






Epidemiology of Cancer - Chronic Non-Communicable Diseases (NCDs)

Chronic Disease Definition:

"An impairment of bodily structure and/or function that necessitates a modification of the patient's normal life, and has persisted over an extended period of time."

US Commission on Chronic Illness Definition:

Chronic diseases include all deviations from normal with one or more of these features:

-  Permanent
-  Leave residual disability
-  Caused by non-reversible pathological changes
-  Require special training for patient rehabilitation
-  Expected to require long-term supervision, observation, or care

Cancer: Basic Concepts

Definition:

Cancer is a group of diseases characterized by:

- Abnormal growth of cells
- Ability to invade adjacent tissues and metastasize to distant organs

Major Categories:

Type	Origin	Examples
Carcinomas	Epithelial cells	Mouth, esophagus, uterus, skin
Sarcomas	Mesodermal/connective tissue	Bone, fibrous tissue
Hematological malignancies	Bone marrow/immune system	Leukemia, Lymphoma, Myeloma

Tumor Classification:

- Primary Tumor: Originates in the organ itself
 - Secondary Tumor (Metastatic): Spreads to lymph nodes or distant organs
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Time Trends & Patterns

- Past vs Present:
 - Few decades ago: Cancer = 6th leading cause of death in industrialized countries
 - Today: 2nd leading cause of death
- Reasons: Longer life expectancy, better diagnosis, increased smoking (esp. males)

Geographical Variation:

- Stomach cancer: High in Japan, low in USA
- Cervical cancer: High in Colombia, low in Japan
- South-East Asia: Oral cavity and uterine cervix cancers predominant

Factors Affecting Patterns:

- Environmental exposure
 - Food habits & lifestyle
 - Genetic factors
 - Detection/reporting differences
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Global Cancer Observatory – Pakistan 🇵🇰

Pakistan Statistics (2023, IARC/WHO):

- New cases: 185,748
- Deaths: 118,631
- 5-year prevalence: 390,443

[Source: GLOBOCAN Pakistan Fact Sheet](#)

Causes of Cancer

A. Environmental Factors 🌿

1. Tobacco: Leading cause of lung, larynx, mouth, pharynx, esophagus, bladder, pancreas cancers


- Responsible for >1 million premature deaths yearly
- 2. Alcohol: Linked to esophagus & liver cancers (~3% of all cancer deaths)
- 3. Occupational exposures: Benzene, arsenic, cadmium, chromium, polycyclic hydrocarbons (1-5% of cancers)

B. Infectious Agents

Agent	Cancer Association
Hepatitis B & C	Hepatocellular carcinoma
HIV	Kaposi's sarcoma
Epstein-Barr Virus (EBV)	Burkitt's lymphoma, nasopharyngeal carcinoma
Human Papilloma Virus (HPV)	Cervical cancer
Schistosomiasis	Bladder carcinoma

C. Genetic Factors

- Retinoblastoma: Children of same parent
- Certain populations (e.g., Mongols) more prone to leukemia
- Generally difficult to identify

 Note: At least 1/3 of all cancers are preventable through primary and secondary prevention.

Cancer in Pakistan: Key Risk Factors

High prevalence cancers:

- Oral cavity, cervical, and stomach cancers

Contributing factors:

- Tobacco: ~90% of oral cancers in South-East Asia linked to chewing/smoking
- Alcohol: Synergistic with tobacco
- Precancerous lesions: Leukoplakia, erythroplakia detectable up to 15 years before invasive cancer

Oral Cancer: Epidemiology & Prevention

Risk Factors:

- Tobacco chewing and smoking
- Bidi smoking with betel quid
- Use of "nass" or "nasswar" (tobacco mix)

Prevention:

- Primary: Public education, lifestyle changes, legislation on tobacco
- Secondary: Early detection of precancerous lesions
- Cessation: Leukoplakia can regress with stopping tobacco use

Screening in Primary Care:

- PHC workers detect early-stage oral cancers during home visits

Cervical Cancer: Epidemiology & Prevention

Global Facts:

- 2nd most common cancer among women
- Mortality rate: 52%
- Developing countries: 88% of cases
- Decline in cases due to extensive screening

Natural History Flowchart:

Normal Epithelium → Dysplasia → Cancer in situ →
Invasive Cancer

Causative Agent:

- Human Papilloma Virus (HPV) – sexually transmitted (>95% cases)

Risk Factors:

- Age 25–45 years
- Genital warts
- Multiple sexual partners
- Early marriage & repeated childbirth

- Long-term oral contraceptive use
- Lower socio-economic status (poor genital hygiene)

Prevention:

- Primary: Personal hygiene, birth control
- Secondary: Screening (Pap smear, VIA), radical surgery, radiotherapy

Precancerous "Danger Signs":

- Changes in warts or moles → early screening

5-Year Survival Rate:

- Carcinoma in situ: 100%
- Local invasive disease: 79%
- Regional invasive disease: 45%

Summary Flowchart - Prevention of Cancer

Primary Prevention → Avoid risk factors (tobacco, alcohol, infections, occupational hazards, poor hygiene) →

Lifestyle & education interventions → Vaccination (HPV, Hepatitis B)

Secondary Prevention → Early detection (screening for oral/cervical cancers) → Management of precancerous lesions → Early treatment

Tertiary Prevention → Treat invasive cancer → Surgery, radiotherapy, chemotherapy → Rehabilitation & palliative care

 Exam Tips:

- Always mention risk factors, prevention, and epidemiology for each cancer type
 - Use natural history flowcharts to score full marks
 - Include country-specific stats for comparative epidemiology questions
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 Breast Cancer

Epidemiology:

- Most frequent cancer among women globally (developed & developing regions)
- Leading cause of cancer death in women in developing countries

Risk Factors:

Factor	Explanation
Age	Incidence rises between 35-50 yrs; secondary rise after 65 yrs. Early-onset (<40) increases risk of second cancer 3x
Family history	Genetic predisposition
Marital status	Unmarried women tend to have higher risk
Parity	Early first pregnancy protective
Menarche & Menopause	Early menarche & late menopause increase risk; surgical menopause reduces risk

Hormonal factors	Elevated estrogen & progesterone
Prior benign breast biopsy	Increased risk
Socio-economic status	Higher SES groups at higher risk
Lifestyle	Diet, radiation exposure, oral contraceptives

Primary Prevention:

- Reduce childhood obesity
- Increase strenuous physical activity
- Reduce dietary fat intake

Secondary Prevention:

- Screening & early diagnosis
 - Breast self-examination
 - Mammography
- Treatment and follow-up

Lung Cancer

Epidemiology:

- ~1/3 of lung cancer deaths occur under 65 yrs
- Smoking is the strongest risk factor; risk increases with:
 - Number of cigarettes smoked
 - Age of smoking initiation
 - Passive smoking exposure
- Other risk factors: air pollution, occupational exposure (asbestos, arsenic, polycyclic hydrocarbons, nickel dust), radioactivity

Primary Prevention:

- Public education & awareness
- Legislative measures (restricting tobacco)
- Smoking cessation campaigns
- National & international coordination

Secondary Prevention:

- Early detection via chest X-ray & sputum cytology
 - Note: Screening less effective than prevention in reducing mortality
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Stomach Cancer

Epidemiology:

- 2017: 1.22 million new cases, 865,000 deaths worldwide
- Highest incidence in high-income Asia Pacific & East Asia (China accounts for ~50% of cases)

Primary Prevention:

- Improve food preservation
- Promote diet rich in fresh vegetables & fruits
- Reduce intake of preserved/salted foods
- Prevent *Helicobacter pylori* infection

Secondary Prevention:

- Diagnosis: Barium meal X-ray, biopsy
 - Treatment: Surgical removal ± chemotherapy
 - Prognosis: Poor overall; 5-year survival 60% if localized, but only 18% diagnosed early due to vague symptoms
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Cancer Prevention Strategies 🌟

Overall Principle:

- At least 1/3 of cancers are preventable through primary & secondary prevention

Primary Prevention:

- Tobacco & alcohol control → Reduces millions of cancers annually
- Personal hygiene → Cervical cancer
- Occupational exposure → Protective measures in industry
- Immunization → HPV, Hepatitis B

- Food & lifestyle → Diet, reduced carcinogen exposure
- Legislation → Tobacco, alcohol, air pollution control
- Treatment of precancerous lesions → Lumps, polyps, chronic sores, abnormal bleeding, unexplained weight loss

Secondary Prevention:

- Cancer registration → Determine magnitude & plan services
- Population-based registries → Complete epidemiological data
- Early detection / Screening:
 - Mass screening → Rapid examination of multiple sites
 - Site-specific screening → Cervix, breast, lung
 - High-risk screening → Chronic smokers, women >35 yrs for cervical cancer



Pakistan: Cancer Control

WHO Recommendations for National Cancer Control Program:

1. Assess magnitude (incidence, prevalence, mortality)
2. Evaluate strategies for cancer control
3. Choose priorities for initial control activities
4. Set measurable objectives

Components of Control:

Primary Prevention

- Tobacco control 
- Health education on lifestyle: diet, sun exposure, sexual habits
- Hepatitis B vaccination 

Early Diagnosis & Screening


- Detect premalignant or early cancer stages

Therapy

- Surgery
- Radiotherapy

- Chemotherapy (essential drugs)

Palliative Care

- Pain relief
- Symptom management
- Improved quality of life
- Home & terminal care 

Recall Flowchart - Cancer Prevention Approach

Primary Prevention → Reduce risk factors (tobacco, alcohol, infection, poor hygiene, diet) → Lifestyle education & immunization → Legislation & environmental control

Secondary Prevention → Early detection (screening for precancerous / early stages) → High-risk / mass screening → Early treatment → Follow-up

Tertiary Prevention → Manage invasive cancers → Surgery, radiotherapy, chemotherapy → Rehabilitation & palliative care

 Exam Tips:

- Always mention risk factors, prevention, and natural history
 - Include screening methods & survival statistics
 - Compare developed vs developing regions
 - Use flowcharts & tables for easy memorization
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