

**Prevalence of *Plasmodium falciparum* and Intestinal Parasitemia, and  
Clinical Outcomes of these Co-Morbidities among Children in  
Kiryandongo Refugee Camp, Mid -Western Uganda**

**By**

**PAUL OBOTH., BU/GS15/MPH/011**

A Research Dissertation Submitted To the Department of Public Health, Faculty  
of Health Sciences in Partial Fulfilment of the Requirements for the Award of  
the Degree of Master of Public Health of Busitema University

**September 2018**

## DECLARATION

I, **Paul Oboth** hereby declare that except for references made to other people's work, which have been duly acknowledged, this dissertation is my original work and has neither in part nor completely been presented for consideration anywhere for any academic award.

**Signature**.....

**Date:** .....

## **APPROVAL**

This dissertation is being submitted to the Department of Public Health, Faculty of Health Sciences in partial fulfilment of the requirement for the award of the Degree of Master of Public Health of Busitema University by the approval of the supervisors.

1. Signature.....Date.....

**BARUGAHARE JOHN BANSON, B.Sc., M.Sc., M. PHIL**

Senior Lecturer

Department of Biology

Faculty of Science and Education

Busitema University

2. Signature.....Date.....

**GAVAMUKULYA YAHAYA, BSc, MSc**

Lecturer

Department of Biochemistry and Molecular Biology

Faculty of Health Sciences

Busitema University

## **ACKNOWLEDGEMENTS**

I would like to extend my sincere gratitude to the supervisors for their valuable guidance, mentorship and support throughout this study. Many thanks also go to the Makerere Sweden Research Cooperation for the scholarship (SIDA) and financial support that allowed smooth running of the study. I would also like to thank the field and technical staff especially laboratory personnel and clinicians from the Panyadoli HC III in the refugee settlement camp for their collaboration and hard work during data collection. Sincere thanks also go to the refugee children and their parents/guardians for their participation and assistance in conducting fieldwork. Lastly but not the least, I would like to wholeheartedly express my gratitude to my family, for all sacrifices made and enduring this process.

## **DEDICATION**

This work is dedicated to my dear family members.

# TABLE OF CONTENT

Declaration.....	i
Approval.....	ii
Acknowledgements.....	iii
Dedication.....	iv
List of acronyms.....	vii
List of tables.....	viii
List of figures.....	ix
Definitions.....	x
Abstract.....	xi
<b>CHAPTER ONE.....</b>	<b>1</b>
1.1 Background.....	1
1.2 Problem Statement.....	2
1.3 Research Question.....	3
1.4 Justification of the Study.....	3
1.5 Conceptual Framework.....	3
1.6 Study Objectives.....	5
1.6.1 General objective.....	5
1.6.2 Specific objectives.....	5
<b>CHAPTER TWO: LITERATURE REVIEW.....</b>	<b>6</b>
1.1 Malaria.....	6
1.2 Global burden and Prevalence of malaria.....	6
1.3 Health and psychosocial effects of malaria.....	7
1.4 Global burden and prevalence of Intestinal parasitic infection.....	8
1.5 Malaria and Intestinal parasitic co-infection.....	9
1.6 <i>Plasmodium falciparum</i> , intestinal parasitic infestation and co-infections.....	10
1.7 Prevention of malaria and Intestinal Parasitic co-infection.....	12
<b>CHAPTER THREE: MATERIALS AND METHODS.....</b>	<b>13</b>
3.1 Study area/site.....	14
3.2 Study Population.....	14
3.3 Study Design or Type.....	14
3.4 Sample Size Calculations.....	15
3.5 Sampling procedure.....	15
3.6 Inclusion and exclusion criteria.....	16
3.7 Study Variable.....	16

3.8	Data collection procedure .....	16
3.9	Data collection .....	17
3.10	Quality Control.....	18
3.10.1	Pre-testing of questionnaire .....	18
3.10.2	Validity and reliability.....	18
3.10.3	Data entry and processing.....	18
3.11	Data Analysis .....	18
3.12	Laboratory Methods .....	19
3.12.1	Giemsa staining and Microscopy .....	19
3.12.2	Determination of Intestinal Parasitic infection .....	19
3.12.3	Determination of Haemoglobin level .....	20
3.12.4	Ethical consideration .....	20
	<b>CHAPTER FOUR: RESULTS .....</b>	<b>21</b>
	<b>CHAPTER FIVE: DISCUSSION.....</b>	<b>29</b>
	<b>CHAPTER SIX : CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS .</b>	<b>36</b>
6.1	Conclusions.....	36
6.2	Limitations.....	37
6.3	Recommendations.....	38
	<b>REFERENCES .....</b>	<b>39</b>
	<b>APPENDICES .....</b>	<b>45</b>
	Appendix 1. Copy of Informed Consent Form .....	45
	Appendix 2. Mbale Regional Hospital Institution Review Committee (MRHIRC) .....	46
	Appendix 3. Study Site clearance form .....	47
	Appendix 4 Data collection Form/Questionnaire .....	48

## LIST OF ACRONYMS

<b>BUFHS</b>	Busitema University Faculty of Health Sciences
<b>CI</b>	Confidence Interval
<b>CME</b>	Continuous Medical Education
<b>EDTA</b>	Ethylene-Diamine-Tetra Acetic Acid
<b>g/dl</b>	grams per decilitre
<b>Hb</b>	Haemoglobin
<b>IPI</b>	Intestinal Parasitic Infection
<b>ITNs</b>	Insecticide Treated Mosquito Nets
<b>IRB</b>	Institutional Review Board
<b>IRS</b>	Indoor Residual Spray
<b>LLINs</b>	Long Lasting Insecticide Nets
<b>MAUC</b>	Mid-Upper Arm Circumference
<b>MDA</b>	Mass Drug Administration
<b>ml</b>	millilitre
<b>MRRH</b>	Mbale Regional Referral Hospital
<b>MOH</b>	Ministry of Health, Uganda
<b>NaCl</b>	Sodium Chloride
<b>NTDs</b>	Neglected Tropical Diseases
<b>NGOs</b>	Non-Government Organisation
<b>P</b>	Prevalence
<b>PI</b>	Principle Investigator
<i>Pf-Hk</i>	<i>Plasmodium falciparum</i> and <i>Hookworm</i>
<i>Pf-Sch</i>	<i>Plasmodium falciparum</i> and <i>schistosomes</i>
<b>SSA</b>	Sub-Saharan Africa
<b>UNCST</b>	Uganda National Council of Science and Technology
<b>WBCs</b>	White Blood Cells
<b>WHO</b>	World Health Organisation



## LIST OF TABLES

Table 1: Variables measured in the study .....	16
Table 2: Descriptive demographic characteristics of the study population (n=476) .....	21
Table 3: Descriptive study related factors of the study population (n=476).....	23
Table 4: Overall prevalence of parasitic infection in the study population (n=476) .....	23
Table 5: Prevalence of <i>Plasmodium falciparum</i> and intestinal parasitic infection, stratified by age and sex .....	24
Table 6: Prevalence of <i>plasmodium falciparum</i> and intestinal parasitic co-infection in the study population.....	25
Table 7: Logistic regression analysis of interaction of <i>Plasmodium falciparum</i> and intestinal parasitic co-infections on malaria in the study population. ....	25
Table 8: Logistic regression analysis predicting occurrence of anaemia in relation to parasitic infections in the study population. ....	26

## LIST OF FIGURES

Fig. 1 Conceptual Framework.....	4
Fig. 2 Study Site.....	14

## DEFINITIONS

Term	Definition
<b>Malaria</b>	is a febrile illness caused by the plasmodium parasite, which is transmitted via the bites of infected mosquitoes Adebayo, Akinyemi, and Cadmus (2015).
<b>Haemoglobin (Hb)</b>	is the iron-containing, oxygen-transport metallo-protein in RBCs. Normal Hb vary substantially with age, sex and race
<b>Intestinal helminths</b>	refers to worms infecting the gastro-intestinal tract of humans that are usually transmitted via the feco-oral route, or via contaminated soil, usually in areas with poor sanitation. Examples of such worms include- <i>Ancylostoma</i> , <i>Trichuris</i> , <i>Ascaris</i> , <i>Schistosoma</i> (Mengistu, 2010).
<b>Anaemia</b>	is a medical condition in which the number of red blood cells transporting oxygen to the various body parts is not sufficient to meet the needs of the body. Anaemia may result from varied causes but iron deficiency is a major cause of anaemia (Gutema, Adissu, Asress, & Gedefaw, 2014).
<b>Infection</b>	is the invasion by an endoparasite which lives within cells of the host.
<b>Infestation</b>	is the invasion by an ectoparasite which lives outside of the cells of the host.

## ABSTRACT

**BACKGROUND:** The prevalence of *Plasmodium falciparum* and Intestinal Parasitic Infections (IPIs) - with the corresponding disease characteristics among children remain uncertain. This study aimed at determining the prevalence and evaluation of the nature of associations of the respective infections and the clinical outcomes.

**METHODS:** This was a cross sectional study conducted among 476-refugee camp schoolchildren. Kato-Katz technique was used to screen stool samples for intestinal parasites. Geimsa thick blood smear microscopy was used for malaria testing while the portable Hb calorimeter was used to measure haemoglobin concentration.

**RESULTS:** The overall prevalence of the mixed infections was 62.2%. *Plasmodium falciparum* was most prevalent of the single infections 262(55.04%) followed by *Taenia spp* 14 (2.9%), *Schistosoma mansoni* 12(2.5%), *Giardia lamblia* 7 (2.9%), *Trichuris trichiura* 2(0.4%), Hookworm 2(0.4%) and *Strongyloides stercoralis* 1(0.2%). The odds of developing simple or uncomplicated malaria infection or anaemia was 14 times higher in individuals with dual co-infection with; *Plasmodium falciparum*+*Taenia spp* compared to single parasitic infection (Odds = 14.13,  $P = 0.019$ ). Co-infection with *Plasmodium falciparum*+*Taenia spp* was a strong predictor of Malaria and anemia. This is in agreement with studies conducted in North Western and Western Uganda, which have strongly indicated that Malaria and IPIs are risk factors for childhood anemia.

**CONCLUSION:** This study shows that *Plasmodium falciparum* and *Taenia spp* co-infections is a stronger predictor of malaria and anaemia. Even when there were vivid control measures in the camp, the prevalence of malaria and anaemia remains higher than the other regions in Uganda outside restricted settlements.