Screening;

Screening: is a strategy used in a population to identify an unrecognized disease in individuals without signs or symptoms. This can include individuals with pre-symptomatic or unrecognized symptomatic disease. As such, screening tests are somewhat unique in that they are performed on persons apparently in good health.

Importance: - Identifying disease in a community early may lead to an earlier diagnosis

- enabling earlier intervention and management in the hope of reducing mortality and suffering from a disease.

Although screening may lead to an earlier diagnosis, not all screening tests have been shown to benefit the person being screened; overdiagnosis, misdiagnosis, and creating a false sense of security are some potential adverse effects of screening. For these reasons, a test used in a screening program, especially for a disease with low incidence, must have good sensitivity in addition to acceptable specificity.

Types of screening: - **universal screening** involves screening of all individuals in a certain category (for example, all children of a certain age).
- Case finding involves screening a smaller group of people based on the presence of risk factors (for example, because a family member has been diagnosed with a hereditary disease).
Screening interventions are not designed to be diagnostic and often have significant rates of both false positive and false negative results.

Principles of screening

1. The condition should be an important health problem.
2. There should be a treatment for the condition.
3. Facilities for diagnosis and treatment should be available.
4. There should be a latent stage of the disease.
5. There should be a test or examination for the condition.
6. The test should be acceptable to the population.
7. The natural history of the disease should be adequately understood.
8. There should be an agreed policy on whom to treat.
9. The total cost of finding a case should be economically balanced in relation to medical expenditure.

10. Case-finding should be a continuous process, not just a "once and for all" project.

Types of screening

- Mass screening : Mass screening means, the screening of a whole population or a subgroup. It is offered to all, irrespective of the risk status of the individual.

- High risk or selective screening : High risk screening is conducted among risk populations only.

- Multiphasic screening : It is the application of two or more screening tests to a large population at one time instead of carrying out separate screening tests for single diseases.

- medical screening : When done thoughtfully and based on research, identification of risk factors .

Common screening programmes : Cancer screening
Pap smear or liquid-based cytology to detect potentially precancerous lesions and prevent cervical cancer Mammography to detect breast cancer Colonoscopy and fecal occult blood test to detect colorectal cancer Dermatological check to detect melanoma , SPAI-B, the Liebowitz Social Anxiety Scale and Social Phobia Inventory to screen for social anxiety disorder , Alpha-fetoprotein, blood tests and ultrasound scans for pregnant women to detect fetal abnormalities ,Bitewing radiographs to screen for interproximal dental caries

The test result may incorrectly show positive for those without disease (false positive), or negative for people who have the condition (false negative). Limitations of screening programmes can include:

Many screening tests involve the detection of cancers. It is often hypothesized that slower-growing tumors have better prognoses than tumors with high growth rates. Screening is more likely to detect slower-growing tumors (due to longer pre-clinical time), which may be less deadly. Thus screening may tend to detect cancers that would not have killed the patient or even been detected prior to death from other causes.

Validity ; the extent to which a test measure what is designed to be measure

Accuracy ; the ability to produce the true values

It's the proportion of true (+ve) + true (–ve) among all = **A + D**

(A+B+C+D)

Validity components;

Sensitivity; ability to identify individuals who have specific disease (true +ve)

= A / (A+C)

Specificity; ability to identify individuals who not have specific disease (true -ve)

= D / (B+D)

Other measures;

False (+ve); the proportion of false +ve (B) among non disease (B+D)

= B / (B+D)

False(-ve); the proportion of false -ve (C) among disease (A+C) **= C / (A+C)**

Predictive value (+ve) ; **= A /(A+B)** **المتوقع الموجب**

Predictive value (–ve) **= D (C+D)** **المتوقع السالب**

Test	Diseased	N. Diseased	Total
+ve	A	B	A+B
-ve	C	D	C+D
Total	A+C	B+D	A+B+C+D

Note ; sensitivity has +ve association with prevalence, when sensitivity = 1

predictive +ve = 1 - specificity

Example ; **An investigation about T.B , a sample of 200, had found patients 40 had tuberculin test +ve out of 80, & 60 patients had test –ve out of 120 . Find the following :**

- sensitivity

- specificity

- predictive +ve , Predictive -ve , false +ve & false -ve

Test	Diseased	Non Diseased	Total
+ve	A 40	B 40	A+B 80
-ve	C 60	D 60	C+D 120
Total	A+C 100	B+D 100	A+B+C+D 200

Sensitivity= A / A+C = 40 / 100 = 0.4

Specificity= D /B+D =60 /100 = 0.6

Predictive value (+ve) = A / (A+B) = 40 / 80 = 0.5

Predictive value (–ve) = D / (C+D) = 60 / 120 = 0.5

Accuracy = $\frac{A + D}{(A+B+C+D)} = \frac{40+60}{200} = 0.5$

false +ve = B/B+D =40/40+60=0.4

false –ve =C/A+C=60/40+60=0.6

Example :- A study of 500 persons had found 75 out of 100 with HIV& developed Leukemia after 5 years, & 50 out of 400 with HIV- developed Leukemia . find the following :

- Find sensitivity

- specificity

- **predictive +ve , Predictive -ve**

Test	Disease Present	Disease Absent	Total
HIV + ve	A (75)	B (25)	100
HIV – ve	C (50)	D (350)	400
Total	125	375	500