abnormal results. It is equally important to deliver the screening results on time and also reinforce that negative test results mean that there is no evidence of cancer but there is still a need for repeated screening. 'See-and-treat' LEEP approach was used for treatment of 1141 women, during 2000-2004, screened with VIA or cytology or HPV testing in the context of a population-based large randomized screening trial in Osmanabad district in Maharashtra, to maximize adherence to treatment and to minimize loss-to-follow-up by reducing visits<sup>12</sup>. The reduction in default rate was attributed to the reduction in number of visits, reduced service and transportation costs as well as reduction in man hours of work.

Community involvement is essential to reduce women's fear of screening and treatment, to strengthen their understanding of prevention and to improve women's experience with services. This can be undertaken by organizing awareness campaigns through public announcements, person to person contacts, nukkad natak, wall writings, posters etc. Following groups can be involved in awareness creation in the community: (i) Peers who have received messages or been screened; (ii) Leaders or members of women's groups; (iii) Community leaders and health promoters; (iv) Accredited Social Health Activists (ASHA), local volunteers, midwives and Anganwadi workers; and (v) Local NGOs and Village Health & Sanitation Committee.

Interventions may be designed to reduce the barriers and certain modifications can be made in the current cancer screening services by<sup>10</sup>:

- Reducing time or distance between service delivery settings and target populations.
- Modifying timings of healthcare facility to suit the patients.

- Offering services at their doorstep (e.g., camp based approach).
- Designing informative IEC material for easier understanding of the disease.
- Educating individuals on the importance of prevention and early detection.
- Changing of the present multi-visit strategy to a single visit strategy of "see and treat" to ensure that all the women who test positive receive the lifesaving treatment.
- Decentralization of cancer screening services to the rural areas, using ANMs, midwives, medics, and officers.
- Integration of cancer screening into existing reproductive health services, like HIV and family planning programs.
- Comprehensive screening of all 3 common cancers (breast, cervical and oral cancer) in one visit.

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### RECOMMENDATIONS FOR CANCER PREVENTION

1. Be as lean as possible without becoming underweight.
2. Be physically active for at least 30 minutes every day. Limit sedentary behavior.
3. Avoid sugary drinks. Limit consumption of energy-dense foods.
4. Eat more of variety of vegetables, fruits, whole grains and legumes such as beans.
5. Limit consumption of red meats (such as beef, pork and lamb) and avoid processed meats.
6. If consumed at all, limit alcoholic drinks to 2 for men and 1 for women a day.
7. Limit consumption of salty foods and foods processed with salt (sodium).
8. Don't rely on supplements to protect against cancer. The Expert Report also makes two recommendations for specific groups.
9. New mothers should breastfeed babies exclusively for up to 6 months and then add other liquids and foods.
10. Post treatment, cancer survivors should follow the recommendations for cancer prevention.

**And always remember - do not smoke or chew tobacco.**

*(www.aicr.org)*

### GLOBE SCAN

#### Effective Protection for Non-Smokers

Smoking is regarded as the central risk factor for lung cancer. According to 'dontsmok.at', an initiative run by experts from the Austrian Society of Haematology & Medical Oncology (OeGHO), Austria is lagging behind in Europe when it comes to controlling tobacco and protecting non-smokers. If the experts were to have their way, there would be a general ban on smoking in pubs and restaurants. Moreover, the price of tobacco products would have to be increased significantly and public awareness raised about the health risks and financial disadvantages of smoking. There is also a need to improve legislation to protect minors. Quitting smoking is always worthwhile. International studies show that it makes good sense to stop smoking, no matter what your age. With this in mind, MedUni Vienna and Vienna General Hospital are taking action, such as offering smoking cessation treatment to employees and banning smoking in their buildings.

*(Austria: Medical University of Vienna, May 24, 2016)*

#### Long-Term Aspirin Use

The authors looked at the association of aspirin with cancer among 135,965 women and men enrolled in two large US studies of healthcare professionals. The authors documented 20,414 cancers among 88,084 women and 7,571 cancers among 47,881 men during a 32-year follow-up. Regular use of aspirin two times or more per week was associated with a 3 percent lower risk for overall cancers, which was mostly due to a 15 percent lower risk for gastrointestinal tract cancers and a 19 percent lower risk for cancers of the colon and rectum, according to the results. Study findings suggest that, for the gastrointestinal tract, aspirin may influence additional mechanisms important for the formation of cancer, which may explain the stronger association of aspirin for a lower risk of gastrointestinal cancers. On a population-wide level, the authors suggest regular aspirin use could prevent 17 percent of colorectal cancers among those who did not undergo lower endoscopy and 8.5 percent of colorectal cancers among those who underwent lower endoscopy.

*(USA: ScienceDaily, Mar 3, 2016)*

## RESEARCH & DEVELOPMENT

### Breast Cancer Risk Predicted by Genes

The researchers have found that roughly 30 percent of breast cancer cases could be prevented by modifying known risk factors, say, by drinking less alcohol, losing weight and not taking hormone replacement therapy. Advances in the field of genetics can be used for developing precision prevention strategies to help women improve their odds of avoiding breast cancer. More than a dozen institutions around the world developed a model predicting risk of breast cancer by analyzing records on more than 17,000 women with breast cancer and nearly 20,000 women without the disease and about 6,000 women participating in the 2010 National Health Interview Study. The researchers combined individual-level data on risk factors, such as age, weight and smoking status with data on almost 100 common gene variations, each of which are known to have a modest association with breast cancer but in combination they can lead to substantially elevated risk. They further combined this information with population incidence rates from the National Cancer Institute-Surveillance, Epidemiology and End Results Program. The study tells us even people who are at high genetic risk can change their health outlook by making better lifestyle choices such as eating right, exercising and quitting smoking. The common gene variations studied by the researchers are quite different from the well known rare mutations in genes like BRCA1 and BRCA2, where having a single variant can mean a very high risk of developing breast cancer.

*(ScienceDaily, May 26, 2016)*

### New Prevention Approach for Ovarian Cancer

Researchers at University College, London, have found that knowing the early changes in the cells of fallopian tubes of women carrying genetic mutation responsible for ovarian cancer, could open the way for new preventive strategies. The research team examined the post-surgical reproductive tubal tissue from 115 women, 56 with the BRCA1/2 mutation and a control group of 59 without mutation. They analyzed the cells' epigenetic programs - the 'software' which dictates how the cells read instructions encoded within DNA. In addition, both ends of the fallopian tubes were compared (the fimbrial, closest to the ovary, and the uterine, closest to the womb), from the same woman. About 60 percent of women carrying BRCA1 or BRCA2 gene, showed

a radically altered sub-cellular activity occurred in the tubal cells that were closest to the ovary. These sub-cellular changes were similar to those seen in cells from ovarian cancer specimens. The changes were not seen in the women without BRCA mutations. The findings of study are very important as at present the most effective method of prevention for ovarian cancer is drastic risk-reducing surgery, which deprives women of their hormones and ability to give birth prior to menopause. These findings take us a step closer to understanding how ovarian cancers develop in BRCA 1/2 gene mutation carriers, opening up new opportunities for ovarian cancer prevention.

*(Nature Communications, May 24, 2016)*

### Urinary PGE-M Levels & Prognosis

Measurements of urinary PGE-M, a stable metabolite of PGE2, reflect systemic PGE2 levels. A multidisciplinary team from Mazumder-Shaw Cancer Center, India, investigated whether urinary PGE-M levels were elevated in healthy tobacco users and in patients with oral squamous cell carcinoma (OSCC). Median urinary PGE-M levels were increased in healthy tobacco quid chewers (21.3 ng/mg creatinine (Cr); n=33; P=0.03) and smokers (32.1 ng/mg Cr; n=31; P<0.001) compared to never tobacco quid chewers and never smokers (18.8 ng/mg Cr; n=30). Urinary PGE-M levels were also compared in OSCC patients versus healthy tobacco users. An approximately one-fold increase in median urinary PGE-M level was found in OSCC patients (48.7 ng/mg Cr, n=78) versus healthy controls (24.5 ng/mg Cr, n=64) (P<0.001). It was determined whether baseline urinary PGE-M levels were prognostic in OSCC patients who underwent treatment with curative intent. A nearly one-fold increase in baseline urinary PGE-M levels (64.7 versus 33.8 ng/mg Cr, P<0.001) was found in the group of OSCC patients who progressed (n=37) compared to the group that remained progression free (n=41). Patients with high baseline levels of urinary PGE-M had both worse disease specific survival (hazard ratio, 1.01 per unit increase, 95% CI, 1.01-1.02, P<0.001) and overall survival (hazard ratio, 1.01 per unit increase, 95% CI, 1.00-1.02, P=0.03). The findings raise the possibility that NSAIDs, prototypic inhibitors of PGE2 synthesis, may be beneficial for reducing the risk of tobacco-related aerodigestive malignancies or treating OSCC patients with high urinary PGE-M levels.

*(Cancer Prevention Research, April 27, 2016)*

## PERSPECTIVE

### LIFESTYLE MODIFICATIONS IN CANCER PREVENTION

#### Background

An estimated 130 lakh cancer cases are reported per year worldwide and 70 lakh cases die and roughly 60% of these cases as well as deaths occur in developing countries [1]. As per the recent estimates by the National Cancer Registry Program (NCRP), 14.5 lakh cases would occur in 2016 with 7.4 lakh deaths in India. This is expected to rise to 17.3 lakh cases and 8.8 lakh deaths in 2020 [2].

Major potentially modifiable lifestyle factors include tobacco consumption in various forms, dietary factors (which sometimes is underestimated), infections and alcohol use. It is estimated that 35-50% of cancer cases worldwide can be prevented by control of potentially modifiable factors [3, 4]. This article aims to discuss the impact of changing lifestyles on prevention of cancer with special emphasis on Indian scenario.

#### Tobacco

Tobacco increases the risk of lung cancer as well as 15 other cancers and is the forerunner of preventable causes of cancer deaths that account for 21% of total cancer deaths worldwide [3]. It is the strongest risk factor for lung cancer (increasing risk by 10-20 folds) and also the etiological agent for head and neck cancers (oral cavity, nasal cavity, paranasal sinuses, nasopharynx, larynx, and hypopharynx), esophagus, stomach, colorectal, pancreatic, hepatocellular, bladder, kidney, cervical cancers and leukemia [5].

About 80% of the tobacco consumers reside in economically developing countries and most of them are of younger age group [3]. The incidence of tobacco related cancers (TRCs) varies widely as per geographic location and gender in India. 30-60% of total cancers among males and 10-30% among females are TRCs. One out of 17 males and one out of 50 females have a lifetime risk of TRCs in India [2]. This directly corroborates with low proportion of tobacco consumption among females in India [6]. Alarming, 15% of the youth (age group 13-15 years) use tobacco in some form as per the Global Youth Tobacco Survey (GYTS 2009-10) [7]. Over 35% of adults (age > 15 years; 48% males and 20% females) use tobacco in some form [6]—14% adults (25% males and 3% females) smoke tobacco and 26% (33% males; 19% females) use smokeless tobacco.

Tobacco cessation has many health benefits apart from prevention of cancer. Quitting smoking before 50 years of age

reduces the risk of death by 50% as compared to those who continue smoking [8]. Tobacco cessation depends on a complex interplay of personal awareness, socio-cultural habits and governmental legislative actions. At an individual level, for those who are willing to quit, 5 “A” method should be used (Ask, Advise, Assess, Assist and Arrange) and for those not yet willing to quit, 5 “R” method should be used (Relevance of quitting, Risk of continuing tobacco, Rewards of quitting, Roadblocks to quitting and Repeat these at each visit).

Strategies of tobacco control, as advocated by WHO, have been implemented by several countries, including India. This includes a six pronged strategy of **MPOWER**—Monitor tobacco use and prevention policy; Protect people from tobacco smoke; Offer help to quit tobacco; Warn about dangers of tobacco smoking; Enforce ban on tobacco advertising, promotion and sponsorship; Raise tax on tobacco. COTPA (Cigarette and Other Tobacco Products Act 2003) contains provisions for restriction of sale and use of tobacco products in India [9]. Eighteen tobacco cessation centers (an initiative by WHO and supported by Govt. of India) are operational in various parts of the country that are coordinated by the National Institute of Mental Health and Neurosciences, Bangalore. The National Drug Dependence Center of All India Institute of Medical Sciences, New Delhi caters not only to the clinical care but also to community programs, education and research in this arena.

#### Alcohol

As per an estimate by WHO [10], 30% of total population in India consumed alcohol (Global figure is 38.3%). The per capita consumption has increased from 1.6 liters in 2003-2005 to 2.2 liters in 2010-2012. As compared to global figures of 16%, heavy/binge drinking was noted in 11% of population.

Around 4% of all cancers worldwide are caused by alcohol intake [11]. A prospective study [12] found an increased risk by 6% per consumption of 10g/day of alcohol and this increased the risk of oropharynx, larynx, esophagus, rectum, liver and breast cancers in women. The EPIC study (The European Prospective Investigation into Cancer and Nutrition) founds 10% attributable cancer risk of alcohol in men and 3% in women [13]. High alcohol consumption was set at 2 drinks per day (24 grams of alcohol) in men and 1 drink per day (12 grams of alcohol) for women in this study.

#### Infections

Infection related cancers (stomach, cervix, hepatocellular, Kaposi sarcoma) account for around 20-25% of all the cancer cases worldwide, with 80% of these residing in economically developing countries [1].



Several associations between infection and cancer have been established over time. Human papilloma virus (cervix, ano-genital, squamous cell cancers of head and neck), Hepatitis B & C (hepatocellular carcinoma), Human T-cell lymphotropic virus (adult T cell leukemia), Human immunodeficiency virus (Kaposi Sarcoma, non-Hodgkin lymphoma etc.), Human herpes virus 8 (Kaposi sarcoma and primary effusion lymphoma), Epstein-Barr virus (Burkitt lymphoma) and Helicobacter pylori (gastric cancer) are implicated in infection associated malignancies.

Majority of these are viral in origin and are transmitted by infected blood or body fluids. Following universal guidelines for screening and transfusion of blood and blood products, using disposable needles, regulation of tattooing and practicing safe sex would prevent majority of these infections. Effective vaccination strategies also exist for hepatitis and human papilloma virus infections. Use of highly active anti-retroviral therapy (HART), interferon and nucleoside/tide analogues decreases viral loads in HIV and hepatitis respectively and may impact carcinogenic effects of these onco-viruses.

### Physical Inactivity, Diet and Obesity

At least 6 cancers (colorectal, breast, stomach, liver, kidney and endometrial) have direct links with unhealthy diets, physical inactivity and obesity [14].

**Physical Inactivity:** 5% of cancer deaths are attributable to physical inactivity. Evidence supporting reduction of risk with increase in physical activity is most strong with breast, colorectal, and endometrial cancers while there is still some data to suggest a benefit for gastrointestinal cancers, prostate and endometrial cancers.

Dallal et al [15] reported association between recreational physical activity and risk of invasive/in-situ breast cancer in California Teachers Study. Women with strenuous activity (>5 vs. ≤ 0.5 hrs/week/year) had statistically significant reduction of both invasive (RR 0.80; 95% CI 0.69-0.94; p=0.02) as well as in-situ breast cancer risk (RR 0.69; 95% CI 0.48-0.98; p=0.04) and also had lower risk of breast cancer death (confined to overweight women), irrespective of estrogen receptor status and disease stage (RR 0.53; 95% CI, 0.35-0.80) [15]. A meta-analysis of 52 studies [16] showed an inverse association between physical activity and colon cancer (RR of 0.76; 95% CI: 0.72, 0.81). Voskuil et al [17] in a systemic review of studies, which included 7 cohort and 13 case control studies found that majority (80%) of 10 high quality studies showed a risk reduction of >20%.

**Diet:** A variety of foods has been studied in relation to cancer. Dietary fat (some association with prostate cancer), dairy products (ovarian cancer), soy (decreased risk of breast cancer with 20 mg per day of isoflavone), fruits (decreased risk of prostate cancer with lycopene), vegetables and fibers have all shown weak association, and that controversial results in various studies have not been shown to affect cancer risk [18]. Vitamins and micronutrients have a controversial role in relation to cancer causation and prevention [19]. Although the mechanism of carcinogenicity of red (pork, beef, and lamb) and processed meat (sausages, hot dogs, bacon and salami) is not clear, studies have shown association with increased risk of colorectal cancers. The International Agency for Research in Cancer (IARC) working group [20] reported increased risk of 17% per 100 grams/day of red meat and 18% per 50 gram/day of processed meat for colon cancer and identified these as potential carcinogens. Red meat (HR 1.22, 95% CI 1.16-1.29) and processed meat (HR 1.12, 95% CI 1.06-1.19) were also associated with elevated risk for cancer mortality [21]. This might be of more concern in western population as compared to Indian population (consumption of red and processed meat is <20%).

**Obesity:** 36% American adults and 17% of American children are obese [22]. Although, obesity has not been a concern earlier in India, the scenario is changing in the recent times. As per the National Family Health Survey [23], 12% of males and 16% of females in India are either obese or overweight and this may further increase in future.

Obesity (body mass index of > or = 30 kg/m<sup>2</sup>) is linked to increased risk of several cancers, including non-Hodgkin's lymphoma, leukemia, multiple myeloma, and cancers of the kidney, colon, rectum, breast (in postmenopausal women), pancreas, ovary, and prostate, accounting for approximately 8% (10% in men and 6% in women) of all cancers [24]. A meta-analysis of prospective observational studies [25] suggested strong association of esophageal adenocarcinoma, thyroid cancer and renal cancers in men and endometrial and gall bladder cancers additionally in women with an increase in body mass index of 5 kg/m<sup>2</sup>. Based on a large population based cohort study of 5.2 million UK adults, it is estimated that around 41% of all endometrial cancers and 10% or more of gallbladder, kidney, liver, and colon cancers could be attributable to excess weight [26]. An increase in population wide body mass index by 1kg/m<sup>2</sup> could lead to increase in annual cancer cases by 4000 patients [26].

## Conclusion

Danaei et al [27] elucidated 9 behavioral and environmental risk factors attributable to carcinogenesis. These include tobacco and alcohol consumption, excess weight, low physical activity, low intake of fruits and vegetables, urban air pollution, use of solid fuels, unsafe sex and use of contaminated injections. Following a simple 4-pronged approach (no smoking, prudent diet, BMI <30 and physical activity >3.5 hours weekly) could reduce cancer risk to one-third [28].

In general terms, the following should be communicated to population at large in order to bring sustainable lifestyle changes to reduce cancer incidence: avoid tobacco in all forms and alcohol, avoid red and processed meat, be physically active, maintain a healthy weight, practice safe sex and maintain hygiene of private parts.

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## IN FOCUS

### TOBACCO AND CANCER

#### Introduction

Worldwide, tobacco is used in diverse products smoked or smokeless, all delivering nicotine to their users. The epidemic of tobacco-caused diseases in the world results largely from widespread smoking of manufactured cigarettes, now mostly manufactured and distributed by a small number of multinational corporations, and in the case of China, the China National Tobacco Company. In some countries, particularly India and Bangladesh, smokeless tobacco use is prominent, including women, who generally do not smoke in these countries. The potency of tobacco products as a cause of cancer and its role in causing cardiovascular (CVD) and lung diseases, particularly that of combustible tobacco such as cigarettes, makes tobacco use the leading cause of avoidable premature mortality, estimated as 6 million deaths annually, worldwide (1).

Manufactured cigarettes are highly prone to deliver nicotine-containing smoke to their users. They burn at high temperature, generate thousands of chemicals, and consequently make smokers inhale a highly toxic mixture containing many known carcinogens and toxins, such as benzene (a leukemogen), formaldehyde (an irritant and carcinogen), benzo-a-pyrene (a carcinogen), carbon monoxide and cyanide (asphyxiants), acrolein (an irritant), tobacco-specific nitrosamines (TSNAs), and polonium (a radioactive carcinogen) (2). The smoke inhaled by the smoker is referred to as mainstream smoke (MS) while that emitted from the smoldering cigarette is called sidestream smoke (SS). In the presence of smoking, nonsmokers inhale secondhand smoke (SHS), largely made up of SS and also some exhaled MS. Bidis, pipes, cigars, and water pipes deliver smoke with mixtures of components comparable to those from cigarettes, although there are differences in smoke characteristics across products. In India, prevalence of bidi smoking is higher than cigarette smoking and health consequences, at least at the same level, quite likely even worse (3).

Smokeless tobacco is consumed without burning it, mostly orally and now though rarely, nasally. Oral smokeless tobacco use delivers nicotine more slowly than cigarette smoking - the peak increase in plasma levels of nicotine in smokeless tobacco users is 30 minutes after intake - but the level remains higher longer as it declines slowly while the product is held in the mouth.

Over the course of a day, a user of a smokeless product may ingest twice as much nicotine as a smoker. Smokeless tobacco comes in many forms, with names specific to the countries of origin. Smokeless tobacco is used along with areca nut in Southeast Asia, both in their countries of origin and wherever they have migrated. The user may mix tobacco with areca nut or may purchase a premixed product. Gutka, an industrially packaged product containing tobacco and areca nut, has been intensely marketed in India, taking over traditional products like betel quid and generating new users, especially among children and adolescents. Areca nut contributes its own set of carcinogens, mainly through areca nut specific nitrosamines (4).

The nicotine and carcinogen content (mainly TSNAs), both depend on the tobacco species, growing conditions, the amount of fermentation, ageing and how finely the tobacco is cut or powdered. Smokeless tobacco products, as with many cigarette brands, usually have an ingredient that increases the pH, to promote the availability of nicotine for absorption. Such agents include ammonia, ammonium carbonate, calcium hydroxide, potassium hydroxide, potassium carbonate and sodium carbonate. In India, the most common alkalisng agent used is calcium hydroxide or slaked lime. Nicotine availability also increases with finer powdering of the tobacco (4). Products with different levels of free nicotine are marketed to different types of users: novices usually start with low nicotine products and graduate to brands with higher levels (5).

#### Tobacco as a Cause of Cancer

**Tobacco Smoking:** Tobacco smoke is a rich mixture of gases and particulate matter sufficiently small to reach and deposit in the bronchioles and alveoli. Tobacco smoke components, including nicotine, move from the lungs, enter into circulation and reach throughout the body, thus reaching doses of carcinogens to various tissues, not only at the site of absorption, but in most organs of the body. Tobacco smoke includes numerous known carcinogens (6). Broad classes include polycyclic aromatic hydrocarbons (PAHs), N-nitrosamines (including the TSNAs), aromatic amines, volatile aldehydes, and phenolic amines. There are both specific and non-specific pathways by which smoking is thought to cause cancer. There is very extensive experimental evidence documenting these pathways (2, 6).

**Smokeless Tobacco:** Smokeless tobacco contains over 3000 chemicals and at least 28 carcinogens, many being the same as in cigarette smoke. As such, similar



mechanism for carcinogenesis is applicable. Smokeless tobacco use results in exposure to TSNA, volatile N-nitrosamines, N-Nitrosamino acids, volatile aldehydes like formaldehyde and acetaldehyde; aromatic polycyclic hydrocarbons including benzopyrene, and arsenic; metals, including cadmium, lead, arsenic, nickel, chromium and radioactive elements. Some nitrosamines, their metabolites and benzo-a-pyrene are known to attach to cellular DNA, leading to mutations. leading to mutations. Smokeless tobacco also generates reactive oxygen species, oxidative stress and DNA fragmentation in laboratory experiments. Inflammation of the oral mucosa at the site of tobacco quid placement begins as early as 2-7 days after the initial application by regular users on a new site. The inflammation caused by smokeless tobacco is believed to play a role in the development of oral cancer. Oxidative stress caused by smokeless tobacco has also been implicated as a mechanism in increasing risk for CVD. Nicotine in smokeless tobacco also promotes heart disease as it raises heart rate and blood pressure (3).

### Epidemiological Evidence

**Tobacco Smoking:** The epidemiological evidence on smoking and cancer comes from numerous case-control and cohort studies carried out since mid-20th century. The epidemiological evidence on smoking and cancer is consistent in identifying cigarette smoking as a cause of many types of cancers (7, 8). The affected sites include those where smoke is directly deposited (e.g., the oropharynx and lung) and distal sites that are reached by circulating tobacco smoke components (e.g., the pancreas and urinary bladder), and even unexpected sites like acute myeloid leukemia. Overall, risks for cancers caused by smoking increase with the duration of smoking and with the number of cigarettes smoked daily; cancer risk falls after successful cessation of smoking, but for longer-term smokers, the risks may not drop to the levels as for those who never smoked (9).

Examination of relative risk estimates for cancer death for major sites from cohort studies show that: (1) the relative risks for current and former smokers compared to never smokers are remarkably high for some sites, e.g., lung and laryngeal cancer; (2) former smokers uniformly have decreased relative risks in comparison with current smokers; (3) relative risks were lower in females than in males in older studies but has increased in later studies (10). Findings of more recent studies suggest that relative risks have continued to rise as more recent cohorts of women have started to smoke at a similarly young age as men and they smoke with equal intensity (11).

Epidemiological evidence also shows that involuntary smoking, the inhalation of SHS by

nonsmokers, causes cancer. The first epidemiological studies on passive smoking and lung cancer risk in nonsmokers were published in 1981; by 1986, there was sufficient evidence, particularly in the context of the already extensive literature on active smoking, to conclude that passive smoking causes lung cancer in nonsmokers (12). Exposure to passive smoking increases lung cancer risk by about 25 percent, a finding replicated worldwide (10).

**Smokeless Tobacco:** Numerous epidemiological studies including cohort studies have shown a causal relationship of smokeless tobacco with cancer, specifically evidence for cancers of the oral cavity and pancreas (3). Traditional products from the USA, South Asia and Sudan have been found to contain very high amounts of TSNA and users have high risk for oral cancer. Risk estimates for cancer associated with smokeless tobacco use increase in sync with frequency per day and duration of use in years. Smokeless tobacco users tend to have precancerous oral mucosal lesions, such as the more common leukoplakia. These white lesions tend to disappear within one or two months after discontinuation of tobacco use. These lesions are more common in smokers who also use smokeless tobacco and their risk of cancer is also higher (4, 13). Those who use areca nut along with tobacco, experience high risk of oral submucous fibrosis.

### Prevention

**Tobacco Smoking:** Tobacco control requires far more complex approaches that to acknowledge the hierarchy of factors that determine the use of tobacco and the interplay of these factors across the life course, as health is damaged by smoking from conception onwards. At each age, the emphasis of tobacco control shifts, moving from preventing initiation to promoting successful cessation. Additionally, tobacco control efforts need to be dynamic in time, changing as the tobacco industry attempts to counter control measures. Many nations have now implemented tobacco control programs. Most importantly, there is now the Framework Convention on Tobacco Control (FCTC), the World Health Organization's (WHO) first public health treaty that is intended to bring a global approach to the global epidemic of tobacco use. It has been in force since 2005 and has been ratified by 180 countries. It is now in force in most nations of the world including India.

Building on the FCTC process, the WHO has recommended MPOWER, as a comprehensive tobacco control strategy intended to provide a programmatic counterpart to the FCTC (14). MPOWER includes six

key tobacco control measures, including monitoring the epidemic; protecting nonsmokers from exposure to SHS; warning smokers of the health effects of smoking with strong, effective health warnings, enforcing advertising bans, and raising the price of tobacco products. WHO is tracking implementation of MPOWER and coverage of the world's population by its provisions. Fortunately, global tobacco control has been supported by funding from the Bloomberg Family Foundation and the Bill and Melinda Gates Foundation, first made available in 2007 and now slated to continue through 2016.

**Smokeless Tobacco:** Tobacco control needs to include smokeless tobacco in its purview. Control of unbranded products should be tackled on global scale, especially India. Prohibition of spitting in public places, prohibition of smokeless tobacco use at the workplace, banning of the sale of all tobacco products in and around educational institutions are required to control smokeless tobacco use. The same stringent contents on health warnings and prohibition of advertisements, including use of surrogates and brand stretching, need to be implemented for smokeless tobacco as for smoked products. Healthcare providers need to be imparted adequate and appropriate training to counsel smokeless tobacco users on quitting. Bans on import of smokeless tobacco and control of smuggling are also required to control smokeless tobacco. Interventions in India involving students and the youth in advocacy for tobacco control have been found effective in engaging their interest and keeping tobacco usage down (15).

### Conclusion

A substantive part of the cancer problem in India, just like globally, can be addressed through advancing and enforcing stricter tobacco control policies.

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## OUTLOOK

### ROLE OF GENETIC COUNSELING CLINIC IN CANCER

Cancer is a genetic disorder. Understanding the meaning, relevance and impact of a genetic mutation by the patient and his/her family is important for eliciting patient cooperation and for informed decision making and consent. Additionally, the genetic testing options available today are complex due to the variety of technologies, mutations and test results. The testing outcome can further lead to anxiety, inferences or attitudes and would unleash a series of queries from the patients and family members. Hence it is imperative to offer genetic counseling before and after ordering genetic tests.

Genetic counseling is the process through which the patient and their family members are explained in brief the role of genetic mutations; role and limitations of genetic testing; test options; possible test results etc. Post test genetic counseling helps patients and their families understand the implications of the genetic tests.

Genetic counseling has emerged as a specialized profession where the counselor understands genetics, genetic tests and technologies, psychology and human behaviour. They help in eliciting useful family history/background information and handling patient concerns and queries.

#### Advantages to Patients

- Understanding the role of genetic mutations in their disorder
- Empathetic sharing and addressing of their concerns and fears
- Access to a qualified and informed sounding board
- Clarifications with respect to doctor's advise
- Validation of hereditary factors and identification of 'at risk' family members

#### Advantages to Doctors

- Support for explaining genetics to patients and addressing their issues/concerns
- Support for eliciting and/or validating the background information, clinical history and hereditary factors
- Source of information on genetics
- Improved patient handling and decision making
- Will benefit medical oncologist and breast/ovarian surgeons

#### Advantages to Hospital

- Unique value proposition
- Differentiator from other hospitals

### Hereditary Cancers

Two to five percent of all cancers are found to be hereditary. In India, with an estimated one million new cancer cases diagnosed every year, 20,000 to 50,000 of these could be hereditary. The affected individuals with hereditary cancer syndromes are at increased risk of being affected with multiple cancers, and the unaffected/healthy members of these families carry a risk predisposing genes that greatly increase the probability of lifetime cancer risk. Moreover, several members of such families are often affected, with repeated emotional and financial trauma. Members of these families, given their high risk of developing cancer, need to be under lifelong surveillance and need to be offered preventive management options.

### Genetic Testing and Counseling for Hereditary Cancers

- A genetic test can help identify the genetic mutation which renders the individual at a higher risk of developing a cancer.
- A negative test result can provide a sense of relief and reduce the anxiety of the individual or family members. It can reduce the need for, or at least the intensity of, check-ups, screening and preventive therapy.
- A positive test result can help in earlier disease detection, more targeted surveillance, and more effective prevention strategies, such as motivating a person to make behavioural changes to lower their chance of disease.
- Genetic counseling has a very important role in hereditary cancer cases as it involves several branches of the patient family and can help in early identification, prevention or management of the disorder for the entire immediate and extended family.

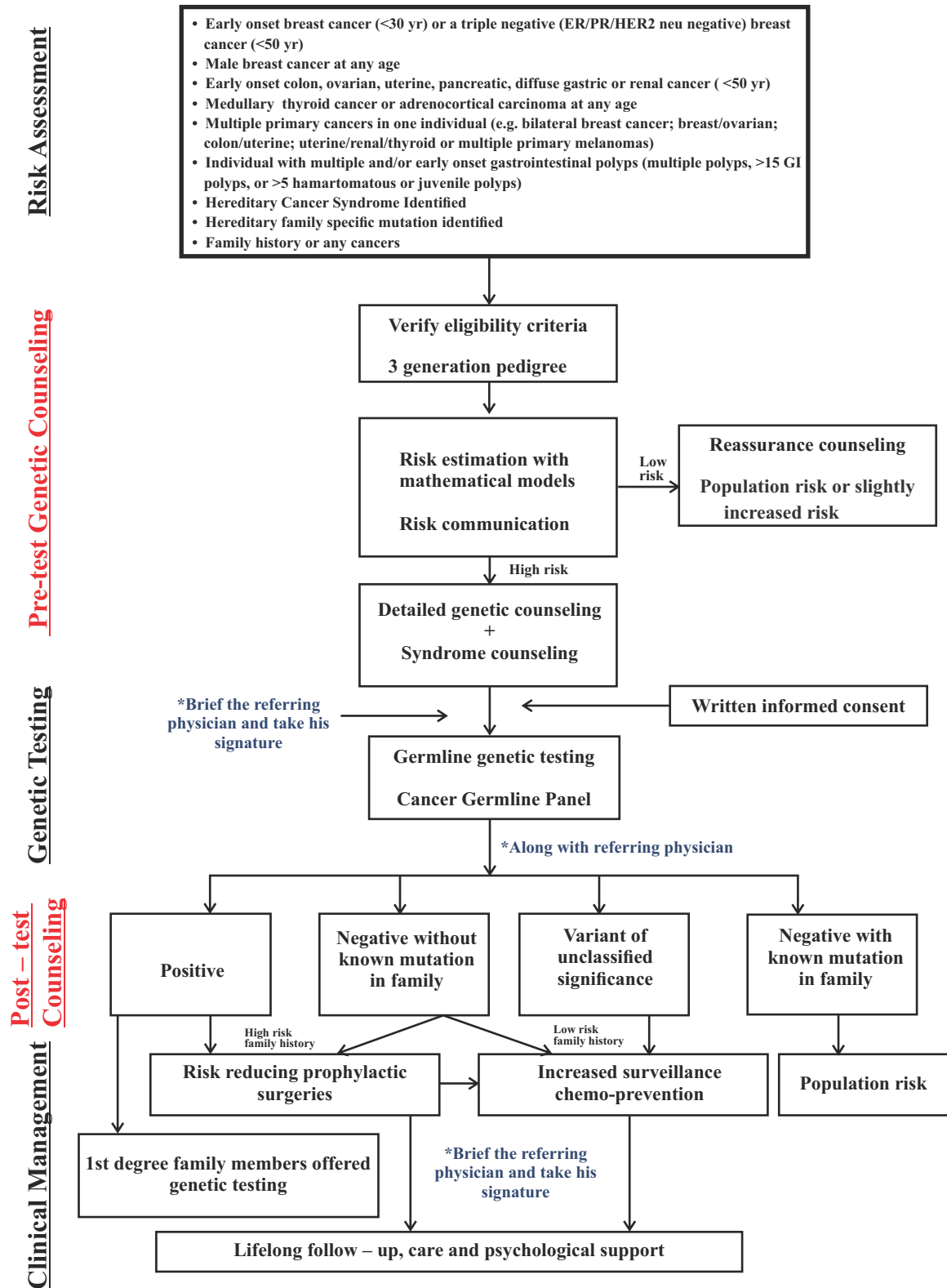
### Genetic Counseling – Rajiv Gandhi Cancer Hospital Experience

Rajiv Gandhi Cancer Institute & Research Centre, New Delhi, has been offering genetic counseling services to its patients with the support of genetic counselors for the last two years. The clinic is held all days of the week in the afternoon 14.00 pm to 17.00 pm.

The centre offer a full range of services that cover risk evaluation, detailed counseling, diagnostic testing, prevention and clinical management consultation for all hereditary cancers. These services of the clinic are available to the affected person and all his/her healthy family members.



STANDARD OPERATING PROCESS – CANCER GENETIC COUNSELING



At RGCIRC, in the past two years, 125 families have been counseled, out of which about 30 went ahead with genetic testing. Extensive surveillance and

prophylactic risk reducing surgery were advised to the mutation carriers depending on their age and history in family.

## PREVENTIVE ONCOLOGY AT RGCIRC

Rajiv Gandhi Cancer Institute & Research Centre (RGCIRC) has set up Preventive Oncology Department to focus on creating awareness among the public about the need to screen for early detection of cancer. The Department provides screening for three most common cancers (breast, cervix & oral) and also organizes training programs for health workers.

### RGCIRC Initiatives

**1. Public Education** – The team educates people about harmful effects of tobacco, alcohol and western lifestyle and has taken initiative for:

- Distributing informative booklets on cancer awareness as well as tips to remain healthy and cancer-free
- Motivating patient's relatives to have cancer checkup
- LCD TV in the main reception area displays Preventive Oncology program
- Public lectures are organized in slum areas of Delhi under "Gender Resource Centre (GRC)" scheme

**2. Conduct Screening** – Screening is done for any healthy individual who may be a relative of a patient.

**3. Create Awareness About Preventive Vaccine** – Display boards in OPD highlight the importance of cervical cancer vaccine.

### Screening Package

Screening packages (Rs. 200/-) include the following:

#### For Males

Clinical Examination (ENT checkup)

- Rectal examination by surgeon (for rectal & prostate cancer)
- CBC - Complete Haemogram
- Sputum for Cytology

#### For Females

Clinical Examination (ENT checkup)

- Breast and pelvic examination by Gynecologist
- CBC – Complete Haemogram
- PAP Smear (for cervix cancer)
- Screening mammography for women above 40 years of age at 50% concession.

### Preventive Oncology Outreach Program

Community based cancer detection camps are organized in collaboration with NCT of Delhi at:

- Ray Welfare Trust, Village Sultan Pur Mazra, Delhi
- Jeet Gender Resource Centre, Budh Vihar, New Delhi
- Samarth Gender Resource Centre, Shahbad Daulatpur, Delhi
- Nishulk Mahila Prashikshan Samiti, Mangolpuri, Delhi.

### Activities on Special Days

Screening camps are arranged in RGCIRC on:

- World Cancer Day - 4th February
- International Women's Day - 8th March
- World No Tobacco Day - 31st May
- National Cancer Awareness Day - 7th November
- Cancer awareness lectures are conducted on above days. Month of October is observed as breast cancer awareness month in RGCIRC and free clinical breast examination is carried out. Also, month of November is observed as cervical cancer awareness month and free Pap smear is done.
- Camps are arranged regularly at schools, colleges, etc. about regular screening & early detection of cancer and activities include high risk identification of general population through family history.
- Creating health awareness through audiovisuals, booklets, pamphlets, etc.
- Health education regarding personal hygiene & dietary advice by Health Educators.
- Screening for early detection at the GRCs.
- Counselling services for high risk people.
- Training Programs for medical and paramedical staff.

### Schedule of Preventive Oncology

OPDs are held from Monday to Saturday 9.00 AM to 5.00 PM in RGCIRC

- GRCs camps on Tuesdays and Thursdays from 1.30 PM to 4.30 PM

### Seven Warning Signals of Cancer

- Change in bowel or bladder habits
- A sore that doesn't heal
- Unusual bleeding or discharge
- Thickening or lump in breast or elsewhere
- Indigestion or difficulty in swallowing
- Obvious change in wart or mole
- Nagging cough or hoarseness

### Take Home Message

Overall, healthy lifestyles hold the key to cancer prevention. Regular screening can help detect many cancers in early stages when they can be treated successfully.

THERE'S A  
VERY SIMPLE  
CURE FOR  
CANCER.

PREVENTION

Our Prevention & Awareness Cell helps you do just that.

*Our's is one of a kind, dedicated programme focused on creating awareness and preventing cancer. The team helmed by experienced senior specialists, screens an average of 12000 persons every year, saving lives by detecting cancer in early stages. Hence, making it curable.*

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