QUALITY CONTROL FOR HAEMOGLOBIN LEVEL, BLOOD COUNTS AND INDICES

THESIS SUBMITTED

FOR PARTIAL FULFILMENT OF

MASTER DEGREE

IN

CLINICAL PATHOLOGY

BY

FAYEZ FOUAD MOHAMED

SUPERVISED BY

PROFESSOR WAGEEH NAGUIB IBRAHIM

PROFESSOR OF CLINICAL PATHOLOGY

FACULTY OF MEDICINE - AIN SHAMS UNIVERSITY

PROFESSOR FADILAH HASSAN

PROFESSOR OF CLINICAL PATHOLOGY

FACULTY OF MEDICINE - AIN SHAMS UNIVERSITY

DR. NEVINE AHMED KASSEM

LECTURER OF CLINICAL PATHOLOGY

FACULTY OF MEDICINE - AIN SHAMS UNIVERSITY

FACULTY OF MEDICINE

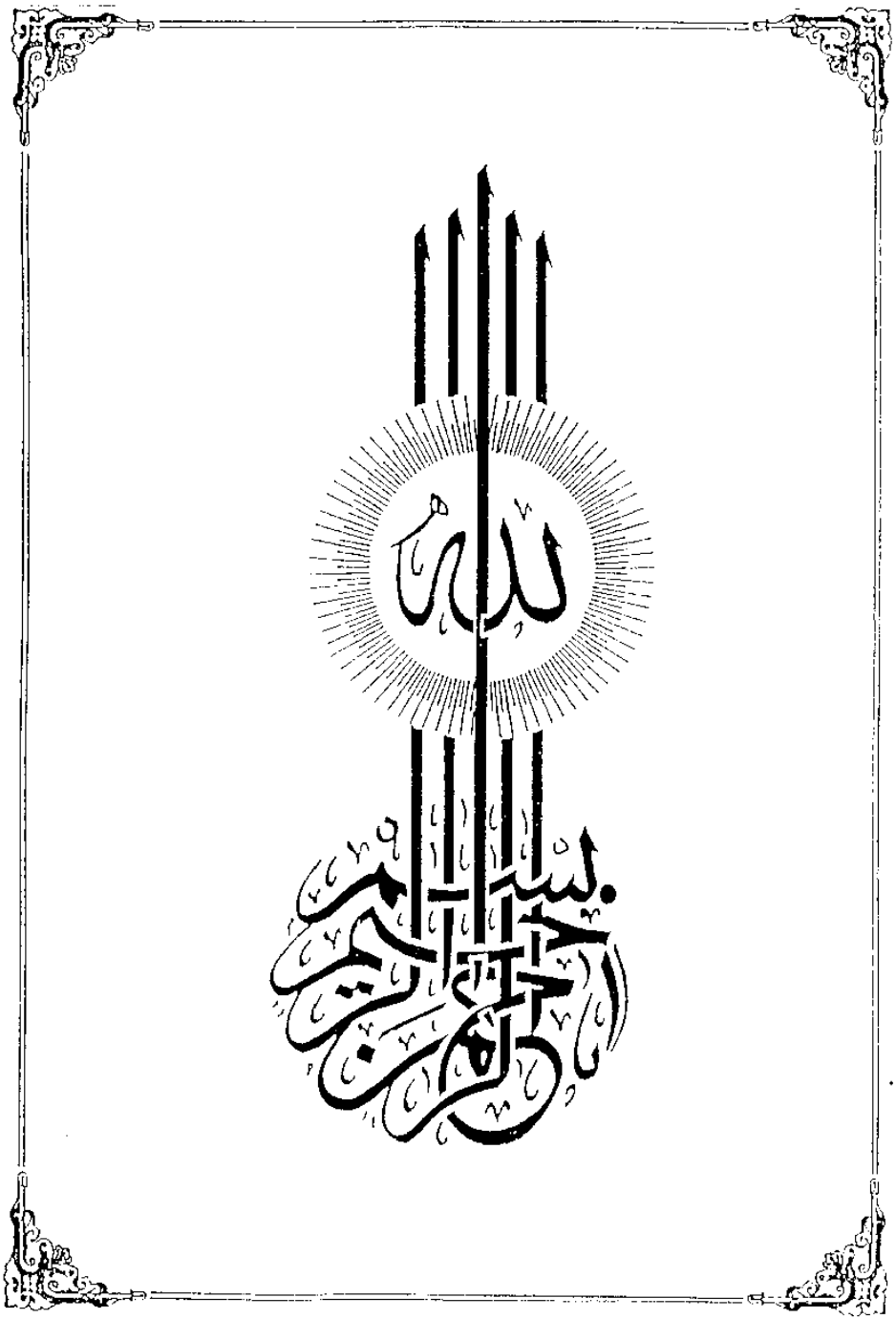
AIN SHAMS UNIVERSITY

1986

TO THE MEMORY OF MY FATHER

AND

TO MY MOTHER



ACKNOWLEDGEMENT

I wish to express my sincere gratitude to Professor Wageeh Naguib for his supervision, valuable guidance and kind encouragement.

I am most grateful to Professor Samir Hanna, who rendered statistics and laboratory mathematics more palatable to candidates.

I owe my thanks to Professor Fadillah Hassan, for her supervision and kind encouragment.

Special gratitude to Dr. Nevine Kassem, who was generous enough to me. Lastly, I thank Mrs. Akila Amin and My sister Faten, for their valuable assistance.

REFERENCES P.108
ARABIC SUMMARY

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INTRODUCTION

Aim of Work:

To provide a comprehensive review of the various forms of quality control programmes so that every laboratory can choose its own according to the size of the laboratory, the number of specimens handled, the computer facilities available and the amount of time which can be devoted to the programme.

CHAPTER I

MEDICAL STATISTICS

MEDICAL STATISTICS

The comparison of test results with standard values and the evaluation of these comparisons usually involve the science of statistics. Statistics include the mathematics involved in the estimation of the significance of deviations of test values from some "correct" values.

Statistical methods must be used in combination with good logic and common sense. Quality control programs often fail to be beneficial when the laboratory personnel try to make statistics do their thinking (Blankenship and Campbell, 1976).

Statistical terminology:

Some effort should be made to learn the basic language of statistics before attempting to analyze data.

Observations and Variables:

Observations are the recognized characteristics of something. These observations can either be qualitative or quantitative. Qualitative observations are descriptions of such variables as colour, texture and odour which are non numerical in value.

Quantitative variables may be continuous or discrete and they are descriptions of observations that utilize numerical values. An example of continuous variables is the size of a particle and an example of discrete variables is the count of particles.

Populations and Samples:

All possible values for a particular characteristic constitute a population. The population may be finite (small or large) or infinite.

A sample is any part of the population and usually its aim is to represent the population. For this reason smaples should be chosen carefully or in other word it should be random.

Parameters and Statistics:

Calculations from data are either parameters or statistics. Parameters are calculations made from the entire population e.g. the population mean (μ). Statistics are calcualtions made from a sample of the population, e.g. $\bar{x}$ (or the sample mean).

Calculated Statistical Values

Most statistical calculations can be placed in

one of two groups:

1. Measurements of central tendency.
2. Measurements of dispersion.

1. Measurements of Central Tendency:

The most common measurements of central tendency are the mean, the median and the mode.

The mean: Usually referred to as the arithmetic average. It is calculated by dividing the sum of individual values by the number of values.

The median : Is the middle value of a body of data i.e. the value which falls half way between the highest and the lowest in position. If a series of samples contains an even number of values the median is the mean of the two middle values.

The mode: Is the variable with highest frequency.

2. Measurements of dispersion

These are values indicating the extent of variation of the observations. Examples of these values are:-

a) The range: It is the difference between the highest and the lowest values in the sample or the population.

b) The standard deviation: This measure characterizes the dispersion about the mean. The classical formula for the standard deviation is:-

$$S = \sqrt{\frac{\sum (X - \bar{X})^2}{n - 1}}$$

Where S = Standard deviation ; $\sum$ = sum of; X = Variables: $\bar{X}$ = mean; and n = number of variables in the same sample. n - 1 is called the degrees of freedom.

c) The variance: is another measure of dispersion and equals the square of the standard deviation. i.e. S^2

Coefficient of variation:

The statistical variance and standard deviation, vary with data considered. For example, we can not compare the S.D. of a sample "A" with sugar level of about 50 mg/100ml with the S.D. of another sample "B" with a sugar level 500 mg/100ml. It is clear that the second sample has a greater S.D. than the first even if a more precise method is applied. The coefficient of variation overcomes this by using a ratio i.e it over-

comes this difficulty by relating the S.D. to the mean of the sample, and it is represented by the formula:-

$$\% \text{ CV.} = \frac{\text{SD.}}{\bar{X}} \times 100$$

Thus, the CV can be used to compare two samples, two methods or two laboratory results irrespective of the sample used.

Frequency distribution curve: This is a graphic representation of the magnitude of variables with how frequent they occur.

Gaussian distribution or normal distribution:

This type of distribution is commonly met with in the study of many parameters if the sample studied is large enough. This type is also met with if we study replicates of the same sample.

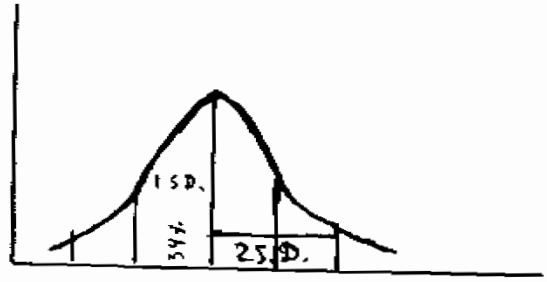

Fig. 1 Normal distribution curve.

The characters of the normal distribution curve are:-

a) Bell shaped

b) Symmetrical

c) Have two points of inflection (the point of inflection is the point at which the curve changes its convexity to concavity).

d) The mean equals the mode equals the median.

e) The area enclosed between the mean $\pm$ 1 S.D. includes 68% of the population.

f) The mean $\pm$ 2 S.D. includes 95% of the population.

The confidence limit: When we say that the confidence limit of this range is 95% we mean that a value of a certain population will have the probability of 95% to fall in this range (Blankenship and Campbell, 1976).

CHAPTER II

BASIC CONCEPTS IN QUALITY CONTROL