

Serum Ferritin and iron metabolism in malnourished children

THESIS

SUBMITTED FOR PARTIAL FULFILLMENT

OF MASTER DEGREE

IN

PEDIATRICS

BY

ASHRAF HOSNY MOHAMED GOMAA

M. B., B. CH.

AIN SHAMS UNIVERSITY

SUPERVISED BY

PROF. DR. MOHAMED FOUAD MOHY EL-DIN BADRAWY

PROF. OF PEDIATRICS

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

PROF. DR. TARIF HAMZA SALLAM

PROF. OF CLINICAL PATHOLOGY

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

DR. MOHAMED NASR EL-DIN EL- BARBARY

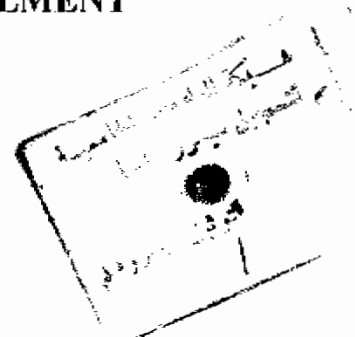
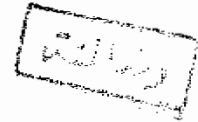
LECTURER OF PEDIATRICS

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

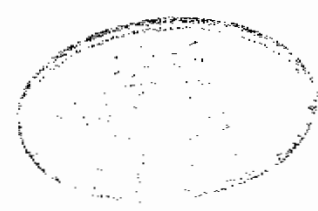
AIN SHAMS UNIVERSITY

1995



61819209
A-14

51749



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ وَقُلْ رَبِّ زِدْنِي عِلْمًا ﴾

صدق الله العظيم



**To my Parents , my Wife
&
my Son**

ACKNOWLEDGMENT

I wish to express my gratefulness and appreciation to Professor Dr. Mohamed Fouad Mohy El-Din Badrawy, Professor of Pediatrics , Faculty of Medicine , Ain Shams University , for the kind help and moral support he gave me during this work .

I would also like to express my deepest gratitude and indebtedness to Professor Dr. Tarif Hamza Sallam , Professor of Clinical Pathology , Faculty of Medicine , Ain Shams University for his great help and his fatherly guidance to produce this work .

My deepest gratitude and indebtedness goes also to Dr. Mohamed Naser El-Din El-Barbary , Lecturer of Pediatrics, Faculty of Medicine , Ain Shams University , for faithful help , sincere guidance and honest assistance that facilitated the completion of this work .

LIST OF CONTENTS

| | Page |
|---------------------------|------|
| 1. INTRODUCTION | 1 |
| 2. AIM OF THE WORK | 2 |
| 3. MALNUTRITION | 3 |
| 4. IRON | 37 |
| 5. FERRITIN | 51 |
| 6. SUBJECTS | 64 |
| 7. METHODS | 66 |
| 8. RESULTS | 71 |
| 9. DISCUSSION | 92 |
| 10. SUMMARY | 102 |
| 11. RECOMMENDATIONS | 105 |
| 12. REFERENCES | 106 |
| 13. ARABIC SUMMARY | |

LIST OF TABLES

| Table | Page |
|---|------|
| 1. Gomez Classification of PEM | 7 |
| 2. Wellcome Classification | 9 |
| 3. Classification of McLaren and Read (1975) | 11 |
| 4. Statistical data of male and female patients as regards age and weight | 72 |
| 5. Statistical data of group (1) and group (2) Vs group (4) for age and weight | 74 |
| 6. Statistical data of group (1) and group (2) Vs group (4) for haematological results | 77 |
| 7. Haematological data of KWO cases | 79 |
| 8. Haematological data of Marasmus cases | 80 |
| 9. Statistical data of group (1) and group (2) Vs group (4) for iron and TIBC | 82 |
| 10. Statistical data of group (1) Vs group (2) for Serum iron and TIBC | 83 |
| 11. Statistical data of group (1) and group (2) Vs group (4) for serum ferritin results | 85 |
| 12. Statistical data of group (3a) Vs group (3b) for weight (Wt.), haematological and biochemical results | 90 |
| 13. Time needed for recovery from malnutrition according to weight gain group (3) | 91 |

LIST OF FIGURES

| Figure | Page |
|--|------|
| 1. Control of iron absorption by mucosal cells of the duodenum and jejunum | 41 |
| 2. Absorption of iron from vegetables and meats | 49 |
| 3. Absorption of a tracer dose of iron by breast fed infants and by infants given a cow's milk formula | 50 |

List of Abbreviations

| | |
|-------------|--|
| Hb | Hemoglobin |
| Hct | Hematocrit |
| KWO | Kwashiorkor |
| MCH | Mean Corpuscular Hemoglobin |
| MCHC | Mean Corpuscular Hemoglobin Concentration |
| MCV | Mean Corpuscular Volume |
| PEM | Protein Energy Malnutrition |
| RBCs | Red Blood Cells |
| TIBC | Total Iron Binding Capacity |
| TLC | Total Leucocytic Count |

Introduction

INTRODUCTION

World wide , malnutrition is one of the leading causes of morbidity and mortality in childhood. Mal - nutrition may be due to improper or inadequate food intake or may result from inadequate absorption of food (*Barness, 1992*).

Anaemia is one of the manifestation of mal - nutrition ; Any type of anaemia may be presented , including iron deficiency, megaloblastic and normocytic normochromic anaemia (*Vaughan et al. , 1987*).

Ferritin is a water soluble form of stored iron. It constitutes 2/3 of the latter inside the body. Apart from reticuloendothelial cells , it is present in kidneys , brain , placenta , gut and serum (*Hershko, 1977*).

A low concentration of serum ferritin is characteristic only of iron deficiency (*Nathan and Oski, 1981*).

Any decrease in serum ferritin level may be interpreted as iron depletion but an increased level does not necessarily mean iron over load. Thus , the serum ferritin may be increased by shifts of iron from the erythrocyte to the stores , as would occur with anaemia not associated with blood loss , and by abnormalities in either hepatic or reticuloendothelial cell function (*Lipschitz et al. , 1974*) .

Aim Of The Work

AIM OF THE WORK

Is to study iron metabolism in malnourished children especially focusing on serum ferritin.

Review Of Literature

MALNUTRITION

Introduction :

Under nutrition is the most common disease in the world to affect the physical development of the child. Preschool children appear to be the major risk group all over the world. Approximately, 300 million preschool children (60 % of the total preschool population of the world) suffer from some degree of moderate to severe protein energy malnutrition (*Kaplan, 1972*).

About 100 million children through the world are suffering from moderate or severe protein energy malnutrition at any one time (*McLaren, 1976*). Nutritional deficiency may be primary in origin resulting from inadequate intake of nutrients or secondary from pathological conditions of the host which include demands greater than normal requirements or the interference with proper absorption or the utilization of ingested nutrients (*Jelliffe, 1978*). Among the important ecological factors that aggravates malnutrition in Egypt is the economic situation and the problem of over population (*Mina, 1973*).