

CANCER

This article aims to provide some information on Cancer based on the following sub-topics:

1. Understand what is cancer and the prevalence and epidemiology of different types of cancer in HK and other parts of the world.
2. The difference between benign and malignant tumours.
3. Some statistics and epidemiology of cancer.
4. Factors that may increase the incidence of cancer.
5. The link between causal factors and the incidence of different types of cancer.
6. How to reduce the risks of cancer and information on some preventive screening tests.

What is CANCER?

The body is made up of different types of cells. Under normal circumstances, cells in the body grow, divide and die in a controlled manner.

Cells contain genetic materials called chromosomes and some of these control the growth of cells. Sometimes, due to changes that occur in these genetic materials (**mutation**), the ability to control cell growth is lost. As a result, rather than dying, abnormal cells continue to divide and grow without normal control, resulting in an abnormal growth called a **tumour**.

The sudden change in genetic materials may occur for many reasons. Changes may be:

- caused by exposure to mutagens (factors that bring about mutation)
- inherited
- (most often) multifactorial in nature.

All cancers begin with uncontrolled growth of abnormal cells (uncontrolled mitosis).

The difference between a BENIGN and a MALIGNANT tumour

A mass of abnormal cell growth is called a **tumour**.

Benign tumours do not invade surrounding tissues although they can grow to such a size as to cause compression to and displacement of the surrounding tissues or organs. They are rarely life threatening except perhaps in the brain, where the location and lack of space make even enlarging benign tumours problematic.

Malignant tumours (also called **Cancer**), on the other hand, invade and destroy nearby cells and tissues and may threaten a person's life. Cancerous cells may break off and spread

through the blood vessels and lymphatic drainage system to other parts of the body. This process is called **metastasis**.

The site of the original cancer is called the primary growth and the cancer spread is called secondaries.

Malignant tumours may invade and metastasise and are often life threatening. Benign tumours do not spread and are rarely life threatening. They may cause problems due to compression of the surrounding tissues.

Some Statistics and Epidemiology of Cancer

The **Epidemiology** of a disease is the study of that disease in man under different conditions in life.

In cancer, this was first noted nearly 300 years ago. Differing conditions in life may lead to certain diseases. Cancer of the breast was noticed to occur more commonly in nuns. We now know that pregnancy and breast feeding both protect against this type of cancer.

The study of epidemiology may help us identify certain preventive measures.

Some examples:

- **Difference between communities** e.g. Jewish females have low incidence of cancer of the cervix wherever they live. This is thought to be related to circumcision practiced by Jewish males which reduces the chance of papilloma virus infection and hence the incidence of cervical cancer.
- **Change in incidence after migration** e.g. Cancer of the colon and cancer of the breast in African Americans and Japanese migrants to Hawaii are both markedly higher than the indigenous population. Changes in dietary habits are thought to be responsible.
- **Change of incidence in time** e.g. the global increase of cancer of the lung with an increasing population of smokers.
- **Identifiable causes** these vary for different cancers e.g. smoking related to cancer of the lung, prolonged exposure to sunlight related to cancer of the skin, although some factors may cause cancer on many sites e.g. ionizing agents.

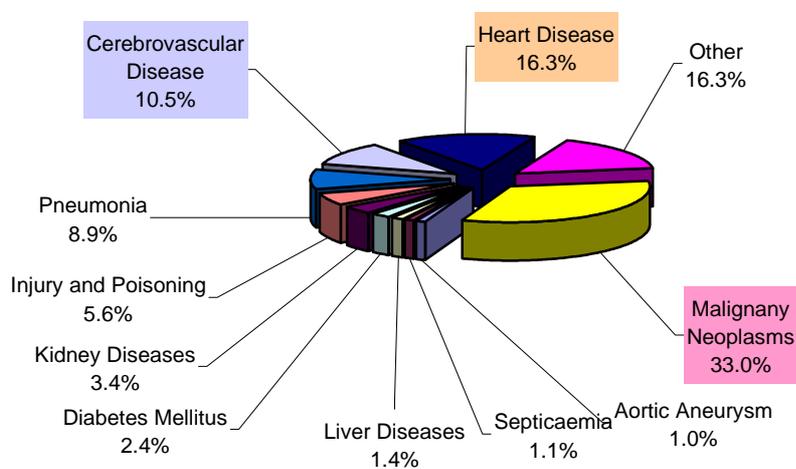
By the year 2020, it is estimated that new cancer cases will double to 20 million a year. Currently, over half of newly diagnosed cancers occur in the developing world and the proportion is

expected to reach 70% by 2002. Deaths are also set to double from 6 million to 12 million annually.

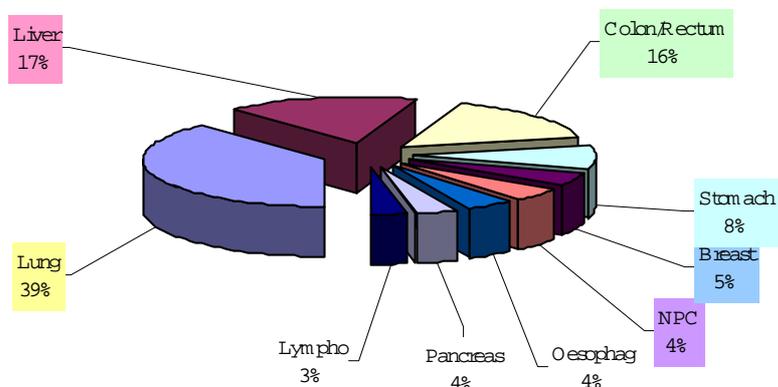
There are more than a hundred different forms of cancer, which is currently the number one killer disease in Hong Kong.

- The **Top Three Killer Diseases** in Hong Kong in 1999 were **Cancer, Heart Diseases and Cerebrovascular Disease (stroke)**. They accounted for **59% of all deaths**.
- The following are the top ten leading causes of death in Hong Kong in 2000.

The Leading Causes of Death, 2000



Leading Cancer Deaths (Overall)

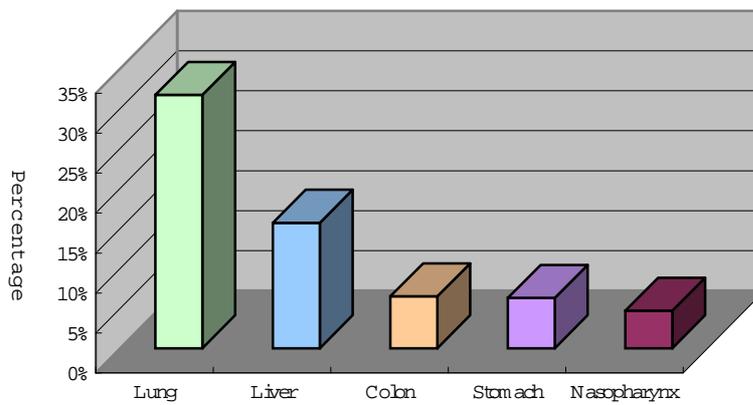


- Of the above, Cancer represented almost one third of all deaths. The top five cancers causing death in Hong Kong in 1999 were:

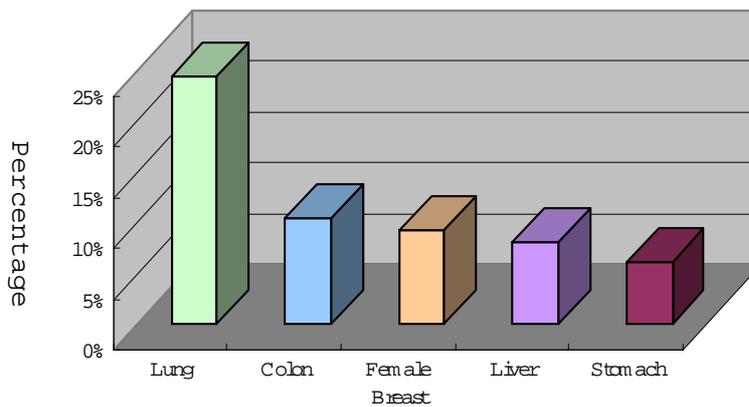
In Men	Cancer of the Lung	31.7%
	Cancer of the Liver	15.7%
	Cancer of the Colon	6.5%
	Cancer of the Stomach	6.3%
	Cancer of the Nasopharynx	4.7%

In Women	Cancer of the Lung	24.4%
	Cancer of the Colon	10.5%
	Cancer of the Breast	9.3%
	Cancer of the Liver	8%
	Cancer of the Stomach	6.2%

Leading Cancer Deaths (Male), 1998 - 1999



Leading Cancer Deaths (Female), 1998 - 1999



Note the variation of cancer worldwide.

In **developed**, and increasingly, developing countries, tobacco causes 1 in 3 cancer deaths. Cancers linked to a fatty diet also predominate (breast and colon cancer). In Hong Kong, it is estimated that one in 24 women will develop breast cancer.

In **developing** countries, chronic infections play an important role e.g.

- Helicobacter pylori-----linked cancer of the stomach
- Hepatitis B&C-----linked to cancer of the liver
- Human papilloma viruses-----linked to cancer of the cervix

Hence, the most common cancers in the **developed world** are cancers of the lung, colorectum, breast, stomach and prostate, in descending order.

In the **developing world**, the most common cancers are cancers of the stomach, lung, liver, breast and cervix in descending order.

N.B. Hong Kong: the most common cancers are cancers of the **lung, liver, colorectum, stomach and breast.**

Possible Causes of / Risk Factors associated with Cancer

As previously mentioned, cancer is caused by mutation in genes that control normal cell growth, division and death. Some of the mutations may be inherited although most are factors related to lifestyle or the environment.

Some recognised factors that may increase the likelihood of cancer are:

1. Heredity

Some types of cancer are more common in certain families indicating that cancer may be familial or have a genetic component e.g. cancers of the breast, ovary, colon and prostate.

Example:

- *Genetic changes in certain genes increase the risk of breast cancer. Both men and women have some of these genes (BRCA1 and BRCA2), therefore changes in these genes*

can be passed down from either the mother or the father. Gene changes have been found in some families with a history of breast or ovarian cancers. In families in which many women have had breast cancer, gene testing can detect the presence of specific genetic changes that increase the risk of breast cancer. Doctors may suggest ways to try to delay or prevent breast cancer, or to improve the detection of this disease in women who have these changes in their genes.

There is a known association between cancers of the breast, ovary and colon.

2. Ionising Radiation

This includes X-rays, gamma rays, particles from the decay of radioactive substances. Cells are damaged and cancer and other diseases may result. Ultraviolet light damages genes and depletion of the ozone layer allows more UV light to penetrate to the earth's surface resulting in an increase in skin cancer.

Examples:

- *Survivors of the Hiroshima atomic bomb in Japan have an increased risk of developing leukemia and other cancers.*
- *Radon is a radioactive gas released from the decay of uranium in rocks and soil. As it decays, radon emits tiny radioactive particles. In areas without adequate ventilation, such as underground mines, radon can accumulate to levels that cause damage to the cells lining the lung when inhaled, substantially increasing the risk of lung cancer.*
- *Increase in skin cancer with increased UV light exposure.*

3. Chemicals

Certain chemicals and substances may damage DNA molecules and hence result in gene mutation (**mutagens**). Some mutagens are carcinogenic (causing cancer) and are called **carcinogens**.

Known carcinogens:

Tar in tobacco smoke-----lung cancer
Asbestos-----lung cancer
Aniline dyes-----bladder cancer

Example:

- *There are more than 3,000 chemicals present in tobacco smoke, including at least 60 known carcinogens such as nitrosamides and polycyclic aromatic hydrocarbons. Tobacco smoke also contains a chemical called nicotine, which is addictive, making it difficult for people to stop smoking.*

Known health effects associated with Smoking are:

- *Carcinogenic effects: lung cancer, cancers of the nasal sinus, throat, pharynx and oesophagus.*
- *Respiratory effects : increased incidence of respiratory infections, induces attacks of asthma, chronic airway problems, eye and nose irritations*
- *Cardiovascular effects : heart Disease, stroke*
- *Developmental effects: affects baby's development in utero, increases risk of Sudden Infant Death Syndrome.*
- *Decreases one's projected lifespan.*

Note the importance of "Secondhand Smoking". Nonsmokers exposed tobacco smoke absorb nicotine and other toxicants just as smokers do and though the concentration of inhaled smoke is less, the risks to health are still significant.

A report by the U.S. Environmental Protection Agency, after reviewing 30 epidemiological studies that focused on the health risks on nonsmokers exposed to environmental tobacco concluded that there is a strong association between this type of exposure and lung cancer. Studies point to a 20% to 30% increased risk of developing lung cancer in this group.

4. Infections

Chronic infections play an important part in some common cancers, especially in the developing world.

Epstein-Barr Virus (plus salted fish)-----Nasopharyngeal cancer (NPC)
Hepatitis B&C----- Liver cancer
Human Papilloma virus-----Cervical cancer (cancer of the cervix)
Helicobacter Pylori -----Stomach cancer

Example:

- *Epstein-Barr Virus(EBV)*
The association of EBV and Nasopharyngeal cancer (NPC) is strong and consistent and was discovered in 1966 although the causal relationship is not yet proven. The virus is transmitted via the saliva and in developing countries most children are infected before the age of 3 years. Studies in HK have found that all Chinese children have evidence of infection before the age of 15 years.
Viruses do not cause cancer. However, in specific circumstances in association with other factors, they may become oncogenic and act as initiator of a cancerous change. In NPC, the highly salted fish fed to young children over a long period is thought to be a

contributory factor.

5. Lifestyle

Diet – a high fat and low fibre diet is thought to increase the risk of cancers of the breast, colon, ovary, uterus, prostate.

Excessive exposure to UV light – Skin cancer in Australian whites. As a group they are particularly affected due to their fair skin, habit for “sun bathing” and the often sunny Australian weather.

Alcohol – increased risk of cancers of liver, mouth, throat, larynx and oesophagus (especially if associated with smoking).

Smoking – Cancer of the lung plus above.

Combined Hormone Replacement Therapy – Cancer of the breast (see below).

Example:

- *Combined Hormone Replacement Therapy (for post-menopausal women): A major clinical trial in the USA involving more than 16,000 women which was due to continue until 2005 had to be discontinued three years early. Early results were so convincing that it was thought unethical to continue the study. This study found that women who took a certain combined form of Hormone Replacement Therapy (containing oestrogen and progesterone) were 26% more likely to develop breast Cancer.*

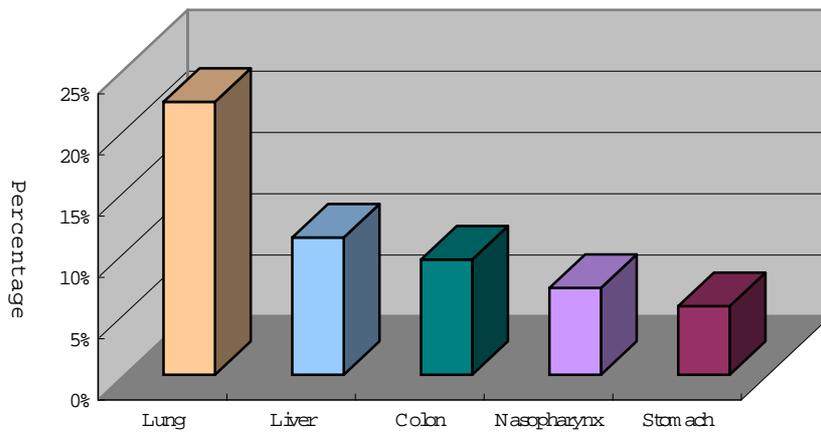
How to Prevent Cancer--- Screening and Preventive Measures based on known associated factors.

Illustrated by examples of the leading cancers in HK and two cancers specific to females.

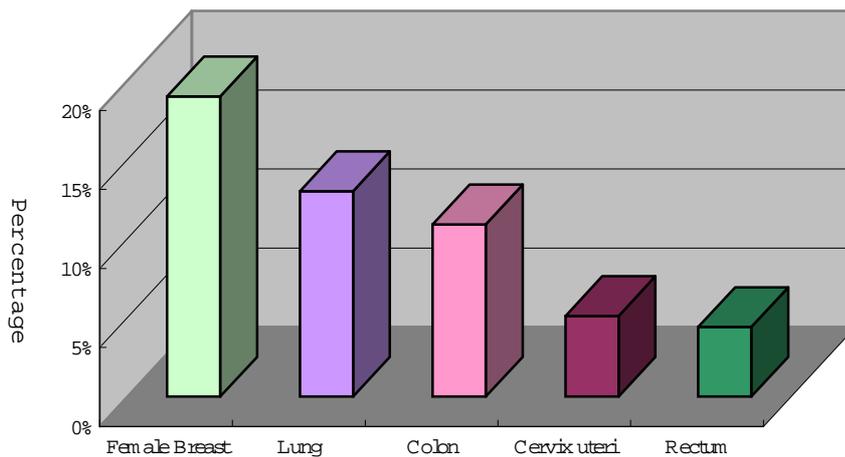
- The Hong Kong Cancer Registry provides us with information on the number of new cases notified to the Registry giving us the incidence of different types of Cancer in Hong Kong.

In Men	Cancer of the Lung	22.3%
	Cancer of the Liver	11.2%
	Cancer of the Colon	9.4%
	Cancer of the Nasopharynx	7.1%
	Cancer of the Stomach	5.6%
In Women	Cancer of the Breast	19.0%
	Cancer of the Lung	13.0%
	Cancer of the Colon	10.9%
	Cancer of the Cervix uteri	5.1%
	Cancer of the Rectum	4.4%

New Cases of Leading Cancer Sites (Male), 1998-199



New Cases of Leading Cancer Sites (Female), 1998-199



- Cancer can sometimes be found before the patient experiences any symptoms. Doctors may detect unusual signs on routine check ups. Special tests or procedures can also be carried out to check for cancer in patients who do not have symptoms of the disease. This is called **SCREENING**.
- By discussing the known factors and risks associated with some of the leading cancers in Hong Kong, we can devise screenings for these cancers and hopefully reduce or even help prevent their occurrence.

Leading Cancers in Hong Kong: Some Facts and Screening/Preventive Measures

LUNG Cancer

The leading cancer in Hong Kong and 30% of all cancer deaths. Rare globally before the 1920's.

Signs of lung cancer include:

- Coughing up blood, a persistent cough, tiredness and weight loss, shortness of breath, persistent shoulder or chest pain.

Associated Factors:

- By far the most important is that of **cigarette smoking**. The risk is 20 times more common in regular cigarette smokers smoking since early adult life and up to 40 times more common in very heavy smokers than in non-smokers. Mortality has been reduced in Britain following a reduction in smoking and the change of product to low-tar cigarettes. However, lung cancer is a rising problem globally due to the increasing population of smokers. Chinese males now consume about 30% of the world's cigarettes.
- Occupation--- Exposure to **asbestos** in asbestos mines, textile works, insulation works may lead to lung cancer.
Exposure to **Polycyclic hydrocarbons** from the combustion of fossil fuels e.g. in steel works and aluminum foundries may also lead to lung cancer.
Exposure to **Radon** in the air of mines.
- Chinese non-smoking females also have a high risk of developing lung cancer. This is thought to be due to the exposure to mutagens in the fumes from oils used in cooking with a wok.

Apart from the occupational hazards mentioned, the only change in mortality can be achieved by stopping smoking. Changes in treatment have had little effect on the prognosis of lung cancer. Tobacco control is therefore a high priority in health both locally and internationally.

There has been suggestion that by lowering cooking temperature and improving ventilation, the concentration of mutagens in fumes from oils used in wok cooking can be reduced.

Studies have shown little benefit in screening, even among the high risk group. Random chest x ray and sputum cytology (looking for cancer cells in the sputum) offer little improvement in mortality rate.

LIVER CANCER

The second most common cancer in Hong Kong and 13% of all cancer deaths.

Signs:

- Cancer of the Liver may present with weight loss, pain in the right upper part of the abdomen and problems associated with cirrhosis (hardening) of the liver as a result of chronic hepatitis infection or chronic alcoholism.

Associated Factors:

- Chronic active infection usually established in early life with the **Hepatitis B virus**. Infection occurs through unsafe injections (sharing of needles between drug addicts) and transfusions, sexual contact (unprotected sex), from mother to baby (most important route of infection and occurs during childbirth between a carrier mother and her infant) and from child to child at play.

The carrier rate in South East Asia is around 10% for the adult population.

Hepatitis C virus also implicated.

Hence, infection may lead to cirrhosis, which may lead to cancer.

However, a certain trigger is also thought to be an important factor. Exposure to a potent carcinogen, aflatoxin, which may be present in mouldy peanuts, may be contributory.

- **Alcohol**---chronic alcoholism may lead to hardening of the liver (liver cirrhosis) which can result in cancer of the liver.

Preventive Measures:

- **Neonatal vaccination against Hepatitis B**----- Vaccination programmes for newborns in many Asian countries including Hong Kong, Taiwan and Singapore started in the mid-1980's (Hong Kong started in 1986). However, it would be another 3 to 4 decades before its preventive efficacy on the incidence of liver cancer could be seen.
- **Abstain from alcohol.**

Screening:

- In chronic hepatitis carriers, screen at least yearly for liver cancer by ultrasound scan of the liver to detect any abnormality. Also a rise in alpha-fetoprotein level may indicate early stage of liver cancer in at risk patients.

COLORECTAL CANCERS

These account for 12% of cancer deaths in Hong Kong.

About a quarter of these are cancer of the rectum.

Signs of these cancers are

- Blood in the stool, a change in bowel habits, abdominal pain or a sense of something pressing on the abdomen.

A healthy lifestyle with increased physical activities, a high fibre and low fat diet play a very important part in the prevention of this type of cancer, as evidenced by the low rate in Japanese living in Japan and the increased rate in Japanese who have migrated to Hawaii, where the rate now approaches that of the Caucasian population

Associated factors:

- Family or personal history of colorectal cancer or polyps.
- Inflammatory bowel disease
- High fat and low fibre diet/ consumption of processed food
- Physical inactivity

Screening Tests:

- **Stool blood test (faecal occult blood) yearly after the age of 50.**
- **A thin, lighted tube called a colonoscope can be used to examine the entire colon and a sigmoidoscope to examine the lower colon and rectum in those at risk.**
- **Another screening test involves using a solution containing barium. This is given as an enema to outline the colon on a series of x-rays (A barium enema test).**
- **The tumour marker Carcinoembryonic antigen (CEA) is a useful tool to check for recurrence although not as useful in detecting early disease.**

BREAST CANCER

The commonest cancer in the female population, now estimated to affect one in 24 adult females in Hong Kong. It is also the most common fatal cancer in women in the developed world. **3.6% of cancer deaths in Hong Kong.**

Signs:

- Breast lump, thickening or dimpling of skin on breast, a change in the shape or size of the breast.
- Blood-stained discharge from the nipples, sudden thickening or inverted nipples.
- Unusual swelling in the armpit.

Associated factors:

- Early first period and late menopause.
- Late first pregnancy or never having had children.
- High fat diet
- Family history of breast cancer
- Lengthy exposure to oestrogen (e.g. late menopause, contraceptive pills, HRT)

Preventive measures:

- **Monthly breast self-examinations from the age of 20 (recently controversial as thought to cause unnecessary anxiety on the one hand and a false sense of security on the other). This procedure could be viewed on medbroadcast.com**
- **A special kind of x-ray of the breast called a mammogram. Women over the age of 40 should have a yearly mammogram and those with a family history even earlier.**
- **Ultrasound examination of the breasts. This is an adjunct tool which is useful in experienced hands.**

CANCER OF THE CERVIX

The cervix is the opening of the uterus. Cancer of the cervix is closely associated with sexual activity and the risk of having this type of cancer increases with the number of sexual partners a woman has. The majority of cases can be attributed to infection with types 16 and 18 human papillomavirus.

Signs:

- Abnormal vaginal bleeding e.g. after intercourse or in between periods. In women who have stopped their periods (post-menopausal), new bleeding is a sign not to be taken lightly.

Associated factors:

- First intercourse at early age
- Multiple sexual partners
- Use of oral contraceptives
- Smoking

The disease is rare in Muslims and Jewish women, indicating male circumcision may reduce the risk of the cancer of the cervix. However, this reduction in risk is not seen in communities where only some men are circumcised. Cleanliness is therefore thought to be another important factor in preventing cancer of the cervix.

Preventive measures:

- **A Pap (Papanicolaou) smear performed yearly when a woman becomes sexually active. After three consecutive normal smears, they can be performed less frequently. Cells are collected from the cervix and examined under the microscope to detect cancer or changes that may lead to cancer.**

The Psychological Aspects of Cancer

Being told one has cancer can be devastating. Different persons react differently but most go through stages of emotions which are very similar to those experienced during grieving.

- Shock and Disbelief “This is not true. There must be a mistake”
- Fear and Uncertainty “Will I die?”
- Denial “There is nothing wrong with me...”
- Anger “Why ME?”
- Apportion Blame/ Self Guilt “I must have done something wrong...”
- Resentment “It's alright for you, you are not me...”
- Withdrawal/ Self Pity “ Poor me...”
- Acceptance/Fight Back “I have cancer. I will deal with it.”

Only when the person affected has come to terms with his or her cancer can that person start to move on in life again. By understanding the emotions cancer patients go through, we hope to learn how to give them support and encouragement in their times of need and in their fight against cancer.

By Dr H.Y. Chiu, University Health Service

Author's Note:

CANCER causes great distress and significant morbidity and mortality in the population. In addition, it results in an increased economic and social burden on the immediate family and society at large. Only by getting to know more about the condition can we hope to reduce its prevalence and protect ourselves from cancer. This article should have left you in no doubt that the best form of prevention is a health lifestyle which includes a healthy diet, adequate rest and exercise and abstinence from smoking and alcohol.

* Materials for this article are taken from lessons written for a Secondary level “Health Module” for the Education Department in 2002.