# Study of the Alterations of Platelet Parameters and Functions in Children and Adolescent with Iron Deficiency Anemia and Response to Therapy

*Thesis*

Submitted for the partial fulfillment of M.D. degree
in Pediatrics

*Presented by*

**Heba Gomaa abd El Raheem**
M.B.B.Ch., M.Sc.Pediatrics
Faculty of Medicine - Ain Shams University

*Under Supervision of*

**Prof. Dr./ Galila Mohamed Mokhtar**
Professor of Pediatrics
Faculty of Medicine, Ain Shams University
Head of Pediatric Department and Hematology-oncology Unit

**Prof. Dr./ Wafaa Ezzat Ibrahim**
Professor of Pediatrics
Faculty of Medicine, Ain Shams University

**Prof. Dr./ Nevine Ahmed Kassim**
Professor of Clinical Pathology
Facultyof Medicine, Ain Shams University

**Dr. /Iman Ahmed Ragab**
Lecturer of Pediatrics
Faculty of Medicine, Ain Shams University

**Dr. /Abeer Attia Saad**
Lecturer of Clinical Pathology
Faculty of Medicine, Ain Shams University

**Faculty of Medicine**
**Ain Shams University**
**2013**

بسم الله الرحمن الرحيم

﴿ قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا
إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ
الْحَكِيمُ ﴾

صدق الله العظيم

سورة البقرة الآية (٣٢)

# Acknowledgement

***Thanks are given to ALLAH the source of all knowledge for blessing this work till it has come to an end.***

*I would like to express my deepest thanks to* ***Prof. Dr. Galila Mohamed Mokhtar,*** *Professor of Pediatrics, Faculty of Medicine, Ain Shams University, for her kind support guidance and valuable remarks. I am profoundly grateful for her continuous close supervision and constant help.*

*I would also like to express my deepest thanks and gratitude to* ***Prof. Dr. Wafaa Ezzat Ibrahim,*** *Professor of Pediatrics, Faculty of Medicine, Ain Shams University for his generous help, continuous encouragement and stimulating remarks throughout the study.*

*I would also like to express my great gratitude to* ***Dr. Nevine Ahmed Kassim,*** *Professor of clinical pathology, Faculty of Medicine, Ain Shams University for her valuable comments, knowledge, experience and hand necessary for achieving this work.*

*Many thanks to* ***Dr. Iman Ahmed Ragab,*** *Lecturer of Pediatric, Faculty of Medicine, Ain Shams University and* ***Dr. Abeer Attia Saad,*** *Assistant professor of clinical pathology, Faculty of medicine, Ain Shams University for their generous help, supervision, and extreme kindness through out the work.*

*Many thanks to my patients who helped me in my study.*

*Last but not least, I would like to thank my family who encouraged and supported me all the time, to them I dedicate this work.*

# Contents

# List of Abbreviations

**AA** : Arachidonic acid
**AAP** : American Academy of Pediatrics
**ACS** : Acute coronary syndrome
**ADP** : Adenosine diphosphate
**aPTT** : activated partial thromboplastin time
**At** : Adequate Intake
**BCSH** : British Committee for Standard Hematology
**BT** : Bleeding time
**CADP** : Collagen/Adenosine diphosphate
**CAMP** : Cyclic adenosine monophosphate
**CBC** : Complete blood count
**CEPI** : Collagen/Epinephrine
**CLSI** : Clinical and laboratory Standard Institute
**CNS** : Central nervous system
**CT** : Closure time
**CVS** : Cardiovascular system
**DALY's** : Disability Adjusted Life Years
**DMT** : Divalent metal transporter-1
**ELISA** : Enzyme-linked immuno sorbent assay
**EPI** : Epinephrine
**Epo** : Erythropoietin
**ESA** : Erythropoietin stimulating agent
**$Fe^{3+}$** : Ferric iron
**GIT** : Gastrointestinal tract
**GV** : Growth velocity
**Hb** : Hemoglobin
**HCT** : Hematocrit

# List of Abbreviations *(Cont...)*

**HR** : Heart rate
**IDA** : Iron deficiency anemia
**IEG** : International Expert Group
**IMP** : Integrin-mobilferrin pathway
**IRIDA** : Iron refractory anemia
**ISTH** : International Society on Thrombosis and hemostasis
**Kcal** : Kilo calories
**LDCs** : Lesser-developed countries
**LTA** : Light transmission aggregometry
**MCH** : Mean corpuscular hemoglobin
**MCHC** : Mean corpuscular hemoglobin concentration
**MCV** : Mean corpuscular volume
**mL** : Milliliter
**MPV** : Mean platelet volume
**OCD** : Obsessive compulsive disorder
**PF4** : Platelet factor 4
**PFA** : Platelet function analyzer
**PFAIOO** : Platelet function analyzer 100
**plt** : Platelet
**ppm** : Parts per million
**PPP** : Platelet-poor plasma
**PRP** : Platelet-rich plasma
**PT** : Prothrombin time
**PTG** : Beta-thromboglobin
**RBC** : Red blood cell
**RDA** : Recommended Dietary Allowance
**RDW** : Red cell distribution width
**RETICs** : Reticulocytes

# List of Abbreviations *(Cont...)*

**RR** : Respiratory rate
**SD** : Standard deviation
**SES** : Socioeconomic standards
**SIT** : Stimulators of iron transport
**SSC** : Scientific and Standardization Committee
**Temp** : Temperature
**TfR** : Transferrin receptor
**TIBC** : Total iron binding capacity
**TMB** : Tetramethylbenzidine
**UIBC** : Unsaturated Iron-binding capacity
**vWD** : von Willebrand Disease
**WBA** : Whole blood aggregometer
**WBC** : White blood count
**WHO** : World Health Organization

# List of Tables

| Tab. No. | Title | Page No. |
|---|---|---|

## Review of Literature

# List of Tables *(Cont…)*

# List of Tables *(Cont…)*

# List of Tables *(Cont…)*

# List of Figures

# List of Figures *(Cont...)*

# List of Figures *(Cont...)*

| Figure No. | Title | Page No. |
|---|---|---|

**Results:**

# List of Figures *(Cont...)*