

## Malaria Case (Early Detection)

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### Abstract

Middle East Respiratory Syndrome coronavirus (MERS-CoV) is the latest coronavirus to have emerged in the human population. The Saudi Arabian Ministry of Health (MoH) quickly came up with guidelines for the public and healthcare workers. This article looks at the policies recommended by International Organizations and the MoH. Like Ebola, the MERS-CoV is speculated to have come from bats, which harbour similar Coronaviruses. The article uses the principles of One Health to look at the outbreak and compares the MERS outbreak to the Ebola virus disease outbreak in West Africa. Besides highlighting key policy recommendations for the MERS-CoV outbreak, some recommendations have been brought about. The article intends to explain the MERS-CoV outbreak in a more holistic approach, taking in to consideration the One Health implications of the outbreak.

### Introduction

Malaria is a parasitic infectious disease is caused by plasmodium parasites which invade RBC's and inhabit there feeding on RBC's Hemoglobin, Four plasmodium species cause Malaria in human, they are: *P. falciparum*, *P. vivax*, *P. malariae* and *P. ovale*. *P.f* and *P.v* are the most common; *P.f* is the most dangerous with the highest rates of complications and mortality. The parasite needs two hosts to complete its life cycle; man and mosquito, in man asexual cycle but in mosquito sexual cycle. For each cycle the parasite has its own developmental stages. Sporozoite which inhabits the salivary glands of mosquito is the infective form of Malaria parasite to man while male and female gametocytes which present in human blood are the infective form of Malaria parasite to mosquito.

### Incubation Period

It is the period which starts from the first inoculation of the plasmodium sporozoites into human blood by the infected female An. Mosquito up to the appearance of disease symptoms, this period takes 7-30 days and maybe extends for more according to the parasites species and the vector species.

### Symptoms and Signs

All of the four plasmodium species can produce the same signs and symptoms of uncomplicated Malaria, i.e. fever, chills, flu- like illness, anemia, nausea, joint pain, vomiting, headache, shivering, and sweating. A typical Malaria case comprises the following three successive stages:

- The cold stage: Shivering and a feeling of intense cold (15-60 min).
- The hot stage: The temperature rise to more than 40°C, the face flushed, the skin dry and burning, headache become more intense, vomiting is common, this stage lasts (2-6 hrs).
- The sweating stage: The patient breaks out in profuse sweat, the temperatures falls rapidly often below the normal level, the patient feels much better though exhausted and sleepy. Duration of typical attack which often begins in the early afternoon is from 8-12 hrs.

### Complications Symptoms

The highest rates of complications occur in *p.f* infections:

- Cerebral Malaria
- Renal failure

- Pulmonary edema
- Hypoglycemia
- Severe anemia
- Dehydration
- Jaundice
- Abnormal bleeding and disseminated intravascular coagulation
- Hemoglobinuria (black water fever)
- Coma

For various national projects and programs concern to malaria elimination or eradication the planners put the topic of early detection as one of the basic aims if it is achieved well will lead for success of malaria eradication program. What do we mean about this expression; early detection of malaria case? Although it seems to be a simple question, but many technicians working in malaria field and sometimes professionals ones and may some of them spent more than thirty years' experience on the aspect but still non-able to understand real meaning for this expression that many of them mix and interference between meaning of this expression and meaning of activation the negative survey process which aim to collect a number of blood samples (limited proportion) from different groups for checking for malaria plasmodium parasites also early detection not means ,at all, standing on airports or any entrance gates of the country waiting those who are coming from endemic areas to collect blood samples from them for malaria checking, sure this is not the meaning of early detection. The real meaning for early detection of malaria case is the correct and accurate diagnosis for the examined sample for malaria when it is positive for malaria plasmodium parasites also we could define it as the ability of the medical lab technicians to diagnose without errors the positive blood films for malaria plasmodium parasites and identify the species

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of the plasmodium and can distinguish between the different stages for the same species and also for different species microscopically.

**Three elements must be available for creating Malaria infection, they are**

- A patient carrier Malaria plasmodium parasites
- Submitted person for mosquito bites
- Vector of disease (female An. species transmit Malaria)

These three factors seem to be like a three circles linked together to create the disease, so break off the link between any two of them will lead to eliminate the disease. Success controlling programs must use the suitable methods or procedures adapt each element, For the first element: treatment of Malaria patients and be sure they are given correct and complete dose of Malaria drug and following them up after treatment and checking the contacts of Malaria patients by microscopic Malaria tests. The mainstay of malaria diagnosis microscopic examination of blood, utilizing blood films by a trained microscopist. Although blood is the sample most frequently used to make a diagnosis. More recently, modern techniques utilizing antigen tests or polymerase chain reaction have been discovered, though these are not widely implemented in malaria endemic regions. Malaria microscopy is a skilled exercise requiring great care at each step of the standard operating procedures and precise visual and differential skills.

**Standard Operating Procedures Recommended by WHO**

**Kinds of blood film**

In microscopic diagnosis of malaria plasmodium parasites there are two kinds of blood films are used: thick and thin.

**The thick film**

A thick film is always used to search for malaria parasites. The film consists of many layers of red and white blood cells. During staining, the hemoglobin in the Red blood cells dissolves (dehaemoglobinization), so that large amounts of blood can be examined quickly and easily. Malaria parasites, when present, are more concentrated than in a thin film and are easier to see and identify.

**The thin film**

The thin film is used to confirm the malaria parasite species, when this cannot be done in the thick film. It is used to search for parasites only in exceptional situations. A well-prepared thin film consists of a single layer of red and white blood Cells spread over less than half the slide. The frosted end of the slide is used for Labelling. Use of the thin film as a label is no longer recommended. If slides with a Frosted end are not available, then details can be written on the thin film with a soft Lead pencil. Do not lick the end of the pencil during use (Table 1).

**Staining Blood Films with Giemsa Stain**

**Buffered water**

On properly stained blood films, malaria parasites can be seen clearly under the microscope. Before staining blood films, prepare the buffered water used to dilute the stain (pH 7.2).

**Giemsa stain**

Giemsa stain is an alcohol-based Romansky stain. It is purchased

ready to use or is made up at regional centers by skilled technicians and then distributed throughout the laboratory and malaria control programmer network. Giemsa stain is a mixture of eosin, which stains parasite chromatin and stippling shades of red or pink, and methylene blue, which stains parasite cytoplasm blue. White-cell nuclei stain blue to almost black, depending on the type of white blood cells.

**Staining blood films**

There are two methods of staining with Giemsa stain: the rapid (10%) method and the slow (3%) method. The rapid method is used in outpatient clinics and busy laboratories where a quick diagnosis is an essential part of patient care. The slow method is used for staining larger numbers of slides, such as those collected during cross-sectional or epidemiological surveys and field research (Figures 1 and 2).

**The Rapid (10%) Method**

This is the commonest method for staining 1–15 slides at a time. It is used in laboratories where a quick result to determine a patient’s malaria status is required. The method is efficient, but more stain is used.

**The Slow (3%) Method**

This method is less appropriate when a quick result is needed but is excellent for staining large numbers (20 or more) of slides. It is ideal for staining blood films from surveys or research work or batches of slides for teaching. It performs best when slides have dried overnight. The method is economical because much less stain is used (3% rather than 10%).

Malaria parasites	Incubation period in days
<i>P. falciparum</i>	7-14
<i>P. vivax</i>	12-18
<i>P. ovale</i>	12-18
<i>P. malaria</i>	18-40

Table 1: Incubation period of some malarial parasites.

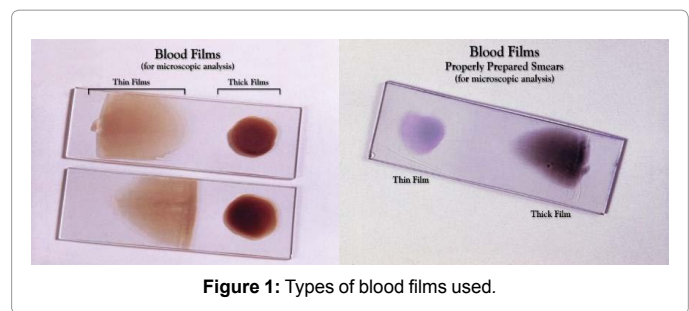


Figure 1: Types of blood films used.

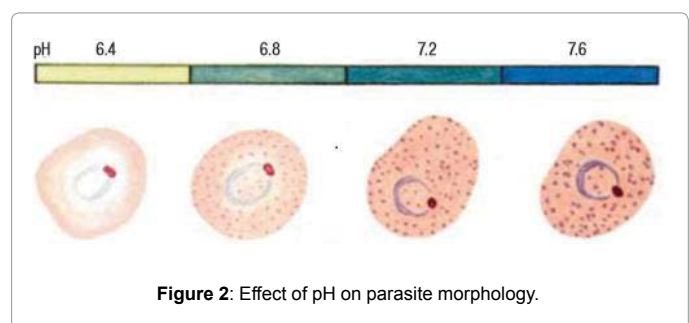


Figure 2: Effect of pH on parasite morphology.

### **Blood in Giemsa-stained thick films**

When a stained thick blood film is examined under a 100X oil immersion objective and 10X paired oculars, the viewer will see the remains of red blood cells, white blood cells and platelets. The white blood cells and platelets look much the same as in thin films, except that the cytoplasm around the nuclei is not visible.

A thick blood film consists of dehaemoglobinized red blood cells, layer on layer in a thick mass. When a thick film is stained, the water in the stain acts on the unpreserved red cells, and the hemoglobin in the cells dissolve into the water. This process is called 'dehaemoglobinization'. It can be observed when an unstained thick film is placed in a Petri dish of clean water. As soon as the slide enters the water, the red hemoglobin starts to flow out, leaving the thick film pale and opaque after a few minutes. This takes place during staining, and all that remains when staining is complete are the remnants of red blood cells, stained white cells and platelets.

### **Artifacts and contamination that can cause confusion**

A number of objects in blood films are seen that have caused some confusion, if we could not identify them as parasites we have probably wondered what they are. Some of these artefacts are more common than others and some are easier to prevent than others, from these artefacts: Fungus, bacteria, vegetable cells, spores, Giemsa stain crystals, scratches in glass slide.

### **Conclusion**

Early malaria case detection needs practical training program for medical laboratories technicians to present a skilled trainees whom we in need to in both of controlling programs the eradication one or the one after eradication, that is presence of a trained skilled microscopist is essential to keep an eradicated area free of malaria transmission.