



Cancer

● Objectives :

- 1- Appreciate the Global impact of cancer.
- 2- Identify the most prevalent cancers worldwide, in the region and in KSA.
- 3- Identify the leading causes of cancer deaths.
- 4- Understand the cancer control continuum and explain its implication to public health
- 5- Screening for cancer.
- 6- Understand and reflect the Kingdoms efforts to control the rising burden of Cancers in KSA
- 7- Explain important factors and trends affecting cancer control and directions for future research.

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● Resources :

Slides.

Doctor's notes.

BRAINSTORMING QUESTIONS....

- Large percentage of cancers are preventable ? **True**
- Preventing cancer is easier than treating cancer? **True**
- Screening tests are recommended for most cancers? **False**



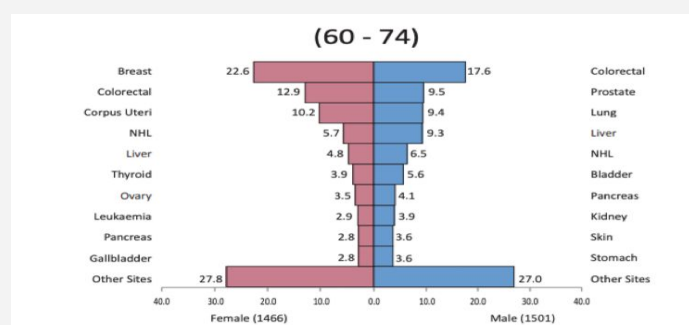
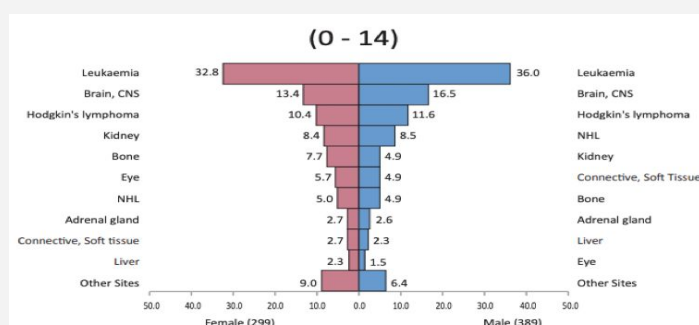
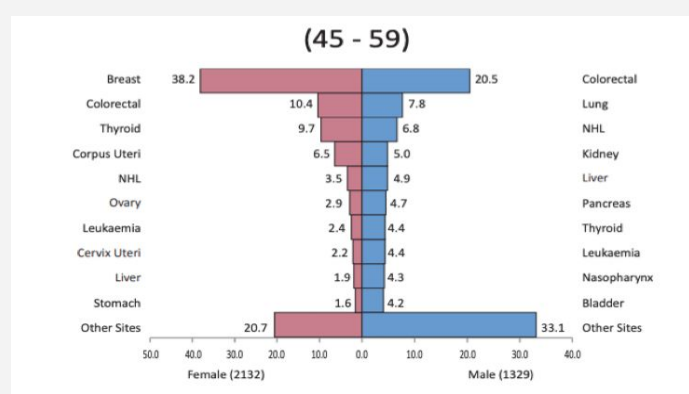
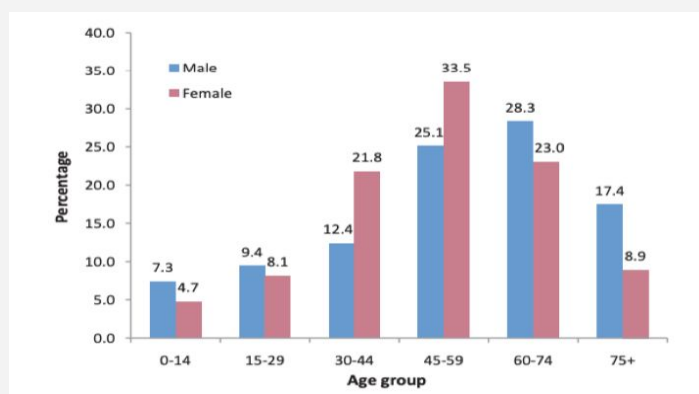
THE GLOBAL IMPACT OF CANCER

- 2nd leading cause of death globally (After cardiovascular diseases).
- In 2018, 18.1 million new cases and 9.6 million deaths (26,300 death/days)
- One in 5 men and one in 6 women develop cancer during their lifetime.
- one in 8 men and one in 11 women die from the cancer.
- In 2010 total annual economic cost of cancer was approximately 1.16 trillion US\$.
- Late-stage presentation and inaccessible diagnosis and treatment are common.
- In 2017, only 26% of low-income countries reported having pathology services generally available in the public sector. **Diagnosis and confirmation of the cancer is also an issue, especially in low income country and middle income country.**
- More than 90% of high-income countries reported treatment services are available compared to less than 30% of low-income countries.

Region	World				Middle East and North Africa				Saudi Arabia			
Cause	Men		Women		Men		Women		Men		Women	
	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality
1st	Lung		Breast		Lung		Breast		Colorectal		Breast	
2nd	Prostate	Liver	Colorectal	lung	Prostate	Liver	Colorectal		Lymphomas, multiple myeloma		Colorectal	
3rd	Colorectal	Stomach	lung	Colorectal	Bladder	Prostate	Thyroid	Lung	Prostate	Lung	Thyroid	Lymphomas , multiple myeloma
4th	Stomach	Colorectal	Cervical		Colorectal		Non-Hodgkins	Stomach	Lung	Liver	Lymphomas , multiple myeloma	Leukemia
5th	Liver	Prostate	Stomach		Liver	Bladder	Ovarian	Liver	Leukemia		Uterine	Liver

The most prevalent cancers worldwide, in the region and in KSA

Cancer incidence report Saudi Arabia 2014



The most affected age group by cancer is 45-59 years old (The life expectancy in SA is between 72-75, so people are dying early) Distribution among males and females: Male: Colorectal CA In female: Breast CA. In older age group it is the same colorectal and breast In younger age groups below 14 it is leukemia, a blood borne cancer which is prevalent in both genders.

Cancer Causes:

Cancer is the result of the interaction between a **person's** factors and 3 categories of **external** agents, including:

PERSONAL FACTORS

- Genetic (Family hx)
- Age (in relation to the age, older ages are associated with colorectal CA and in early age it's hematologic CA) : cellular repair mechanisms become less effective as a person grows older & accumulation of external risk factors.
- Diethylstilbestrol (DES) hormone is associated with vaginal adenocarcinoma

EXTERNAL FACTORS

- **physical** carcinogens, such as ultraviolet and ionizing radiation;
- **chemical** carcinogens, such as asbestos, components of tobacco smoke, aflatoxin (a food contaminant), and arsenic(زرنيخ) (a drinking water contaminant).
- **biological** carcinogens, such as infections from certain viruses, bacteria, or parasites.

Infectious agent and cancers:

Table 4 **Cancer-causing Pathogens**

Bacteria		
Infectious Agent	Cancer	% of global cancer cases attributable to infection*
<i>Helicobacter pylori</i>	Stomach cancers	32.5
Parasites		
Infectious Agent	Cancer	% of global cancer cases attributable to infection*
<i>Clonorchis sinensis</i>	Biliary, gallbladder, and pancreatic cancers	0.1
<i>Opisthorchis viverrini</i>	Biliary, gallbladder, and pancreatic cancers	
<i>Schistosoma haematobium</i>	Bladder cancer	0.3
Viruses		
Infectious Agent	Cancer	% of global cancer cases attributable to infection*
Epstein-Barr virus (EBV)	Hodgkin and certain non-Hodgkin lymphomas, and stomach and nasopharyngeal cancers	5.4
Hepatitis B/C viruses (HBV and HCV)	Hepatocellular carcinoma	29.5
Human herpes virus type-8 (HHV-8; also known as Kaposi sarcoma herpes virus)	Kaposi sarcoma and certain form of lymphoma	2.1
Human immunodeficiency virus (HIV)	Kaposi sarcoma and non-Hodgkin lymphoma	
Human papillomavirus (HPV)	Anal, cervical, head and neck, oral, penile, vaginal, and vulvar cancers	30
Human T-cell lymphotropic virus, type-1 (HTLV-1)	T-cell leukemia and lymphoma	0.1
Merkel cell polyomavirus (MCV)	Merkel cell carcinoma	

* where known data from Ref 76

Understand the cancer control continuum and explain its implication to public health:

▶ The cancer control continuum describes the various stages from cancer etiology, prevention, early detection, diagnosis, treatment, survivorship, and end of life.

▶ The cancer control continuum is a useful framework to view plans, progress, and priorities.

▶ It helps us identify research gaps, where we must collaborate with others to have an impact, and where more resources may be needed.

Cancer Control Continuum

Prevention

- *Tobacco control
- *Diet
- *Physical activity
- *Sun exposure
- *Virus exposure
- *Alcohol use
- *Chemoprevention

Early detection

- ***Cancer screening**
- ***Awareness of cancer signs and symptoms**

Diagnosis

- *Oncology consultations
- *Tumor staging
- *Patient counseling and decision making

Treatment

- *Surgery
- *Radiation therapy
- *Chemotherapy
- *Immunotherapy
- *Adjuvant therapy
- *Symptoms management
- *Psychosocial care

Survivorship

- *Long-term follow up/surveillance
- *Late-effects management
- *Rehabilitation
- *Coping
- *Health promotion

End of life care

- *Palliation
- *Spiritual issues
- *Hospice

Cross Cutting Issues

Communication, decision making, quality of care, health equity, and family/caregiving

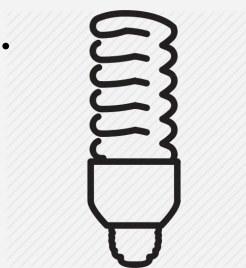
What does cancer control continuum mean? You start from prevention and you go up and treat the person till the end of life. Prevention is done to the risk factors that have been identified for cancer which are: Tobacco consumption leading to lung CA. Diet & physical inactivity leading to colorectal CA. Sun exposure leading to skin CA. Viral exposure leading to hepatitis which then leads to hepatocellular CA. Alcohol consumption leading to liver CA. Chemoprevention leads to leukemia, lymphoma, bone marrow depletion CA (Rare). Sun Exposure can be limited by sunscreen, you also have Hep. A and B vaccination, early treatment & immunoglobulin. Early detection by screening. Most cancers do not have screening, but the ones who have screening are the ones considered a high burden CA

Screening For Cancer:



The Wilson-Jungner Criteria for Screening:

1. The condition being screened for should be an **important health problem**.
2. The **natural history** of the condition should be **well understood**.
3. There should be a detectable **early stage**.
4. **Treatment** at an early stage should be of more benefit than at a later stage.
5. A suitable **test** should be devised for the early stage.
6. The test should be **acceptable**.
7. **Intervals** for repeating the test should be determined.
8. Adequate **health service** provision should be made for the extra clinical workload resulting from screening.
9. The **risks**, both physical and psychological, should be **less than** the benefits.
10. The **costs** should be **balanced** against the benefits



USPSTF Recommendation Grades:

Grade	Recommended / against	Evidence	Benefits
A	Recommended	High	Substantial
B	Recommended	High	Moderate
		Moderate	Moderate to Substantial
C	Recommended selectively based on: 1. Professional judgment. 2. Patient preferences.	Moderate	Small
D	Against	Moderate to high	No benefit or harm > benefit
I	Unknown	Lacking, or poor quality, or conflicting	Benefit? Harm?

USPSTF Recommendation Grades Cont'

What does “C” mean in the population between 40- 49 years? The decision to start screening in women prior to the age of 50 this is category “C”. That means that it is recommended selectively based on professional judgment and the patients preference. Women who are at higher risk and have a family history of females with breast CA, you’ll most definitely start screening at the age of 40-49 this is what we mean by Grade C. The evidence to put them in a screening program or mammogram (40-49) is having a sibling, daughter, mother, or an aunt which has had breast CA.

SCREENING FOR CANCER

Breast Cancer Screening :

Population	Recommendations	Grade
40 to 49 yrs	<ul style="list-style-type: none"> - The decision to start screening mammography in women prior to age 50 years should be an individual one. - Women with a parent, sibling, or child with breast cancer are at higher risk for breast cancer and thus may benefit more than average-risk women from beginning screening in their 40s. 	C
50 to 74 yrs	The USPSTF recommends biennial screening mammography for women aged 50 to 74 years.	B
75 yrs or older	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening mammography in women aged 75 years or older.	I

EXTRA

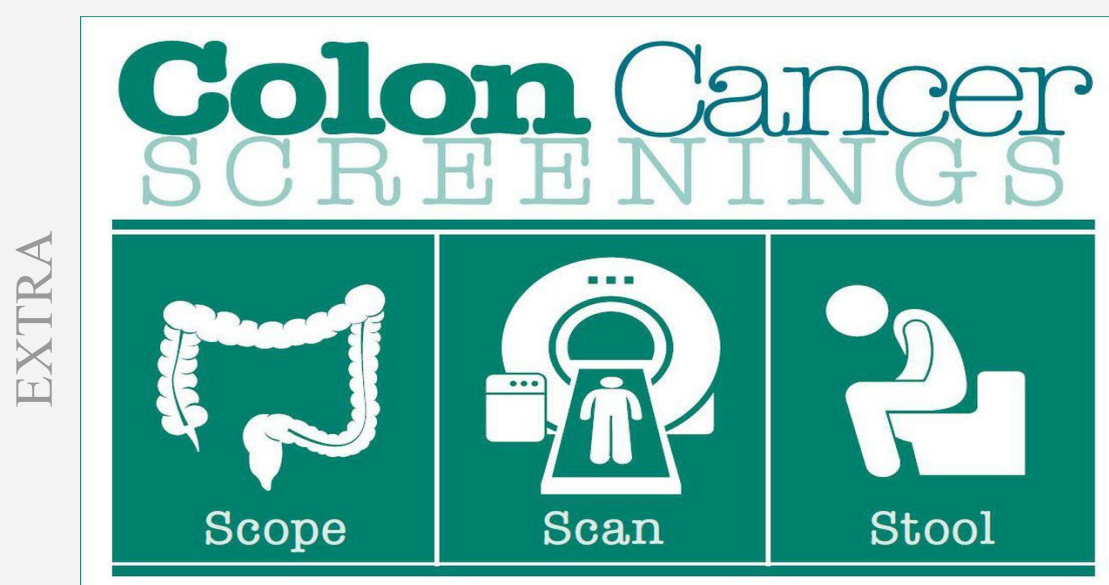


SCREENING FOR CANCER

Colorectal Cancer Screening:

Population	Recommendations	Grade
Adults aged 50 to 75 yrs (for both Males and Females)	<ul style="list-style-type: none"> - The USPSTF recommends screening for colorectal cancer starting at age 50 years and continuing until age 75 years. - The risks and benefits of different screening methods vary. 	A
Adults aged 76 to 85 yrs	<p>The decision to screen for colorectal cancer in adults aged 76 to 85 years should be an individual one, taking into account the patient's overall health and prior screening history.</p> <ul style="list-style-type: none"> ● Adults in this age group who have never been screened for colorectal cancer are more likely to benefit. ● Screening would be most appropriate among adults who: <ul style="list-style-type: none"> ○ Are healthy enough to undergo treatment if colorectal cancer is detected. ○ Do not have comorbid conditions that would significantly limit their life expectancy. 	C

Adults 50-75. Are you going to put them for screening? "A" means yes. The risk and benefit of different screening methods vary. Starting at the age of 50 and continue until the age of 75, hence this shows that colorectal CA if diagnosed early is a preventable carcinoma. Otherwise, they would not have put "A" category as screening category. "C" means clinical consideration, and its recommend screening for colorectal CA.



Cont'

Colorectal Cancers Modalities & Frequency:

Test	Frequency (years)
Guaiac-based Fecal Occult Blood Test (gFOBT)	1
Fecal immunochemical test (FIT) ¹	1
FIT-DNA	1-3
Colonoscopy for a person who is suspected of colorectal CA should be done every 10 years	10
CT-colonography	5
Flexible sigmoidoscopy	5
Flexible sigmoidoscopy +FIT	10

1-It looks for globin, more sensitive than gFOBT

Cervical Cancers Screening:

Age Group	Pap smear (cytology)	HPV testing	Grade
< 21 years	Against screening	-	D
21-30 years	-	Against	D
	Recommended every 3 years	-	A
30-65 years	Recommended every 3 years	Recommended every 5 years	A
	Or recommend pap + HPV every 5 years		
>65 years	against screening if they have had adequate prior screening and are not otherwise at high risk for cervical cancer.		A
Had Hysterectomy + removal of cervix + no prior high-grade precancerous lesion (CIN grade 2 or 3) or cervical cancer.: Against			D

Cont'

- **Definition of Adequate Cervical Cancers Screening:**

- 3 consecutive negative cytology (Pap smear) results.

- 2 consecutive negative HPV results within 10 years before cessation of screening, with the most recent test occurring within 5 years.

- Screening may be clinically indicated in > 65 years for whom the adequacy of prior screening cannot be accurately assessed or documented.

- Primary prevention of cervical cancer → pap smear every 3 years

- Cervical cancer screening modality: Pap smear (most sensitive screening is pap smear) when greater than 65 years of age. Class “A” recommendation is anybody after the reproductive age). Here, for every year after marriage you have to have a pap smear, if 3 consecutive pap smears are negative. You don't have to repeat it.

- **Cervical cancers Incidence In KSA (estimates in 2012):**

Indicators	KSA	Western Asia	World
Annual number of new cancer cases	241	4,455	527,624
Crude incidence rate	1.9	3.8	15.1
Age-standardized	2.7	4.4	14
Cumulative risk (%) at 75 yrs old	0.3	0.5	1.4



SCREENING FOR CANCER

SCREENING FOR LUNG CANCER:

- Age 55–77 years We don't have a screening program, but we know that smokers are more prone to it and it is preventable
 - Smoking history >30 Pack Years
 - Active smoker or quit smoking less than 15 years ago
 - Did not have chest CT scan the last year
- Screening modality:** Low dose chest CT scan.
- Screening patients for smoking:**
1. Ask all your patients systematically if they smoke or not. Make it part of their vital signs.
 2. If a smoker is identified, implement smoking cessation guidelines.



SCREENING FOR PROSTATE CANCER:

Population	Recommendation	Grade
Men aged 55 to 69 years	<ul style="list-style-type: none">● Decision to undergo periodic prostate-specific antigen (PSA) screening should be an individual one.● Screening offers a small potential benefit of reducing the chance of death in some men.● Many men will experience potential harms of screening, including <u>false-positive results</u> that require additional testing and possible <u>prostate biopsy</u>; overdiagnosis and overtreatment; and <u>treatment complications</u>, such as incontinence and erectile dysfunction.● Patients and clinicians should consider the balance of benefits and harms on the basis of family history, comorbid medical conditions.● Clinicians should not screen men who do not express a preference	C
Men 70 years and older	The USPSTF recommends against PSA-based screening for prostate cancer in men 70 years and older.	D

SCREENING FOR CANCER

Screening for Hematologic Malignancies (Lymphoma, Leukemia..etc):

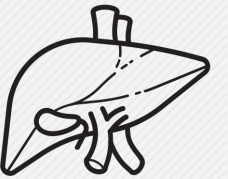
- There are no routine screening tests for hematologic malignancies.**
- It is typical for a patient to seek medical treatment when symptoms appear.
- Incidental finding when a blood test is ordered for another reason.

SCREENING FOR THYROID CANCER:

Population	Recommendation	Grade
Adults	The USPSTF recommends against screening for thyroid cancer in asymptomatic adults.	D

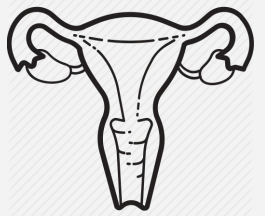
SCREENING FOR LIVER CANCER:

- Patients with cirrhosis of any etiology, but especially cirrhosis caused by hepatitis B or C, are at high risk for the development of HCC and these patients should be the targets for a screening program.
- **The best screening modality is ultrasound of the liver** (Hepatitis B, C, and hepatocellular carcinoma are good candidates for this, but because liver cancer does not have a high burden of mortality it is not a recommendation).



SCREENING FOR UTERINE CANCER:

- No evidence that screening reduces mortality from uterine (endometrial) cancer.
- Most cases of endometrial cancer (85%) are diagnosed at an early stage because of symptoms, and survival rates are high.
- **We don't screen for it**



SCREENING FOR OVARIAN CANCER:

Population	Recommendation	Grade
Asymptomatic women	<ul style="list-style-type: none">● The USPSTF recommends against screening for ovarian cancer in asymptomatic women.● This recommendation applies to asymptomatic women who are not known to have a <u>high-risk hereditary cancer syndrome</u>.	D

Example of a **high-risk hereditary cancer syndrome**, women with BRCA1 or BRCA2 genetic mutations associated with hereditary breast and ovarian cancer.

EXPLAIN IMPORTANT FACTORS AND TRENDS AFFECTING CANCER CONTROL AND DIRECTIONS FOR FUTURE RESEARCH

TOBACCO	<ul style="list-style-type: none"> ● Raise tobacco taxes to keep up with or outpace inflation and income increases to at least prevent tobacco products from becoming affordable. ● Tax all tobacco products to maintain a comparable price to prevent consumers switching from highly taxed products to less taxed ones. ● Require by law and enforce 100% smoke-free environments in all indoor workplaces and public places. ● Put health warnings on all tobacco packaging. ● Establish a national pilot cessation program in health-care facilities ● http://www.tcpmoh.gov.sa/ call 937 ● Build media awareness of both the addictive nature of tobacco use and treatment options.
UNHEALTHY DIET, PHYSICAL INACTIVITY, OVERWEIGHT AND OBESITY	<ul style="list-style-type: none"> ● Develop and implement national dietary guidelines and nutrition policies. For eg restaurants should put calories ● Promote educational and information campaigns about reducing salt, sugar and fat consumption ● Develop and implement national guidelines on physical activity ● Implement community-wide campaigns to promote the benefits of physical activity ● Promote physical activity in workplaces.
ALCOHOL	<ul style="list-style-type: none"> ● Raise public awareness, especially among young people, about alcohol-related health risks, including cancer.
HEPATITIS B VIRUS (HBV)	<ul style="list-style-type: none"> ● Implement universal infant immunization using one of the recommended immunization schedules



EXPLAIN IMPORTANT FACTORS AND TRENDS AFFECTING CANCER CONTROL AND DIRECTIONS FOR FUTURE RESEARCH

ENVIRONMENTAL EXPOSURE TO CARCINOGENS

- Stop using all forms of asbestos.
- Provide safe drinking water
- Reduce the use of biomass and coal for heating and cooking at home, and promote use of clean burning and efficient stoves
- Implement food safety systems (i.e. legislation and monitoring) focusing on key contaminants. For eg. SFDA.

OCCUPATIONAL EXPOSURE TO CARCINOGENS

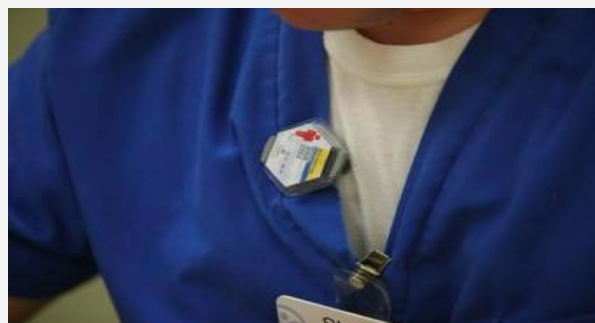
- Develop regulatory standards and enforce control of the use of known carcinogens in the workplace.
- Include occupational cancer in the national list of occupational diseases.
- Identify workers, workplaces and worksites with exposure to carcinogens.

RADIATION

- Provide information about sources and effects of all types of radiation. Include
- occupational cancer in the national list of occupational diseases
- Establish national radiation protection standards (using internationally available guidelines).
- Ensure regular safety training of radiation workers.
- Promote UV risk awareness and UV protection action
- ☐ For example Dose limits for Ionizing radiation are:
 - for the public, 1 mSv/year.
 - for occupationally exposed persons, 20 mSv/year.



Radiation protection clothes



Personal radiation badge



Display of background radiation in a hotel at Naraha, Japan, showing dose rate in microsieverts per hour, five years after the Fukushima disaster.

HOW ARE PEOPLE EXPOSED TO UV RADIATION?

- Sunlight: the main source of UV radiation.
- Sunlamps and sunbeds (tanning beds and booths)
- Phototherapy (UV therapy):

UVA (320 to 400 nm) OR UVB, UVB is divided into:

1-Broadband (280 to 320 nm)

2-**Narrowband (311-313 nm)**

- The carcinogenic potential of narrow band UVB is less established
- **Other** (Black-light lamps, Mercury-vapor lamps, High-pressure xenon and xenon-mercury arc lamps, plasma torches, and welding arcs).



UNDERSTAND AND REFLECT THE KINGDOMS EFFORTS TO CONTROL THE RISING BURDEN OF CANCERS IN KSA

- Cancer Control Program Ministry of Health
- Saudi Cancer society.
- <http://saudicancer.org/index.php>
- National program for early detection of breast cancer.
- <http://www.bc-moh.com/>
- King Fahad National Centre for Children's Cancer
- <https://www.kfshrc.edu.sa/en/home/hospitals/riyadh/kfnccc>
- Sanad Children's Cancer Support Association
- <http://www.sanad.org.sa/>



MCQs

1- Most common type of cancer in men in Saudi Arabia?

- A) colorectal
- B) lung
- C) prostate
- D) liver

2- Why does prostate cancer classified as 5th most common type of cancer in men world wide?

- A) Slow growing
- B) Genetic factors
- C) Age related
- D) Lifestyle

3- When to consider prostate cancer to have a higher risk?

- A) Multinodular
- B) Single nodule

4- Example of biological factors causing cancer ?

- A) Human Papillomavirus
- B) Adenoviruses
- C) Reoviruses
- D) Varicella zoster virus

Answers:

- 1 - A
- 2 - A
- 3 - B
- 4 - A