# Prevalence of malaria infection in some localities of Fayoum governorate

Thesis

Submitted for fulfillment for Master Degree of

Medical Parasitology

**By**

**Gomaa Desoky Eimam Hassanien**

M.B., B.CH.

Demonstrator of Medical Parasitology

Faculty of Medicine

Fayoum University

**Under supervision of**

**Prof. Dr. Maysa Mohamed Kamel**

Professor of Medical Parasitology

Faculty of Medicine

Cairo University

**Prof. Dr. Naglaa Abd –Elkhalek Al -shirbiny**

Assistant Professor of Community Medicine

Faculty of Medicine

Fayoum University

**Dr. Samr Sayed Attia**

Lecturer of Medical Parasitology

Faculty of Medicine

Cairo University

Faculty of Medicine

Cairo University

2014

# Acknowledgements

*I offer my deepest thanks to* **Prof. Dr. Mona Mahmoud Hamed,** *Head of Parasitology Department, Faculty of Medicine, Cairo University, for her kind support and persistent encouragement.*

*I would like to express the deepest appreciation to my supervisor* **Professor Dr. Maysa Mohamed Kamel**, *Professor of Medical Parasitology, Faculty of Medicine, Cairo University, who gave me the chance to start this work and to continue, with her encouragement, scientific suggestions throughout this research work and extremely unlimited efforts for revising this work.*

*I owe sincere thanks and everlasting gratitude to* **Dr.*Naglaa Abd –Elkhalek Al –shirbiny***, *Assistant Professor of Community Medicine , Faculty of Medicine, Fayoum University, for her moral support, valuable suggestions and her guidance in the epidemiological aspect of this thesis .*

*Special thanks are extended to* ***Dr. Samr Sayed Attia***, *Lecturer of Medical Parasitology , Faculty of Medicine ,Cairo University, who gave me help and provided me with facilities throughout the practical part of this work and extremely unlimited efforts for revising and rewriting this work.*

*Special thanks are extended to* ***Dr. Gomaa Said Mohamed****,assistant Lecturer of Measurement and Evaluation , Faculty of Education ,Fayoum University, for the statistical analysis of the data reported in this thesis..*

*Also, I would like to express profound gratitude* **to Prof. Dr. Abd El-Hamid Abd El-Tawab Sabry**, *Professor of Medical Parasitology, Faculty of Medicine, Fayoum University, for his moral support.*

*I also appreciate the assistance I received from all staff members in Parasitology Department, Faculty of Medicine, Fayoum University, throughout my work.*

*Finally, special deep rooted heartily thanks to my mother for her love and support throughout my life. I also wish to thank my wife* ***Dr.Shimaa*** *for her support and understanding during my study.*

# Abstract

The present work was carried on 600 cases, 500 from household cases from El-Khaldia and Abo-Shanab villages, Abshoy District ,Fayoum governorate and 100 selected cases from Fayoum Fever Hospital in order to find prevalence of malaria infection in some localities of Fayoum governorate**.**. Diagnosis of malaria was done by thin and thick blood film for all cases in addition to malaria RDT applied to the 100 selected cases. Three cases were diagnosed by malaria RDT; while one case was positive by thick blood film.All positive cases were imported from Sudan.



**Key Words*:*** *malaria, RDT, blood film, Fayoum, imported.*

# List of Abbreviations

| | |
|---|---|
| **ACC** | **Automated cell counter** |
| **AIDS** | **Acquired Immunodeficiency Syndrome** |
| **An.multicolor** | **Anopheles multicolor** |
| **DBL** | **Duffy binding like** |
| **DLL** | **depolarized laser light** |
| **DNA** | **Deoxyribonucleic acid** |
| **ELISA** | **Enzyme-Linked Immunosorbent Assay** |
| **FCM** | **Flow cytometer** |
| **HIV** | **Human Immunodeficiency Virus** |
| **HRP-II** | **histidine-rich protein II** |
| **IFA** | **Immunofluorescence antibody testing** |
| **IFU** | **Instruction for use** |
| **IRMA** | **Immunoradiometric assay** |
| **LAMP** | **loop-mediated isothermal amplification** |
| **LDH** | **lactate dehydrogenase** |
| **LDMS** | **laser adsorption mass spectrometry** |
| **LED** | **light emitting diode** |
| **ml** | **Milliliter** |
| **MOHP** | **Ministry of Health and Population** |
| **P. falciparum** | **Plasmodium falciparum** |
| **PCR** | **Polymerase chain reaction** |
| **PfEMP1** | **plasmodium falciparum erythrocyte membrane protein 1** |
| **pLDH** | **pan-malaria lactate dehydrogenase** |
| **QBC** | **Quantitative buffy coat** |
| **RDT** | **Rapid diagnostic test** |

| | |
|---|---|
| **SD** | **Standard deviation** |
| **UN** | **United Nation** |
| **UNMIS** | **United Nation Missions In Sudan** |
| **VCS** | **volume, conductivity, and scatter** |
| **WBC(s)** | **White blood cell (s )** |
| **WHO** | **The World Health Organization** |
| **µm** | **A micrometre or micron** |

# LIST OF FIGURES

# LIST OF TABLES

# Contents

# Introduction

Forty-one percent of the world's population lives in areas where malaria is transmitted (e.g., parts of Africa, Asia, the Middle East, Central and South America) (WHO, 2002).About 3.3 billion people -half of the world's population- are at risk of malaria leading to about 250 million malaria cases and nearly one million deaths every year. People living in the poorest countries are the most vulnerable (WHO, 2009).

About Ninety-percent of all malaria deaths in the world today occur in Africa South of the Sahara. This is because the majority of infections in Africa are caused by *Plasmodium falciparum*, which is considered as the most dangerous of the four human malaria parasites. The vector of *falciparum* malaria (*Anopheles gambiae)* is widely spreaded in Africa and considered as the most difficult vector to control. An estimated one million people in Africa die from malaria each year and most of these are children under 5 years old *(Daoud,2003).*

Malaria control in Egypt achieved a considerable progress in the last few decades due to widespread indoor residual spraying (IRS) with long-lasting insecticides and introduction of artemisinin combination therapy with artemether-lumefantrine (Coartem©).These procedures led to a decrease in malaria caseload from about 85000 cases in 1960 to 5400 cases in 1970, with a preponderance of *P.vivax* cases(MOHP,2006).After application of intensive control measures, only 4 indigenous cases caused by *falciparum* were reported in 1997(WHO, 2006). There were few annual imported malaria cases from 1998-2003(Dawoud, 2003). In 2005, Ministry of health in Egypt reported 23 cases of imported malaria from Sierra Leon and Sudan (WHO, 2006).

It has been shown that malaria infection increased with the decrease of socioeconomic level of families, educational level of examined individuals and among unemployed or students. The infection increased among those living in

muddy or bad constructed houses near the breeding places of mosquitoes. Also, it decreased significantly among individuals who owned animal sheds **(**Dahesh *et al.*, 2009).

However, there are many factors which may contribute to re-emergence of the disease in Egypt. Such factors include infection of local *Anopheline* mosquitoes by imported cases, continuous movement of populations between Aswan governorate and Sudan as well as the influx of large populations from Africa and Asia to Egyptian governorates for educational and religious purposes. Another risk factor is the environmental change brought about by water-sources development projects as Toshka and El Salam Canals *(*Hassan *et al.,2003).*

# AIM OF WORK

**The present work aimed to:**

1- Study the prevalence of malaria in some localities in Fayoum governorate ; in addition to study the demographic criteria of the examined population incorporated in this study.

2- Determine the likelihood of acquisition of malaria infection in this area using thin and thick blood film, in addition to malaria pf/pan one step rapid test to detect plasmodium antigen in blood samples.

# Review of Literature

## Malaria prevalence in the world

The global human population has grown geometrically during the 20th century from approximately 1 to 6 billion. These demographics have important implications for the percentage of the human population exposed to all-cause malaria risk through time. The percentage of the global population at risk has decreased from 77% at the turn of the 20$^{th}$ century to a low of 46% in 1994. This figure increased to 48% in 2002 due to population growth in an unchanged geographic distribution. In absolute terms the numbers of people at risk has increased consistently from 0.9 to 3 billion over the same period (1900-2002). At the turn of the 21$^{st}$ century, it is estimated that 48% of the global population remain exposed to the risk of malaria, a situation that has deteriorated since the early 1990s and a figure substantially higher than the 40% widely cited (Hay *et al.*, 2004).

Almost 300 million clinical cases of malaria occur worldwide each year and over a million people die. Almost 90% of these deaths occur in sub-Saharan Africa, where young children are the most affected. Malaria is directly responsible for one in five childhood deaths in Africa and indirectly contributes to illness and deaths from respiratory infections, diarrhoeal disease and malnutrition (World Health Report, 1999).

According to WHO malaria report in 2011,the number of reported cases of malaria decreased more than 50% in 35 of the 53 countries ongoing transmission between 2000 and 2010 while decreased 25%-50% in the other 4 countries.In 2010, the Europe region reported only 176 indigenous cases.The number of cases continued to fall least in countries with the highest incidence rates, indicating that greater attention should be

given to countries which harbour most of malaria burden outside Africa (WHO,2011).

There were 8 countries in the pre-eliminating stage of malaria control in 2011 and 9 countries are implementing elimination programmes nationwide.

A further 8 countries including Bahamas, Egypt, Georgia, Iraq, Jamica, Oman, Russian federation and Syria have interrupted transmission and are in the prevention of reintroduction phase (WHO, 2011).

An estimated 3.3 bilion people were at risk of malaria in 2010, 2.1bilion were at low risk (< 1reported case per 1000 population ),94% of whom were living in geographic regions other than the WHO African region.The remaining 1.2 bilion were at high risk (> 1reported case per 1000 population ) and were living mostly in WHO African region (47%) and South East Asia (37%) (WHO,2011). Approximately 81%, or 174 milion cases, wer in Africa and 13% in South East Asian region. There were an estimated 655000 malaria deaths in 2010,of which 91% were in Africa. Approximately86% of malaria deaths occurred in children under 5 years of age (WHO, 2011).

## Malaria situation in Egypt

The present distribution of malaria cases in Egypt as reported by the Ministry of Health is demonstrated in table (1).

Table (1): Malaria in Egypt from 1960 – 2003 (MOHP, 2006).

| Year | No.of slides | No.of +ve | *Plasmodium Vivax* | *Plasmodium Falciparum* | % Of malaria in the examined slides |
|---|---|---|---|---|---|
| **1960** | 400000 | 85201 | 83205 | 1996 | 21.3 |
| **1965** | 674044 | 7997 | 7853 | 144 | 1.2 |
| **1970** | 609329 | 5394 | 5241 | 153 | 0.88 |
| **1975** | 1399101 | 1805 | 1759 | 46 | 0.12 |
| **1980** | 1332541 | 374 | 370 | 4 | 0.02 |
| **1985** | 1180900 | 72 | 53 | 19 | 0.006 |
| **1990** | 1145251 | 71 | 2 | 69 | 0.006 |
| **1995** | 1139859 | 313 | 15 | 298 | 0.27 |
| **2000** | 1107560 | 0 | 0 | 0 | 0 |
| **2001** | 1567223 | 0 | 0 | 0 | 0 |
| **2002** | 1357223 | 0 | 0 | 0 | 0 |
| **2003** | 1041767 | 0 | 0 | 0 | 0 |

The last focus of malaria in Egypt was in Fayoum which became free from transmission of malaria since 1998 and Egypt was certificated as free of malaria. There were few annual imported malaria cases since the year 1998.

As regards malaria situation in Egypt from the period 2004-2010;All the detected cases were imported as shown in Table (2) (WHO, 2012).

Table (2): Malaria in Egypt from 2004-2010 (WHO, 2012)

| Year | Suspected | Examined microscopically | Confirmed microscopically | Imported cases |
|---|---|---|---|---|
| **2004** | 43 | | 43 | 43 |
| **2005** | 23 | | 23 | 23 |
| **2006** | 29 | | 29 | 29 |
| **2007** | 30 | 23402 | 30 | 30 |
| **2008** | 30 | 34880 | 30 | 30 |
| **2009** | 94 | 41344 | 94 | 94 |
| **2010** | 35 | 64294 | 35 | 35 |

**Malaria situation in Fayoum governorate:**

Fayoum governorate is considered as a large agricultural area. It lies 90 Km south-east of Cairo. It is composed of six districts, Fayoum, Sinnuris, Ebshawy,Youssef-Elsdek, Tamiya and Itsa.

The main problem in malaria transmission in Fayoum goveronorate is the high level of subsoil water leading to formation of many swamps and pools creating suitable environmental conditions for *Anopheline* vectors(Harb,1994).

Also, the favourable meterological conditions , mainly optimum temperature and relative humidity leading to the extension of the transmission season to 8 months a year from the end of March to the end of November(Bassiouny,1996).

Two main Anopheline vectors in Fayoum governorate were responsible for the transmission of malaria; *Anopheles sergenti* and *Anopheles pharoensis*(Shehata *et al.*,1989).