

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

Thesis

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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**

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618-92614

E. M.

32823

أحمد محمد

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ،

﴿... قَالَ رَبِّ اشْرَحْ لِي صَدْرِي وَيَسِّرْ

لِي أَمْرِي وَأَحْلِلْ عُقْدَةً مِنْ لِسَانِي

يَفْقَهُوا قَوْلِي ...﴾

«صَدَقَ اللَّهُ الْعَظِيمُ،

«سُورَةُ طه آيَة ٢٥ - ٢٧»



To...

**My Dear Father,
Mother, My Wife,
and Brother**

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

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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 concentrations 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 - coenzyme

substrate) complex, and 4) combination of metal with a reaction product to alter equilibrium. 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, nickel, Silicon, vanadium, and most recently, arsenic and possibly cadmium and lead.
- 3) Trace contaminants with no known function: mercury, barium, strontium, 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 glutathione to form oxidised glutathione, water and oxygen (*Stadtman, 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 deficiency was attributed to genetic causes, dietary selenium may play a