Dedication

To my dear family who provided me with great love and incredible support.
ACKNOWLEDGEMENT

I am grateful to my supervisor Dr. Miskelyemen A/Attia A/Alla for her advice and encouragement to conduct this study. My thanks are also due to Dr. Tarig A/Agader, malaria combating program Coordinator in Sudan for his assistance and support while conducting my study. I also wish to thank all the laboratory staff members of Wad Medani Teaching Hospital for their co-
This study was carried out in Wad Medani in Algezera state between Nov. 2008 and Nov. 2009. The aim of the study was to compare blood film (microscopy) with the immunochromatography test (ICT) histidine–rich protein -2 (HRP-2) and parasite lactate dehydrogenase (PLDH) antigen based test in the diagnosis of malaria parasite to find out an alternative method which is sensitive, simple, cheap and accurate in detecting malaria parasite. In the first part of the study, 150 samples were examined by ICT composed of histidine–rich protein -2 (HRP-2) and parasite lactate dehydrogenase (PLDH) antigens based test and microscopic examination. Demographic data of the patient was collected including clinical symptoms due to infection. Out of the 130 samples examined 30 samples were collected as negative controls and one hundred samples were found to be positive by microscopy while only 57 samples were found positive by histidine–rich protein -2 (HRP-2) and parasite lactate dehydrogenase (PLDH) antigens based test. The sensitivity of histidine–rich protein -2 (HRP-2) and parasite lactate dehydrogenase (PLDH) antigen based test was 57% and the specificity was 100%. All the (ICT) negative microscopy positive 43 samples were of low parasitaemia represented as one cross (+).
The study showed that history of fever and headache was good indicators for malaria infection. The frequency of fever was found to be 80% and headache 92% compared to uninfected individuals. Also fever during the follow up period decreased significantly from 100% to complete absence.
أجرت هذه الدراسة في الفترة من نوفمبر 2008 وحتى نوفمبر 2009 في مستشفى ودمدني التعليمي بولاية الجزيرة. استخدمت الدراسة طريقة جديدة لتشخيص طفل الملاเรيا بأنواعه الأربعة وهي التشخيص المناعي الكروماتوغرافي وقد قورنت نتائجها مع نتائج التشخيص المجهري لشرائح دم سميكة ورقيقة صبغت بصبغة جيمسا من مرضاً يعتقد أنهم مصابون بطفيل الملا ريا بناء على الأعراض السريرية التي حضروا بها للمستشفى.

تم فحص شحص بواسطة التفاعل المناعي الكروماتوغرافي والمجرد وتطابقت نتائج التشخيص الإيجابي بالطرفيتين في 57 عينة، ولفتاً في 30 عينة كانت نتائج حساسية التفاعل المناعي الكروماتوغرافي للطفيي 57% وخاصة التقنية 100%.

أشارت الدراسة أن العلاقة الوثيقة بين الحمى والإصابة بالملا ريا. حيث وضح أنه الحمى هي العرض الثابت بنسبة 80% بالمصابين بالملا ريا. وتتشابك الحمى خلال فترة تتبع العلاج تدريجياً إلى أن تختفي تماماً.
# List of contents

<table>
<thead>
<tr>
<th>Page No.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Dedication</td>
</tr>
<tr>
<td>II</td>
<td>Acknowledgment</td>
</tr>
<tr>
<td>III</td>
<td>Abstract (English)</td>
</tr>
<tr>
<td>V</td>
<td>Abstract (Arabic)</td>
</tr>
<tr>
<td>VI</td>
<td>List of contents</td>
</tr>
<tr>
<td>X</td>
<td>List of figures</td>
</tr>
<tr>
<td>XI</td>
<td>List of tables</td>
</tr>
</tbody>
</table>
## List of Figures

**Figures**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Life cycle of human malaria</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Geographic Distribution of Malaria</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Malaria situation in the Sudan</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>Negative one line’ c” in result window</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>Positive 1-p.f positive: two color bands (p.f test line and “C” control line) or three color bands (p.f, “pan” test line and “C” control line)</td>
<td>29</td>
</tr>
</tbody>
</table>
# List of Tables

<table>
<thead>
<tr>
<th>TABLE</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1: overall infection rate (prevalence rate) for the 130 samples and for different technique...</td>
<td>32</td>
</tr>
<tr>
<td>Table 2: Distribution of study participants according to age group</td>
<td>33</td>
</tr>
<tr>
<td>Table 3: Distribution of study participants according to sex</td>
<td>35</td>
</tr>
<tr>
<td>Table 4: Relationship between parasite density and (ICT)</td>
<td>37</td>
</tr>
<tr>
<td>Table 5: Sensitivity and specificity of ICT</td>
<td>38</td>
</tr>
<tr>
<td>Table 6: Correlation between fever and malaria</td>
<td>39</td>
</tr>
</tbody>
</table>
# Chapter One

Introduction and objective

1.1 Introduction

1.2 Rationale

1.3 Objectives

1.3.1 General objective

1.3.2 Specific objective

# Chapter two

Literature review

2.1 Malaria

2.2 Life cycle of human malaria

2.2.1. Life cycle in human

2.2.2 Life cycle in the mosquito

2.3 The vector

2.4 Epidemiology of malaria

2.5 Pathogen city

2.6 Immunity to malaria

2.6.1 Natural immunity

2.6.2 Acquired immunity

2.7 Laboratory diagnosis of malaria

2.7.1 Clinical diagnosis of malaria

2.7.2 Microscopical examination

2.7.3 Non-microscopical examination
2.7.4 Detecting biochemical substances of the parasite by (ICT) ....................................................... 17

2.7.4.1 Histidine –rich protein -2 (HRP-2) .............. 18

2.7.4.2 Parasite lactate dehydrogenase (PLDH) .......... 18

2.8 Malaria chemotherapy ........................................ 19

2.8.1 Sulfadoxine /pyrimethamine (fansidar) ............ 19

2.8.2 Artemisinin and its derivatives ...................... 20

2.8.3 Artesunate +SP ............................................. 20

2.8.4 Artemether ............................................... 20

2.8.5 Quinine ...................................................... 20

2.9 Global malaria control system ............................ 22

2.10 Malaria situation in the Sudan (figure 3) .......... 23

Chapter Three

Material and methods ............................................. 25

3.1 Study design ............................................... 25

3.2 Study areas ................................................. 25

3.3 Study population and sampling .......................... 25

3.4 Ethical consideration ...................................... 25

3.5 Data collection .............................................. 26

3.6 Methods ..................................................... 26

3.6.1 Microscopical diagnosis ................................. 26

3.6.1.1 Preparation of blood films ......................... 26
3.6.1.2 Staining of blood films................................. 27
3.6.1.3 Examination of blood films… 27
3.6.1.4 Examination of the thin blood film… 27
3.6.1.5 Malaria parasite count......................... 27
3.7 Immunochromatographic test (ICT…… 28
3.7.1 Interpretation of the test............... 29

Chapter Four

Result

4.1 General description .................................
4.2 Overall infection rate (prevalence rate) for different techniques...........................
4.3 Malaria infection and age ............................
4.4 Malaria and gender ..................................
4.5 Relationship between parasite density and ((ICT
4.6 Sensitivity and specificity of ICT ......................
4.7 Malaria in relevance to other clinical symptoms