

# الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَةٌ وَلَا نَوْمٌ لِمَا فِي السَّمَاوَاتِ وَاللَّيْلِ فِي الْأَرْضِ مَا يَشَاءُ يَفْعَلُهُ إِنَّ اللَّهَ عِنْدَ الْأَعْيُنِ  
يَعْلَمُ الْغُيُوبَ مَا خَلَقَ مِنْ دُونِهِ شَيْئًا وَإِنَّ الْأَرْضَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ وَاللَّيْلَ  
وَهُوَ الْعَلِيُّ الْعَظِيمُ

صدق الله العظيم

سورة البقرة: الآية 255

Dedication

To our lovely parents

Who haven't spared me any time and efforts to encourage us, help us and with their fruitful advice, I pray to Allah to enable us to repay them for their kind act

To our brothers and sisters

who always hope to see us the best in collage

To all our teachers

the beacons of the way, who enlighten it and who stands with us step by step

To all our colleagues and friends

who are too numerous to mention by name, who advised, supported and encouraged us

With respect and appreciation

## Acknowledgment

Thanks firstly and finally to Allah Almighty for blessing and giving us the power to complete this project.

We would like to express our deepest appreciation to our supervisor Dr/ Tayseer Elamin for her advices, enthusiasm, help and endless guide.

We would like to express our deepest appreciation to Ustaz/ Ahmad Abdalfattah Galandar and Ustaz/ Amjad Mohammed for their support and great help.

We would like to thank all the staff of Parasitology and Medical Entomology department for helping us with every kind of information.

Also we extended our thanks to Abo-Naama health center and all participants in this study.

Sincerely thanks to senior Mohammed Hassan Ahmed Kebiayer who always advised, supported and worked with us.

Finally, thanks to all our friends and colleagues for their help and support, especially Montaser Al-sadig.

## **Abstract**

This cross sectional study was conducted in Abu-Naama area in Sinnar State during the period of November 2013 to February 2014. The aim of this study was to determine the epidemiological and clinical correlation of malaria- intestinal helminthes co-infection.

One hundred subjects were included in this study (age between 2 months and 70 years old), males were 44% while females were 56%. One hundred stool and one hundred blood samples were taken from subjects. Parasitological data were obtained and recorded. The hundred stool samples were examined to detect intestinal helminthes eggs by using wet preparation and formal ether concentration technique (FECT). Out of 100 stool specimens, 7 (7%), 15 (15%) were founded positive respectively. FECT was also used to determine intensity, out of 15 positive samples, 3(20%) samples were presented as few infections, 2 (13%) as moderate, while 10 (67%) stool samples were presented as severe infections.

Malaria infection was determined by detection of *Plasmodium* spp in stained thick and thin blood films, seventy three (73%) of the study subjects were found to be harboring *P.falciparum* parasite.

When results were analyzed, the study indicates that there is no correlation between malaria and intestinal helminthes infection.

## مستخلص الدراسة

أجريت هذه الدراسة المستعرضة في منطقة أبو نعام، ولاية سنار خلال الفترة من نوفمبر 2013 وحتى فبراير 2014.

الهدف من هذه الدراسة هو تحديد العلاقة الوبائية و الإكلينيكية للإصابة المشتركة بالمalaria والديدان المعوية.

تضمنت الدراسة 100 شخص (أعمارهم بين شهرين إلى 70 عاماً). كانت نسبة الذكور 44% و نسبة الإناث 56%. أخذت 100 عينة براز و 100 عينة دم من الأشخاص الخاضعين لهذه الدراسة، تم الحصول على البيانات الطفيلية و تسجيلها، تم فحص عينات البراز للكشف عن بيوض الديدان المعوية باستخدام التحضير الرطب و تقنية الترسيب.

من 100 عينة براز 7 (7%) كانت إيجابية بطريقة التحضير الرطب، و 15 (15%) كانت إيجابية بطريقة الترسيب، تم أيضاً استخدام طريقة الترسيب لتحديد شدة الإصابة، من بين 15 عينة إيجابية، 3 (20%) أظهرت إصابات خفيفة، 2 (13%) أظهرت إصابات متوسطة، بينما 10 (67%) من العينات الإيجابية أظهرت إصابات شديدة.

تم الكشف عن إصابات المalaria عن طريق المسحة المصبوغة الثقيلة و الخفيفة، 73 (73%) أظهرت نتائج إيجابية.

وعند تحليل النتائج أظهرت الدراسة أنه لا توجد علاقة وبائية و إكلينيكية للإصابة المشتركة بالمalaria والديدان المعوية.

## List of contents

	Page
الآية	I
Dedication	II
Acknowledgment	III
Abstract	IV
مستخلص الدراسة	V
List of contents	VI
List of tables	X
List of figures	XI
<b>Chapter One : Introduction and literature review</b>	
Rationale.	1
1.1 Introduction	2
1.2 Literature review	3
1.2.1 Helminths	3
1.2.1.1 Introduction	3
1.2.1.2 Classification of intestinal helminthes	3
1.2.1.2.1 Phylum: Platyhelminthes	3
1.2.1.2.2 Phylum: Nematoda	4
1.2.1.3 General Characteristics of intestinal helminthes	4
1.2.1.3.1 General Characteristics of Cestodes	4
1.2.1.3.2 General Characteristics of Trematodes	7
1.2.1.3.3 General Characteristics of Nematodes	9
1.2.1.4 Transmission	11
1.2.1.5 Life cycle	12
1.2.1.5.1 Life cycle of cestodes	12
1.2.1.5.2 Life cycle of trematodes	14
1.2.1.5.3 Life cycle of nematodes	15
1.2.1.6 Pathogenesis	16
1.2.1.7 Diagnosis	17
1.2.1.8 Treatment	17
1.2.1.9 Prevention and control	20
1.2.1.10 Epidemiology	21
1.2.2 Malaria	22
1.2.2.1 Introduction	22

1.2.2.2 Transmission	23
1.2.2.3 Life cycle	23
1.2.2.4 Pathogenesis	26
1.2.2.5 Clinical features	26
1.2.2.6 Complications	27
1.2.2.7 Epidemiology and distribution	29
1.2.2.8 Laboratory diagnosis	31
1.2.2.9 Treatment	32
1.2.2.10 Malaria control	34
1.2.2.11 Malaria in Sudan	35
1.2.3 Co- infection	36
1.2.3.1 Background	36
1.2.3.2 Malaria susceptibility and helminth infection	36
1.2.3.3 Immunomodulatory effects of helminthes	38
1.2.3.4 Anemia and co-infection	38
1.2.3.5 Outcome of co-infection	39
Objectives	40
<b>Chapter Two: Materials and Methods</b>	
2.1 Study design	41
2.2 Study area	41
2.3 Study population	41
2.4 Period of study	42
2.5 Sample size	42
2.6 Samples collection	42
2.6.1 Stool samples	42
2.6.1.1 Method of collection	42
2.6.1.2 Method of examination	42
2.6.2 Blood samples	45
2.6.2.1 Method of collection	45
2.6.2.2 Preparation of blood films	45
2.6.2.3 Staining of blood films	46
2.6.2.4 Method of examination	46
2.7 Data analysis	46
2.8 Data presentation	46
2.9 Ethical consideration	46
<b>Chapter Three: Results</b>	
3.1 General Characteristics of studied population	47
3.2 Parasitological results.	47
3.2.1 Intestinal Helminthes.	47
3.2.1.1 Overall prevalence of intestinal helminthes in	47

study area.	
3.2.1.2 Intensity of intestinal helminthes.	48
3.2.1.3 Relation between presence of <i>H.nana</i> infection and presence of clinical features.	49
3.2.2 Overall prevalence of other intestinal protozoan infection.	51
3.2.2.1 Intensity of intestinal protozoan infection.	51
3.2.2.2 Relation between presence of intestinal protozoan and presence of clinical features.	53
3.2.3 Malaria	55
3.2.3.1 Prevalence of Malaria in the study area.	55
3.2.3.2 Density of malaria parasite.	56
3.2.3.3 Relation between presence of malaria and presence of clinical features.	56
3.3 Co-infection.	58
3.3.1 Plasmodium - intestinal helminthes co-infection.	58
3.3.2 Mean of <i>Plasmodium falciparum</i> parasitemia (per $\mu$ l of blood) in relation to presence of helminthes infection	58
3.3.3 Mean <i>Plasmodium falciparum</i> parasitemia (per $\mu$ l of blood) in relation to helminthes infection status.	59
3.3.4 Prevalence of co-infection among different age groups.	59
3.3.5 Relationship between co-infection and fever, abdominal pain and diarrhea.	60
3.3.6 Helminthes - protozoa co-infection	61
3.3.7 <i>Plasmodium</i> - protozoan co-infection	62
3.3.8 Prevalence of previous helminthes and current malaria co-infection.	62
3.3.9 Relation between previous helminthes infection and co-infection.	63
3.4 Comparison of wet preparation and FECT	63
<b>Chapter Four : Discussion</b>	
Discussion	64
<b>Chapter Five : Conclusions and Recommendations</b>	
5.1 Conclusions	67
5.2 Recommendations	67
References	68
Appendices	
Appendix 1: List of reagents and items.	78



Appendix 2: Table of results of samples.	79
Appendix 3: Ecology of intestinal parasites and <i>Plasmodium</i> .	83
Appendix 4: Ecology of intestinal parasites and <i>Plasmodium</i> .	83
Appendix 5: Abu-Naama health center.	84
Appendix 6: Ecology of intestinal parasites (Contamination of water).	84
Appendix 7: Ecology of intestinal parasites.	85
Appendix 8: Stool Specimens.	85
Appendix 9: Collection of blood specimen.	86
Appendix 10: Thin and thick blood films.	86
Appendix 11: Olympus microscope.	87
Appendix 12: Centrifuge.	87
Appendix 18: Questionnaire.	88

## List of tables

	Page
Table 1.1: Morphological differences between Cyclophyllidae and Pseudophyllidae.	5
Table 1.2: Differential morphology of the diagnostic stages of medically important cestodes found in human.	6
Table 1.3: Differential morphology of the diagnostic stages of medically important tematodes found in humans.	7
Table 1.4: Differential Morphology of the diagnostic Stages of nematodes found in humans	10
Table 1.5: Drugs used in the treatment of helminth infections.	18
Table 2.1: Description of intestinal parasites intensity	44
Table 3.1: Frequency of age groups among gender.	47
Table 3.2: Overall prevalence of intestinal helminthes in study area.	48
Table 3.3: Detection of intestinal helminthes eggs by wet preparation and Formal Ether Concentration Technique.	48
Table 3.4: Intensity of Intestinal helminthes infection among age groups.	49
Table 3.5: Relation between presence of <i>H.nana</i> and presence of clinical features.	50
Table 3.6: Mean of <i>H.nana</i> density among different clinical status.	50
Table 3.7: Prevalence of intestinal protozoan infections in the study area.	51
Table 3.8: Intensity of <i>G.lambelia</i> infection among age groups.	52
Table 3.9: Intensity of <i>E.histolytica</i> infection among age groups.	53
Table 3.10: Relation between presence of <i>G.lambelia</i> and presence of clinical features.	54
Table 3.11: Relation between presence of <i>E.histolytica</i> and presence of clinical features.	54
Table 3.12: Mean of intestinal protozoa density among different clinical status.	55
Table 3.13: The prevalence of malaria parasite in the study subjects.	55
Table 3.14: Mean of parasitemia among age groups and	56

sex.	
Table 3.15: Relation between presence of malaria and presence of clinical features.	57
Table 3.16: Mean of malaria parasitemia among different clinical status.	57
Table 3.17: Prevalence of Plasmodium - intestinal helminthes co-infection in the study area.	58
Table 3.18: Mean of <i>Plasmodium falciparum</i> parasitemia (per $\mu$ l of blood) in relation to presence of helminthes infection.	58
Table 3.19: Mean <i>Plasmodium falciparum</i> parasitemia (per $\mu$ l of blood) in relation to helminthes infection intensity and sex.	59
Table 3.20: Prevalence of co-infection among different age groups.	60
Table 3.21: Relationship between co-infection and fever, abdominal pain and diarrhea.	61
Table 3.22: Helminthes - protozoa co-infection.	61
Table 3.23: Plasmodium - Protozoan co-infection	62
Table 3.24: Prevalence of previous helminthes and current co-infection	62
Table 3.25: Relation between previous helminthes infection and current co-infection	63
Table 3.26: Comparison of wet preparation and FECT.	63

## List of figures

	Page
Figure 1.1: Typical life cycle of cestodes.	13
Figure 1.2: Typical life cycle of trematodes.	14
Figure 1.3: Typical life cycle of nematodes.	15
Figure 1.2: (A) Malaria life cycle and (B) <i>Anopheles</i> mosquito pumping blood.	25
Figure 1.3: Distribution of probable and confirmed malaria cases in Sudan (per 1000 population) .	35