# URINARY TRACE ELEMENTS AND SERUM SELENIUM IN EGYPTIAN CHILDREN AND ADOLESCENTS WITH CHRONIC RENAL FAILURE

## Thesis

Submitted for partial fulfillment of the
Master Degree in Paediatrics


By

**Eslam Mohammed Amein**

*M.B., B.Ch.*

Supervised By

**Prof. Dr. Farida Ahmed Farid**

*Professor of Paediatrics*

*Ain Shams University*

Assistant Supervisors

**Dr. Mohammed Salah El-Din Faheem**

*Lecturer of Paediatrics*

*Ain Shams University*

**Dr. Mohammed Yehia El-Awady**

*Lecturer of Community Medicine*

*Ain Shams University*




**Faculty of Medicine**

**Ain Shams University**

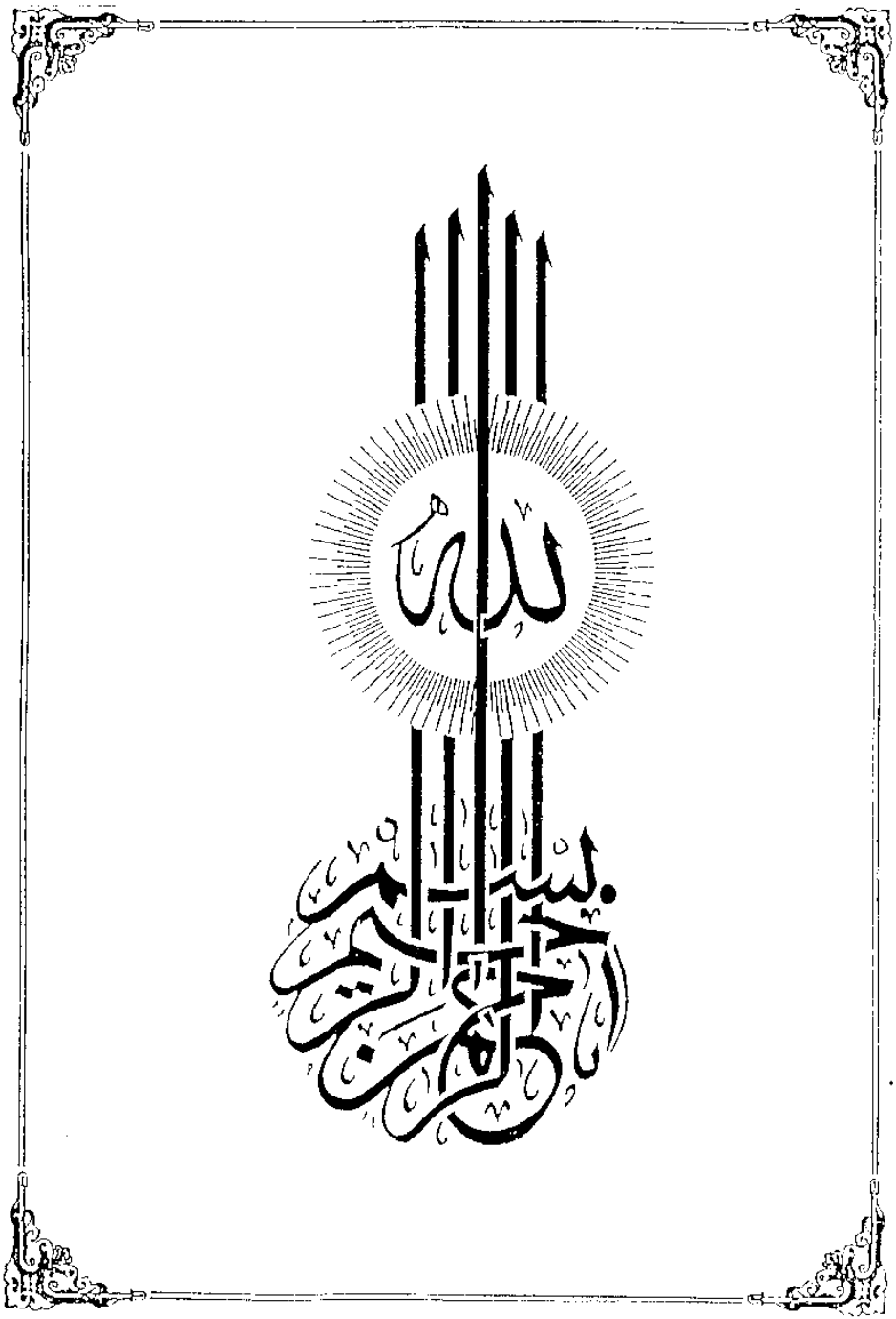
**1994**

«بسم الله الرحمن الرحيم»

﴿... قَالَ رَبِّ اشْرَحْ لِي صَدْرِي وَيَسِّرْ لِي أَمْرِي وَاحْلُلْ عُقْدَةً مِنْ لِسَانِي يَفْقَهُوا قَوْلِي ...﴾

«صَدَقَ اللَّهُ العَظِيمُ»

«سورة طه آيه ٢٥ - ٢٧»



# To...


*I wish to express my thanks and deepest gratitude for their tolerant support and appreciable help throughout this work and always.*

# Acknowledgment

*Thanks to* **Allah**

*I would like to express my utmost gratitude and thanks to the eminent Prof. Dr.* **Farida Ahmed Farid**, *Prof. of Pediatrics, and the Head of Pediatric Dialysis Unit, Faculty of Medicine, Ain Shams University, for her generous help and scrupulous supervision and for having devoted to me much of her precious attention and sincer advice.*

*I do feel deeply indebted to Dr.* **Mohammed Salah El-Din Faheem**, *Lecturer of Pediatrics, Faculty of Medicine, Ain Shams University, for his continuous encouragement, and valuable guidance. I would like to thank him for his constant support and valuable remarks that have been of utmost help.*

*I owe special thanks to Dr.* **Mohammed Yehia El-Awady**, *Lecturer of Community Medicine, Faculty of Medicine, Ain Shams University, for his help and great cooperations regarding the practical part of this work.*

*Last, but not least, my deep thanks and best wishes are conveyed to the young patients of this study as well as their parents. God Bless them all.*

# CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| Alk.P. | Alkaline Phosphatase |
| C.R.F. | Chronic renal failure |
| CLr | Clearance |
| Cr | Creatinine |
| L | Litre |
| mg | Milli-gram |
| mL | milli-liter |
| S | Serum |
| U | Urinary |
| Yr | Year |

# Introduction and Aim of The Work

# INTRODUCTION

Chronic renal failure is one of the serious problems in paediatric age group. This illness is characterized by disturbances in trace elements homeostasis. These disturbances are related to aluminum, zinc, managanese, nickel, Copper and Selenium (Richard et al., 1991). Such changes include anaemia, bone disease and neurological disorder (Hosokawa et al., 1990).

Selenium (Se) is an example of important trace elements, it is a component of glutathione peroxidase enzyme which plays a crucial role in the breakdown of hydrogen peroxide (Hosokawa and Yoshida, 1992). Deficiency of this element can lead to anemia, cardiomyopathy, congestive heart failure and striated muscle degeneration (Diplock, 1987).

## Aim of the Work

The aim of the present study is to estimate serum selenium level and urinary concentrations of selenium zinc, and Copper in Egyptian children and adolescents with chronic renal failure. this thesis also aims at detection of the effect of dialysis on serum selenium to correlate any changes if existent with different clinical manifestations of renal failure with or without dialysis.

# Review of Literature

# TRACE ELEMENTS

The term (trace element) arose to describe specific elements present in so minute concentraions that the early workers were unable to measure their precise concentration by the analytical methods then available and they were therefore frequently described as occurring in traces.

An element is considered to be essential if its deficiency consistently results in impairment of a function from optimal to suboptimal *(Mertz, 1980). Forbes and Erdman (1983),* postulated that a trace element must fulfil the following criteria to be considered essential: the element is present in all healthy tissues of all organisms; its concentration in these is relatively constant; and withdrawal produces similar structural and physiological abnormalities in different species, which are prevented or reversed by addition of the element.

*Keile et al. (1984)* lists the following mechanisms by which metals functioning in the enzyme systems: 1) direct participation in catalysis, 2) combination with substrate to form a metal - substrate complex upon which the enzyme acts, 3) formation of a metalloenzyme that binds substrates in an enzyme - metal - substrate (or enzyme - metal - conzyme

substrate) complex, and 4) combination of metal with a reaction product to alter equillibrum. Some enzymes require more than one metal for maximal activity *(Mclaren, 1986).*

**Classification:**

*Mclaren (1986)* divided trace elements into 3 groups:

1) Trace elements known to be essential for man : zinc, copper, iron, iodine, cobalt, manganese, molybdenum, selenium, fluorine, and chromium. These are required in amounts of no more than a few milligrams/day and sometimes a few micrograms.

2) Trace elements essential for animals but not proved to be necessary for man : tin, nickle, Silicon, vanadium, and most recently, arsenic and possibly cadmium and lead.

3) Trace contaminants with no known function: mercury, barium, stronium, aluminium, lithium, beryllium, rubidium, gold, silver and others. Sometimes there are toxic.

# SELENIUM

## Physiology and Biochemistry

Selenium (Se) is an essential element for a number of enzymes. Selenium dependent enzymes have been identified in bacterial systems including glycine reductase, formate dehydrogenase, Nicotinic acid hydroxylase and thiolase *(Diplock, 1987).*

A seleno-enzyme of particular interest is glutathione peroxidase, which is known to be present in human red blood corpuscles protecting them from deleterious effects of peroxidation. It can analyse the reaction between peroxidase and reduced gluthatione to form oxidised glutathione, water and oxygen *(Stadtwan, 1980)*

glutathione peroxidase activity in the liver, kidney and skeletal muscles is not selenium dependent while the enzyme activity in the myocardium is selenium dependent *(Carmagnol et al., 1983).*

Although glutathione peroxidase defeciency was attributed to genetic causes, dietary selenium may play a