AIN SHAMS UNIVERSITY.
FACULTY OF MEDICINE

c

EFFECT OF DIURETICS ON CALCIUM, MAGNESIUM AND SOME TRACE ELEMNTS, LITHIUM & ZINC.

A thesis submitted for partial fulfilment of master degree in Medicine,

Presented by

Samir Ali Shawash
M.B.B.CH.

SUPERVISORS

Prof. Dr:
ABU EL-MAATI NABIH AHMED
Headmaster of Endocrinology,
Faculty of Medicine,
AIN SHAMS UNIVERSITY.

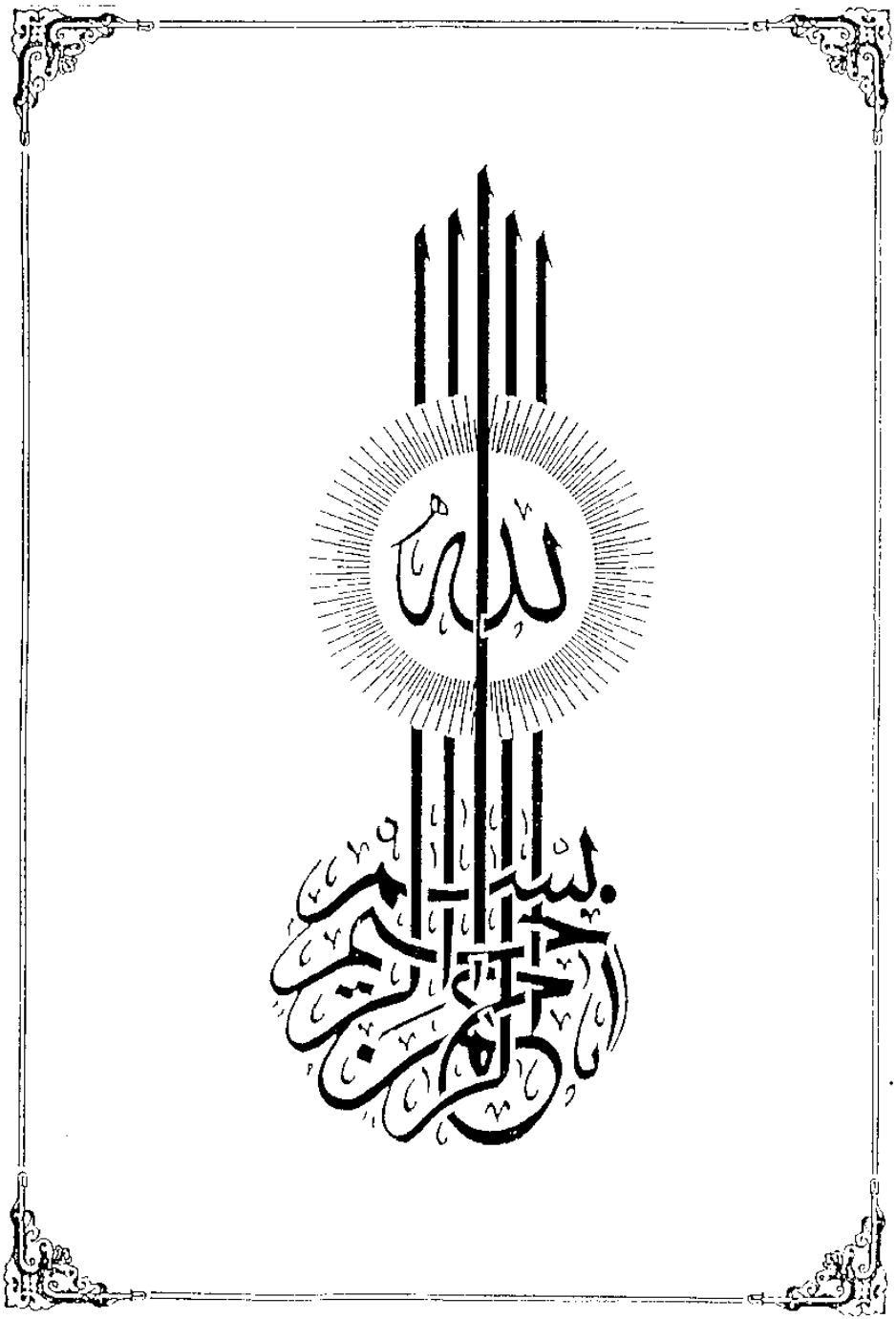
Prof. Dr:
SAYED MOHAMED RAAFAT
Professor of Endocrinology,
Faculty of Medicine,
AIN SHAMS UNIVERSITY.

Dr. MOSTAFA KAMAL EL-DIN
Lecturer of OCC. Medicine,
Faculty of Medicine,
AIN SHAMS UNIVERSITY.

Dr. MOHAMED ALAA EL-DIN AHMED
Asis.Prof of Endocrinology,
Faculty of Medicine,
AIN SHAMS UNIVERSITY.

1988

TO MY PARENTS, WIFE AND SON.



INDEX

ACKNOWLEDGEMENT

I would like to express my all sincere and deepest thanks and gratitude to professor Dr. Abu El-Maati Nabih Ahmed headmaster of endocrinology, faculty of medicine, Ain Shams University, for his continuous and cordial help and guidance which together have enabled me to accomplish this work. Moreover, he has made it possible for me to benifit from his throughout knowledge, honesty, great experience and enthusiasm.

I would like also to express my profound gratitude and deepest thanks to Dr. Sayed Mohamed Raafat professor of endocrinology, faculty of medicine, Ain Shams University, who kindly helped me by his broad experience, precious time and generous support, help, encouragement advice and guidence throughout the course of this work .

He had dedicated much of his effort, activities for the success of this thesis.

I am especially grateful to Dr. Mostafa Kamal El-Din, lecturer of Occ. medicine for his valuable assistance, encouragement and continuous guidence thourgh conduction of this work. His kind infinite help was far

greater than I can acknowledge on these pages.

I also indebted to Dr. Mohamed Alaa El-Din hamed lecturer of endocrinology for his valuable help, support through conduction of this work.

I would also like to express my deepest and heartful thanks to my parents who taught me how to be successful in my life

Samir Aly Shawash

1988

INTRODUCTION
AND
AIM OF THE WORK

INTRODUCTION AND AIM OF WORK

Electrolytes are widely distributed in different body fluid compartments. Besides, they play a major role in the function and structure of different cells.

Undoubtedly electrolyte disturbances affect seriously the reaction and maintenance of the living organism.

This fact made the proper approach to study electrolyte changes that occur in disease state, one of the most important concepts in the field of clinical medicine. But, because of the difficulties in the methods of estimation, the progress in this field was very slow till the last few years.

Many drugs bring about their effect through electralyte changes. Some of these changes may be aimed at as therapy, others occur as side effects.

Diuretics, one of the most important groups of pharmaceuticals used every day for the treatment of different types of oedema and hypertension, provide the best example for the effects of drugs on the body electrolytes.

The aim of this work is to study the serum level of calcium, magnesium, zinc and lithium before and after treatment with furosemide, chlorthalidone, spironalactone and bumetanide, in normal volunteers and with patient, suffering with essential hypertension.

Comparative studies of the results with the effect of diuretic on the level of a hypertension before and after treatment has been also carried out.

The atomic absorption spectrophotometry was selected as the method of estimation of calcium, magnesium and zinc.

Lithium was estimated by the flame emission photometer.

TRACE ELEMENTS

The field of trace element physiology and metabolism has grown rapidly over the past few years.

Mineral elements have two main function in the body, structural which affects the skeleton and soft tissues and regulatory which plays a role in controlling many physiological process such as oxygen transoport, neuromuscular transmission, clotting of blood, and catalysis and regullation of enzyme.

Some minerals are required in relatively large amounts " milligram to gram quantities " and are designated as macromierals. Other minerals are needed in smaller amounts and are referred to as trace elements.

Human body requires 7 principal mineral elements calcium, Mg, Na, K, Phosphorous, sulphur and chlorine At least 8 other minerals are utilized in trace quantities:- Iron, copper, zinc, flourine, Iodine, manganese, cobalt and mylybdenum. Several other elements are present in tissues, but their functions are not clearly defined, these include: aluminum, selenium and chromium.

This has been particularly aided by the recent development of new techniques specially flameless atmic absorption spectrophotmetry.

This technique has allowed the reliable measurement of several trace elements in different tissues.

CALCIUM METABOLISM

Calcium is the most abundant cation in the human body. It not only serves as the principal component of the skeletal tissue, imparting to it the structural integrity essential to support the increasing bodg size of the individual during growth, but also plays a vital role in a variety of essential physiologic and biochemical processes. (Avioli, 1979).

FOOD SOURCES AND REQUIREMENTS:-

Of the common foods, milk and cheese are the richest source of calcium. Most other foods contribute smaller amounts: examples are egg yolk, beans lentils, nuts, figs, cabbage and cauliflower.

Men and women after 18 years of age require about 800 mgms calcium daily, women during the secand and third trimesters of pregnanay and during laction require 1.2 gm daily. Infants under one year require 360-540 mgms daily. Children from 1-18 years require 0.8-1.2 gm daily. (Krupp, 1978).

DISTRIBUTION OF CALCIUM IN THE BODY:-

Calcium is present in the body in larger amoumts

than any other mineral element. It constitutes 2% of the body weight. About 1% of the total body calcium is in solution in body fluids. (krupp 1978).

Calcium in bone:-

Bone serves as a reservoir of calcium. About 99% of the body calcium is in the skeleton. The major inorganic constituent of bone is a crystalline form of calcium phosphate. (Birge et al, 1969).

Calcium in plasma:-

Calcium exists in three forms in the blood and body fluid:

1)Protein bound calcium forming a non-diffusible complex with protein

2)Ionized calcium.

3)Calcium comlexed with organic acids like sulphate or phosphate.

The ionized calcium and complexed with organic or inorganic acids are often referred to as the non-protein bound or ultra-filterable or diffusible calcium. (Moore, 1970).

The physiologic properties of calcium are all functions of the free ionic calcium. Total plasma or

serum calcium concentration is 4.5-5.5 mEq/liter (9-11 mgm/100 ml). Total calcium may fail to reflect the free ionic calcium level particularly in subjects with acidosis, alkalosis and abnormal plasma protein concentration.

About 81% of the protein bound calcium is bound to albumin, the remainder is bound to globulin.

Variations in serum protein will, therefore , alter the protein bound calcium. An increase in serum albumin concentration of 1 gm/100ml will increase protein-bound calcium by 0.8 mgm/100ml, while an increase of 1gm/100ml of globulin will increase protein- bound calcium by 0.16 mgm/100ml .Moore(1970).

Changes in PH will also affect protein-bound calcium, and an increase or decrease of 0.1 PH will increase or decrease protein-bound calcium by 0.12 mgm/100ml respectively (Shrier, 1976).

The measurment of complexed calcium is of little clinical importamce except that it has been found to be increased two fold in patients with uremia.

(Shrier, 1976).

Regulation of Calcium Concentration in the blood:-

The constant concentration of ionic calcium in extra cellular fluid is essential for the performance of a variety of important functions. This requires a close regulation of the continuous large movements of calcium out of extracellular fluid, bone formation, intestinal secretion and glomerular filteration and the continuous large movements of calcium into extra-cellular fluid from bone resorption, intestinal absorption and renal tubular reabsorption.

(Maxwell and Kleeman, 1972).

Plasma calcium is regulated by at least two hormones and possibly more. These two hormones are the parathyroid hormone and calciotonin.

Parathormone has two main actions. First, it causes release of calcium from bone by stimulating the osteoclasts. Second, it reduces urinary calcium possibly by increasing renal tubular reabsorption of calcium. These two effects are synergistic in leading to rise in the plasma calcium (Shrier, 1976).

A role for parathyroid hormone in the intestinal absorption of calcium has been suggested by Wills et