A Study of the Role of Calcium In Hypertension

Essay

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By

Manal Mahmoud Hamed

M.B., B.ch.

Supervisors

Prof. Dr. Mahmoud Sabry Sallam

Professor of clinical pathology

Faculty of Medicine

Ain Shams University

Dr.Hanzada Ibrahim Abdel Fattah

Assisstant professor of clinical pathology

Faculty Of Medicine

Ain Shams University

Dr.Nashwa El Badawi

Lecturer of clinical pathology

Faculty Of Medicine

Ain Shams University

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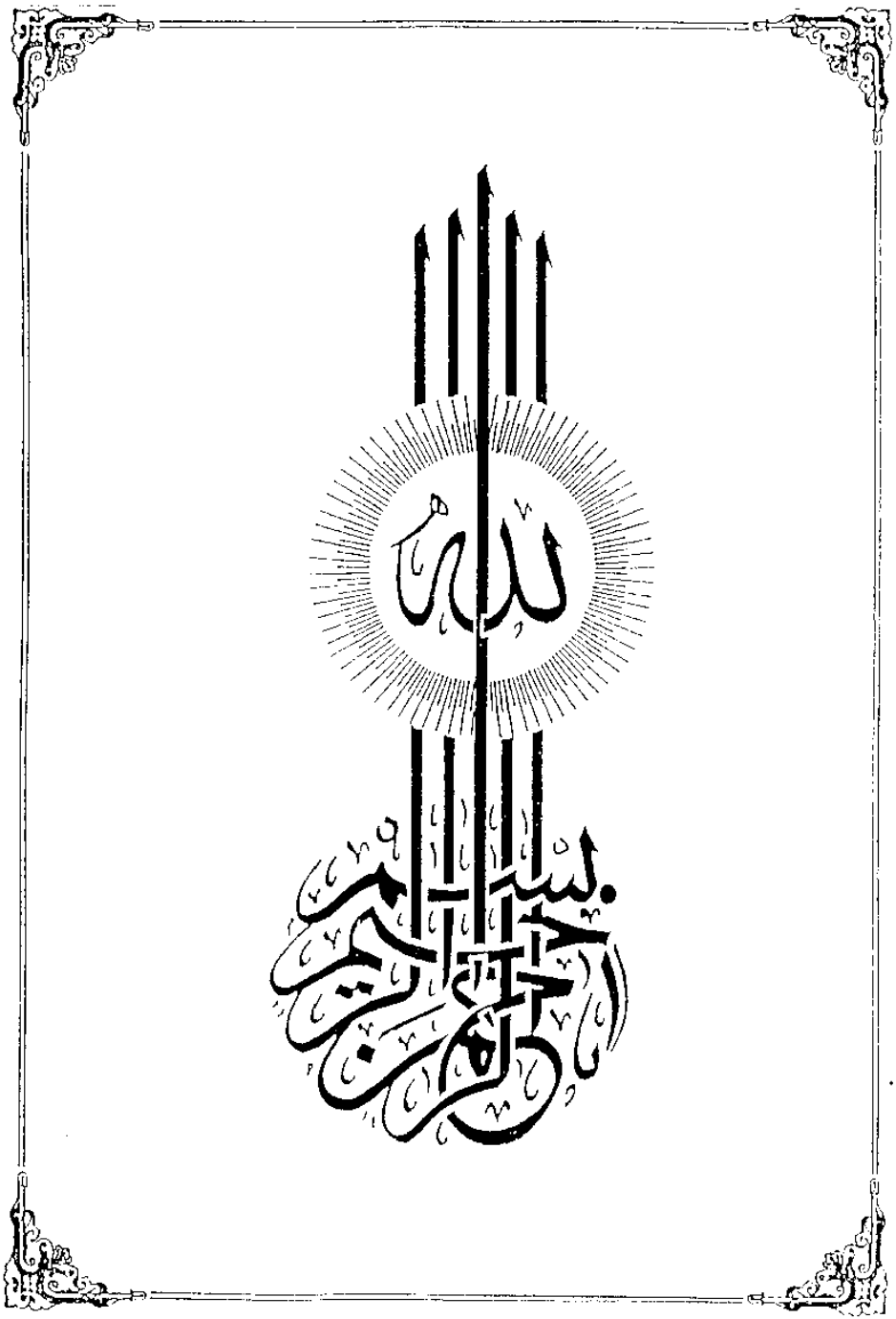
بسم الله الرحمن الرحيم

" قالوا سبحانك لا علم لنا إلا ما علمتنا إنك

أنت العليم الحكيم"

صدق الله العظيم



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Dedication

To my husband, my son, my family for their everlasting selfless love and encouragement.

Contents

List of abbreviations

25-OHD_3	Calcidiol (25-hydroxycholecalciferol).
1.25-$(OH)_2D_3$	Calcitriol (1,25-dihydroxy-cholecalciferol).
PTH	Parathyroid hormone.
Ca2+	Calcium.
Na+	Sodium.
Mg2+	Magnesium.
C cells	Parafollicular cells.
PLP	Parathyroid hormone-like protein.
OAF	Osteoclastic activating factor.
MW	Molecular weight.
CBP	Calcium binding protein.
NAD	Nicotinamide adenine dinucleotide.
CaM	Calmodulin.
ANF	Atrial natriuretic hormone.
CEBcs	Calcium entry blockers.
AAS	Atomic absorption spectrophotometry.
PIPES	1,4-piperazinediethanesulfonic acid.
IDMS	Isotope dilution mass spectrophotometry.
RBcs	red blood cells.

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INRTODUCTION

An important relationship between calcium metabolism and salt sensitivity leading to hypertension is emerging and appears to be providing insights into potential mechanisms that account for the antihypertensive properties of dietary calcium in certain individuals. (Sowers et al., 1989).

Evidence has been accumulated to illustrate that calcium metabolism is deranged in a subset of population having essential hypertension. These alterations may lead to increase in intracellular calcium including smooth muscles which causes increase in peripheral resistance, the increase in calcium also occurs in RBCs, platelets and other tissues. (Erne et al., 1984).

Calcium regulatory hormones, namely parathyroid hormone, 1,25-dihydroxy cholecalciferol (Vit. D) have been observed to be elevated in a group of hypertensive population, both hormones increase the intracellular calcium influx (Linder, et al., 1986).

AIM OF ESSAY

Is to review and summarize the literature and research works suggesting abnormalities in calcium metabolism in relation to human hypertension with emphasis on the different methods of calcium determination.

Review of literature

I- Calcium metabolism

I. CALCIUM METABOLISM

Calcium plays a key role in many cellular processes. It is ubiquitously present in its free form in extracellular fluids and in bound form within the cells. Free Ca^{2+} ions in cells, imported from the outside or liberated from intracellular storage sites, is thought to be the active intracellular form.

The extracellular calcium ions is normally maintained at a concentration of about 1,200,000 nmol/L. The concentration of calcium ions in the cytosol of the resting cell is 100 nmol/L, a 5000 to 10.000 fold difference in calcium ions across the plasma membrane (Borle, 1981).

Calcium ion has a potent effect on many vital biological processes, including cell division, cell movement and muscle contraction. In endocrine system, Ca^{2+} is thought to exert its effects by first binding to a calcium-binding protein. In effect, these proteins are the intracellular receptors for Ca^{2+}. These proteins which are active only when Ca^{++} is bound, then combine with enzymes or other effector proteins and thereby modify their activity typically to activate a biochemical pathway that leads to a physiological response. The most widespread by far of the calcium binding proteins is calmodulin (Williams, 1981).