

Cryptosporidiosis Among Children Presenting With Summer Diarrhea

Thesis

Submitted in partial fulfillment for

M.Sc. in Pediatrics

By

Wafaa Ismail Gazala

M.B. B.Ch.

Supervisors

Prof. Dr.

Magid Ashraf Abdel Fattah Ibrahim

Professor of Pediatrics

Faculty of Medicine, Ain Shams University

Dr.

Mona Moustafa El-Ganzory

Lecturer of Pediatrics

Faculty of Medicine, Ain Shams University

Dr.

Khalifa El-Sayed Khalifa

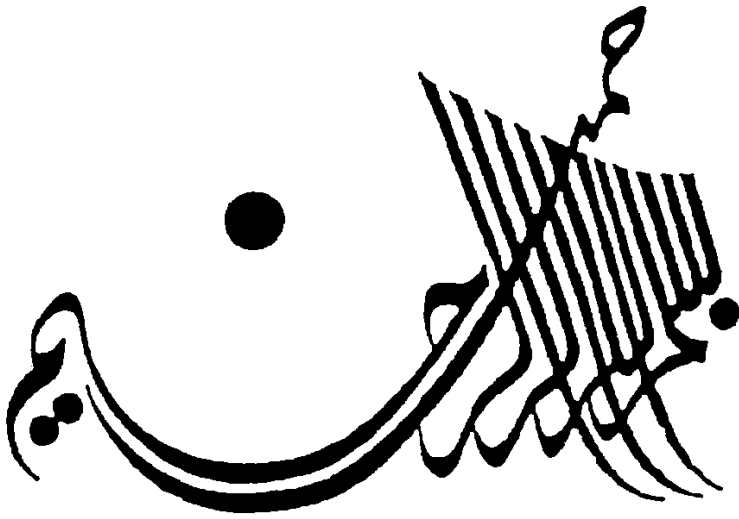
Lecturer of Parasitology

Faculty of Medicine, Ain Shams University

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

1997



قَالُوا

سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا بِمَا عَلَّمْتَنَا

إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صَدَقَ اللَّهُ الْعَلِيمُ

الآيَةُ (٢٢) سُورَةُ الْبَقَرَةِ



Acknowledgement

First, thanks to Allah

I would like to show my sincere gratitude to Prof. Dr. Magid Ashraf Abdel Fattah Ibrahim Prof. of Pediatrics for supervising this work and for his guidance, kind support, generous effort and valuable advice.

Thanks also to Dr. Mona Mostafa El-Ganzory Lecturer of Pediatrics for her close supervision, her patience and her great effort in this study and continuous support throughout this work.

Also, I wish to thank Dr. Khalifa El-Sayed khalifa Lecturer of Parasitology for his continuous help and meticulous supervision. He spared neither time nor knowledge until the end of this work.

I would like also to express my deepest thanks to Prof. Dr. Magda E. Azab, Prof. and head of Parasitology Lab. for allowing me to use the facilities of her Lab., to execute this work.

Last but not least I would like to thank the patients and every body who shared in this thesis.

LIST OF ABBREVIATION

5 MP	: 5 mercaptopurine
ACC	: antimicrobial associated colitis
AIDS	: Acquired immuno deficiency syndrome.
c AMP	: Cyclic adenosine mono phosphate
c GMP	: Cyclic guanosine mono phosphate.
C	: Cryptosporidium.
DLE	: Dialyzable leukocyte extract.
E PEC	: Entero pathogenic Escherichia coli.
E. coli	: Escherichia coli.
EAEC	: Entero adherent Escherichia coli.
EHEC	: Entero hemorrhagic Escherichia coli.
ELISA	: Enzyme linked immunosorbent assay.
ESR	: Erythrocyte sedimentation rate.
ETEC	: Entero-toxogenic Escherichia coli
GI	: Gastrointestinal
Gr	: Group
HIV	: Human immunodeficiency virus
HLA	: Human leukocyte Antigens
Hr	: hour
IBS	: Irritable bowel syndrome
ICU	: Intensive Care Unit

LIST OF CONTENTS

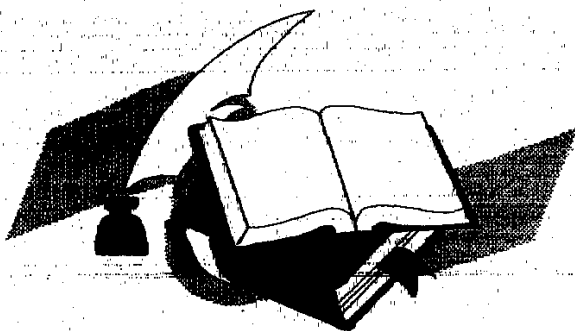
	<i>Page</i>
INTRODUCTION & AIM OF THE WORK	1
REVIEW OF LITERATURE	
Chapter I: Cryptosporidium	3
Chapter II: Diarrhea	19
SUBJECTS & METHODS	43
RESULTS	55
DISCUSSION	82
RECOMMENDATIONS	93
SUMMARY & CONCLUSION	94
REFERENCES	97
ARABIC SUMMARY	

LIST OF TABLES

	<i>Page</i>
Table (1): Taxonomic classification of <i>Cryptosporidium</i> .	3
Table (2): The frequency of human cryptosporidiosis in Egypt.	9
3): Persons susceptible to infection with <i>Cryptosporidium</i>	12
Table (4): Normal infant stool pattern.	20
Table (5): Substances that produce diarrhea through second messengers.	24
Table (6): Immunodeficiency affecting the gastrointe- stinal tract.	32
Table (7): Age, Sex and feeding habits in the studied groups.	55
Table (8): The clinical signs and symptoms among patients of GI, GII.	56
Table (9): Prevalence of cryptosporidiosis among the different studied groups.	57
Table (10): Prevalence of cryptosporidiosis among the clinical presentations of GII.	57
Table (11): Comparison between positive and negative cases of <i>Cryptosporidium</i> as regards their age and sex.	59
Table (12): <i>Cryptosporidium</i> infection in different sex and age groups.	60
Table (13): Comparison between positive and negative cases of <i>Cryptosporidium</i> as regards feeding habit.	60

LIST OF FIGURES

	<i>Page</i>
Fig. (1): Life cycle of <i>Cryptosporidium</i>	5
Fig. (2): A-small intestinal Na ⁺ absorption. B-Intestinal Cl ⁻ secretion.	24
Fig. (3): Ig A calibrator curve obtained by measuring the absorbance of known Ig A standards.	50
Fig. (4): <i>Cryptosporidium</i> positivity in various studied groups.	58
Fig. (5): The type of feeding among <i>Cryptosporidium</i> positives in Group I, II.	62
Fig. (6): The clinical signs and symptoms among <i>Cryptosporidium</i> positives in Group I, II.	64
Fig. (7): The mean duration in days and frequency (motion /day) of diarrhea among <i>Cryptospori-</i> <i>dium</i> positives in Group I, II.	67
Fig. (8): The mean serum Ig A in the studied groups	69
Fig. (9): The mean serum Ig A in <i>Cryptosporidium</i> positive and negative patients.	71
Fig. (10) Numerous <i>Cryptosporidium</i> oocysts (X 1000 stained by modified Ziehl-Neelsen technique) ...	76
Fig. (11) Numerous <i>Cryptosporidium</i> oocysts (X 1000 stained by modified Ziehl-Neelsen technique) ...	77
Fig. (12) Few <i>Cryptosporidium</i> oocysts (X 1000 stained by modified Ziehl-Neelsen Technique). .	78
Fig. (13) <i>Cryptosporidium</i> oocysts in stool (X 1000, stained by modified Ziehl-Neelsen Technique. ...	79
Fig. (14) Few <i>Cryptosporidium</i> oocysts (X 1000 stained by modified Ziehl-Neelsen Technique) .	80



Introduction & Aim of the Work

INTRODUCTION & AIM OF THE WORK

Diarrheal illness is considered as a major cause of morbidity and mortality, especially in young children living in developing countries [Egger et al., 1990].

Cryptosporidiosis is an important wide spread cause of diarrheal illness in humans and some domesticated animals [Ma and Soave, 1983].

Cryptosporidium is an ubiquitous protozoan that infects the gastrointestinal tract, leading to enteritis. It is likely that Cryptosporidium plays an important role in the overall health status of the children. It may also play a role in respiratory disease that often accompanies diarrheal illness in malnourished children [Egger et al., 1990]. The course of the disease is closely linked to immunocompetence of the host [Flanigan, 1994]. In immunocompetent host it causes acute self limited diarrheal illness in both developed and developing countries [Walfson et al., 1985].

In immunocompromised patients, cryptosporidiosis usually presents as life threatening, prolonged cholera-like illness [Forgacs et al., 1983]. Feco-oral spread among humans and animals and ingestion of contaminated water appear to be the principal modes of transmission, [D'Antonio et al., 1985].



Review of Literature

Chapter I: Cryptosporidium

Biology of Cryptosporidium

Taxonomy:

The taxonomic classification of small intracellular protozoans assigned to genus Cryptosporidium is presented in Table (1).

Levine, [1984] classified Cryptosporidium (C.) into four species; one of those infecting fishes (*C. nasorum*), reptiles (*C. crotali*), birds (*C. meleagrides*) and mammals (*C. muris*). But Upton and Current (1985) suggested that at least two valid species infect mammals, *C. parvum* infecting the small intestine and *C. muris* infecting the stomach.

Table (1): Taxonomic classification of Cryptosporidium.

Classification	Name
Phylum	Apicomplexa
Class	Sporozoasida
Subclass	Coccidiasina
Order	Eucoccidiorida
Suborder	Eimeriorina
Family	Cryptosporidiidae
[Current and Garcia, 1991].	

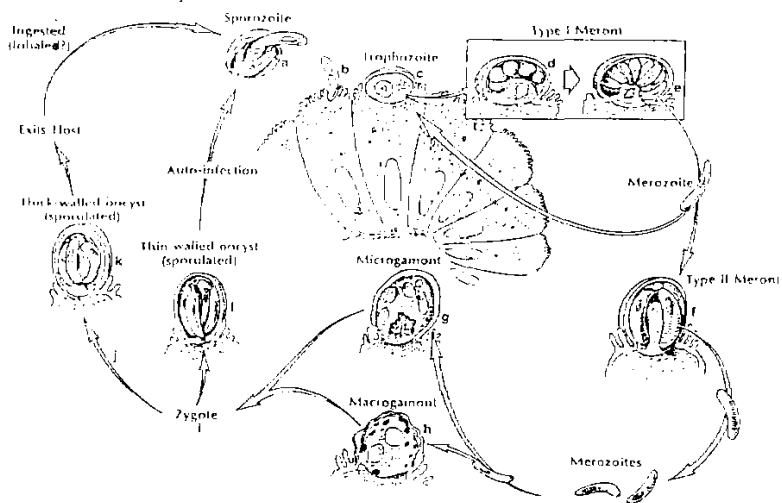


Fig. (1) Life cycle of *Cryptosporidium* (Quoted from: Current and Blagburn, 1990)

countries and 8.5% in developing countries.

The frequency of cryptosporidiosis was shown to be higher in urban areas of Costa Rica [Mata 1988], and Liberia [Hojlyng et al., 1984], where there is closer contact among humans than in rural areas. Symptomatic infection among children is more frequent than in adults, because most adult are immune due to frequent exposure throughout life [Tzipori and Campbell, 1981].

Cryptosporidiosis is commoner among children 6-12 months old and decreases with age towards 2 years [Taylor et al., 1985]. It is less common in neonates compared with infants of 6 months or older [Mata, 1986], because of protection by maternal antibodies resulting from the mother's own frequent exposure. The youngest child reported with cryptosporidiosis was a three days old infant born to a mother who had had diarrhea due to cryptosporidiosis several days before vaginal delivery [Bossen and Britt, 1985]. Several studies revealed that breast fed infant rarely catch cryptosporidiosis [Fayer et al., 1986]. In contrast to this, other studies showed no difference between breast-fed and bottle-fed infants [Mathan et al., 1985].

Infections are often seasonal, with a higher prevalence during warmer and wetter months, but a distinct seasonal trend was not observed in all countries. For instance, in United Kingdom and India no seasonal variations was documented [Casemore et al., 1985; and Mathan et al., 1985].

A number of water-borne outbreaks have been

Table (2): The frequency of human cryptosporidiosis in Egypt

Location	Tested number	% of patients	Age & peak season	Asymptomatic carriage	Reference
1- Cairo	117	2.65%	Children immunosuppressed + immunocompetent	0	Azab et al., 1985
2- Zagazig	80	8.75%	> 50% children	0	Aboul-Maged & Abou Shady, 1986
3- Cairo	400	0	No data	0	Salem et al., 1987
4- Cairo	No data	4.30%	No data	0	Nour et al., 1988
5- Egypt	151	9%	Mean age 18 month	0	Mithail et al., 1989
6- Cairo	460	6.80%	Children, all year	3	Fayyad et al., 1989
7- Qatubya	213	3.20%	Children and infant	0	Khashaba et al., 1989
8- Alexandria	150	4.50%	Children, spring and summer	0	Abdel-Moneim et al., 1989
9- Cairo	180	20.50%	Age 2-30 month	0	Mohsen et al., 1991
10- Cairo	196	18.90%	Children	2.20%	Ibrahim et al., 1995