

Lecture 1

# Famco

Introduction



## GENERAL POINTS ABOUT THE COURSE:

- DON'T PUT EXTRA EFFORT ON MATHEMATICS, JUST CONCENTRATE ON THE CONCEPTS.
- **Biostatistics** deals with the concept behind the numbers.  
e.g. The doctor gave an example of the 99 names of ALLAH, it's not enough to know them by name, we need to know their meanings and what is the concept hidden behind them.
- we are in this course not dealing with numbers as such, we're actually dealing with how to interoperate the numbers we're getting from the software.
- The book written by the doctor I think we can use it as a reference fe al7alat almusta39ya !!! he said that he placed what ever the student needs !!!

## What is Biostatistics ?!

- It is a subject of methods ( not sciences ), but these methods are coming up from :
  - ◆ Empirical sciences → any science that deals with trials that we can use in **Biostatistics** ( tjreebi )
  - ◆ Mathematical science.
- General definition : the science that deals with collecting, organizing, presenting and interpretation of the data.
  - ◆ This is the core of the subject, how to collect, organize,..... And finally how to get the conclusion that can serve me as a doctor.

## Scope and importance.

- Problem of variability (BIOLOGICAL BARIABILITY).
  - ◆ E.g. the variability of proteins we get out of only 4 nucleic bases and 23 amino acids.
  - ◆ E.g. the variability of hypo\hypertension of a single person per day! (Continuous fluctuation)
  - ◆ This fluctuation or this variability is the **SCOPE** of **biostatistics**.
  - ◆ Whenever we have variability → we have a **scope**.
  - ◆ E.g. why does a person out of a family living in the same condition, contract a disease while the others don't!! (We can understand these phenomena through the concept of the **Scope** of **biostatistics**).
  - ◆ Other examples: food poisoning (doesn't happen to all ppl eating the same food), lung cancer among smokers (some heavy smokers don't contract cancer).
- The 1<sup>st</sup> scope of biostatistics is variability.
  - ◆ It can be either for a single person, or for a sample of population.
- The 2<sup>nd</sup> scope is: All knowledge and decisions in medicine are subject to uncertainty.
  - ◆ Not all the patients that are tested positive for a certain disease are actually +ve. Visa versa.

- The 3<sup>rd</sup> Scope is: The complexity of biological systems implies, that not all factors important for a development (of a disease) can be considered.
  - ◆ e.g. some ppl out of the community contract diabetes while others do not, though they live in the same conditions and have the same habits! ( some biological systems will answer to the factors influencing the disease, and some will not ) → this is the problem of complexity.
- The 4<sup>th</sup> Scope is : Randomness.
  - ◆ Randomness means : having an equal chance of having the disease.

## IMPORTANCE

- The most important thing in **Biostatistics** is that it can interpret the uncertainty if happened !
  - ◆ The only way to know and understand why a certain disease for example happens to some ppl and skips others is by biostatistics.
- Statistics has a central role in medical investigations due to actual variation in biological processes.
  - ◆ A healthy individual → in certain circumstances may catch a pathogen → this individual is now considered as susceptible ( may or may not contract the disease depending on the strength of the pathogen and the immune response ).
  - ◆ More pathogens → more antigens → leads to increased immune response → by increasing the antibodies → at this level the individual would have a seropositive test → infected but not yet diseased.
  - ◆ Aggravating factors that strengthen the pathogen leads to even higher antibody response → eventually leading to the appearance of symptoms ( headache ) → complaints start up from the patient at this level.
  - ◆ The doctor does his investigations or integrations to know the type of antigen and antibody found in the patient's system → investigation is one of the important scopes of biostatistics → This step provides the evidence.
  - ◆ Then the doctor would start the course of therapy by giving external antibiotics to strengthen the body's own defense against the pathogen → the individual is now cured.
  - ◆ The above steps are known as the MODEL OF THE DISEASE.
- **Biostatistics** also help to understand the variability of any disease or health state among different ppl or among the same person from time to time.
  - ◆ blood pressure → person → person
  - ◆ blood pressure of a person → day → day
  - ◆ blood pressure of a person → hour → hour

## Vaccine Evaluation

- e.g. if I get a number of cases who didn't get vaccinated against a specific disease, and they got the disease. At the same time, I got another number of cases, who are diseased though they got vaccinated.
  - ◆ Here we have to ask WHY such a phenomena happens !!
  - ◆ Individuals vary in :
    1. responsiveness to vaccine.
    2. Susceptibility and exposure to disease.
  - ◆ percentage of the disease in vaccinated ppl < percentage of the disease in non-vaccinated ppl.
  - ◆ Is vaccine is really effective?
  - ◆ Could the result be just due to chance?
  - ◆ Was there any bias in the way ppl were selected for vaccination? ( I've given the vaccine for a ppl with a healthy immune! )
- We cannot tell a vaccine ( or treatment ) is good or not unless we answer these 4 Q.
- To answer these Q.s we depend on **biostatistics** → this also emphasize us the importance of **Biostatistics**.

## Terms used in biostatistics

- **Variable : means phenomena.**
  - ◆ e.g. when I ask about the gender, my variables are male or female and they are completely different through their biological setup, and to know the patient's gender is of a great medical importance.
  - ◆ Bilharzia in young ( before the productive age ) male or female → is of the same percentage in both.
  - ◆ After puberty, females get to be completely protected against bilharzia → percentage is more in males.
  - ◆ This rule is applicable on all diseases → A woman in the productive age is more protected against all various diseases than men.
  - ◆ After menopause → male and female respond equally to disease.
  - ◆ That is all happens due to resitting in female's body systems.
  - ◆ E.g. when I ask about the age → it is important to know the period of exposure to pathogens.
- **Population : all ppl together having the same characteristics.**
  - ◆ e.g students in a class.
- **Sample : part of the population.**
- **Constant : something fixed during the operation.**

- **Parameter (  $\mu$  ) : fixed, unknown value.**
  - ◆ e.g. the date of death, fixed, but it is unknown for us!
  - ◆ In Biostatistics, they try to know the parameter of the sample, then explore it into the population.
  - ◆ E.g, the known percentage of diabetics in Saudi Arabia is 28%, but actually the real value is considered as a parameter ( no body can know the exact value ).
  - ◆ This 28% came from testing a random sample → then they explored the result to the population by saying that out of each 100 Saudi, 28 persons of them are diabetic.
  - ◆ So, this 28% is considered as an estimated value, not real or actual.
- **Proportion ( probability )**
  - ◆ We can get the proportion of a sample, but when we explore it to the population it gets to be named as a probability.
  - ◆ E.g in each second there is an accident ( traffic ) → this is untrue but it resulted from a study that calculated the number of accidents per an hour, then divided this number by the number of seconds in an hour.
- **Random selection : any person out of the population that has an equal chance to be selected.**
- **Random variable : a variable that is evaluated randomly.**
  - ◆ e.g. when filling a questionnaire of random ppl, all their variables are considered as random variables.

I've placed the overall info out of the slide here within the tfree'3, not copied exactly !

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