Estimation of Serum Levels of Zinc, Copper and Iron among *Giardia Lamblia* Infected Children

Thesis

Submitted for partial fulfillment for Master Degree

in Medical Science (Parasitology)

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2009

Abstract

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The present work constitutes a study on 30 children, aged between 1-10 years old, who were attended the out patient clinics of Cairo university pediatric hospital, with gastrointestinal complaints and diagnosed as having giardiasis by stool examination, they were enrolled as study group. The control group consisted of 30 age matched healthy children ,free of gastrointestinal complaints and free of Giardiasis. Serological levels of Zinc, Copper & Iron were measured by Atomic absorption spectrophotometer). And it was found that the seurm levels of Zinc & Iron decreased significantly. While this did not occur in Copper serum levels.

Key words

Giardia, Iron, Copper, Zinc, Children.

Acknowledgment

First of all I would like to thank **God** who allowed and helped me to accomplish this work and only by his will everything can be achieved.

I wish to express my deepest appreciation to **prof. Dr. Hoda Helmy Al-Rahimy,** head of the Parasitology department, Cairo University for her constant support and guidance.

I wish to express my endless gratitude to **prof. Dr. Omiama Abu Shady**, professor of Parasitology, Cairo University for her human concern, immeasurable support and continuous encouragement.

I would like to express great thanks to **Dr. Mona El Said El Raziky,** Assistant Professor of pediatrics, Cairo University for her valuable advice, limitless help and eminent supervision.

I would like to convey my heartful thanks to **Dr. Mayssa Mohamed Zaki,** Lecturer of Parasitology, Cairo University for her continuous guidance, support and unlimited effort for the successful completion of this work.

I want to thank **Dr. Amal El Saffty**, professor of industrial medicine, Cairo University for giving me the opportunity to carry out most of the practical work of this study.

I also want to thank all staff members and colleagues of Parasitology department, Cairo University for their appreciated help and support during the present work.

List of abbreviations

- AIDS=Acquired immunodeficiency syndrome.
- ºC=Degree celcius
- CRP = Cysteine-rich surface protein.
- Cu=Copper.
- CWP1= cyst wall proteins.
- DNA = Deoxyribonucleic acid.
- E/M = Electron microscope.
- *E. coli = Entamoeba coli.*
- *E. histolytica = Entamoeba histolytica.*
- ELISA = Enzyme-linked immunosorbent assay.
- EMP= Embden-Meyerhof-Parnas.
- Fe=Iron.
- GalNAc = Galactose N-acetyl D-galactosamine.
- GALT=Gut associated lymphoid tissue.
- *G. agilis=Giardia agilis.*
- *G. duodenalis= Giardia duodenalis.*
- *G.intestinalis= Giardia intestinalis.*
- *G.lamblia= Giardia lamblia.*
- *G.muris= Giardia muris*
- gm=Gram.
- H/A=Height per age.
- Hr=Hours.
- IFA = Indirect fluorescence assay.
- IgA = Immunoglobulin A.
- IgG = Immunoglobulin G.

List of abbreviations

- IgM = Immunoglobulin M.
- kDa = Kilo Dalton.
- mg=Milligram.
- n=Number.
- NaCl=Sodium chloride.
- nm = Nano meter.
- NO=Nitric oxide.
- PCR = Polymerase chain reaction.
- PAMR=perijunctional actomyosin ring.
- PEM=Protein energy malnutrition.
- RNA = Ribonucleic acid.
- ROS=Reactive oxygen species.
- SD=Standard deviation.
- Spp=species.
- SOD=Super oxide dismutase.
- Syn.=Synonymous.
- UV=Ultraviolet.
- VSP=Variant surface proteins.
- W/A=Weight per age.
- WHO=World health organization.
- Zn=Zinc.
- ZO-1=Zonula occludens1.
- μ=Micron
- μm = Micro meter.
- μg/l=Micro gram per liter.
- μg/dl= Micro gram per deciliter.

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To my beloved mother, my sisters

To my husband and my children,

And to the soul of my father,

بسم الله الرحمن الرحيم

Introduction

Giardiasis is a major diarrheal disease found throughout the world. The flagellate protozoan *Giardia lamblia*, its causative agent, is the most common intestinal protozoal parasite isolated worldwide. *Giardia* is one of the first enteric pathogens to infect infants in the developing world, with peak prevalence rates of 15-20% in children younger than 10 years **(Pennardt et al., 2008).**

The flagellate *Giardia lamblia* (syn. *Giardia intestinalis, Giardia duodenalis*) was first discovered by Leeuwenhoek in 1681 in his stool specimens but was not described until 1859 by Lambl **(Garcia, 2007).** The first good accounts and illustrations of *Giardia* were by Vilèm Lambl (1859), but the parasite received little attention until the war of 1914-1918 when troops returning to the UK with diarrhea were found to have in their faeces. In 1921 the distinguished British protozoologist Clifford Dobell suggested that *Giardia* could be a serious pathogen **(Dobell, 1921)** and in 1926 Reginald Miller observed diarrhea and malabsorption in some children infected with *Giardia* **(Miller, 1926)**. Where as others acted as unaffected carriers **(Cox, 2002).**

In the last 300 years since *Giardia* was first discovered it has become recognized as a common and serious pathogen worldwide. It is still not known how many species infect human being and what role, if any, is played by reservoir hosts in the epidemiology of the infection **(Garcia, 2005).**

Over several million cases of malabsorptive diarrhea by giardiasis are estimated to occur annually worldwide and waterborne outbreaks of giardiasis are frequent in areas where unfiltered water is routinely contaminated **(Savioli et al., 2006).**

Although various criteria, including host specificity, various body dimensions, and variations in structure, have been used to differentiate species of *Giardia*, there is still considerable debate over the appropriate classification and nomenclature regarding this group of organisms. On the basis of work by Filice1952 related to structural variations three groups have been proposed: amphibian *Giardia* spp. (represented by *G.agilis*) , the muris group from rodents and birds (represented by *G.muris*), and the intestinalis group from a variety of mammals (including humans), birds, and reptiles (represented by *G.duodenalis*) **(Adam,2001).**

It has been postulated that the taxonomy of *Giardia* at the species level is still unresolved, as there are biological and molecular differences between isolates within a species; although their cysts or trophozoites morphologically identical. This is further supported by the observations of significant diversity among *G. intestinalis* isolates in host-infectivity assays **(Visvesvara et al., 1988)**, metabolism **(Hall et al., 1992),** in vitro and in vivo growth requirement **(Andrews et al., 1992 and Binz et al., 1992).**

Alterations in concentrations of serum Iron, Zinc, Copper, malabsorption syndrome and growth retardation are commonly found in patients with gastrointestinal infections mainly giardiasis **(Karakaş et al., 2001).**

Zinc, Copper and Iron are all vital micronutrient elements for reproduction, growth & development. Low serum levels of these electrolytes may result in serious affection of cellular, physiological & enzymatic function **(Tanyüksel et al., 1995)**.

Aim of work

This study aims at:

(1) Evaluation of serological levels of Zinc, Copper, and Iron in *Giardia lamblia* infected children as a result of malabsorption process.

(2) Correlation of giardiasis with other parameters.

(3) Evaluation of the effect of giardiasis on the weight of infected children.