

## ENTITLEMENT ELIGIBILITY GUIDELINES

### MALARIA

**MPC** 00142  
**ICD-9** 084

#### DEFINITION

Malaria is infection by a parasite of the genus *Plasmodium*, only 4 of which are infectious in humans, i.e. *Plasmodium falciparum*, *P. vivax*, *P. malariae*, or *P. ovale*. Malaria may be known as jungle, marsh, blackwater, and swamp fever.

#### DIAGNOSTIC STANDARD

Diagnosis by a qualified medical practitioner is required. A stained blood test for Malaria with thick and thin smears should be obtained, and copy submitted. If a person has a history of Malaria and the condition is no longer present, the diagnosis of "Malaria (resolved)" could be considered.

#### ANATOMY AND PHYSIOLOGY

The infection is initiated when plasmodia sporozoites are injected by female anopheles mosquito during a blood meal. Injection of infected blood is another mode of transmission. More rarely, infection may result from *P. knowlesi*, *P. simium*, and *P. cynomolgi* through mosquito bites, and infected blood (which may be transmitted by primate bites). The epidemiology of Malaria is complex and may vary considerably within relatively small geographical areas. Major epidemiologic determinants that have been identified include the immunologic and genetic makeup of the population, the species of parasite and mosquito in the community at risk, the temperature, the level of rainfall, the distribution of mosquito breeding sites, and the use of antimalarial drugs and application of other control measures. It has been found that patients living in endemic malarious areas commonly present with chronic hepatosplenomegaly of unknown cause, i.e. *tropical splenomegaly syndrome*.

## PREPATENT AND INCUBATION PERIODS

“Prepatent” means the period between infection and appearance of parasites in the blood. “Incubation” is the time between infection and the appearance of symptoms.

- A. **Prepatent and incubation period for *P. falciparum* malaria:** 7 to 14 days (mean 12 days) and may be prolonged further by immunity, chemoprophylaxis or partial chemotherapy. In Europe and North America, 65-95 per cent of patients with imported *falciparum malaria* present within one month of arriving back from the malarious area. A few present up to one year later, but none after more than four years.
- B. **Prepatent and incubation period for *P. vivax* & *P. ovale* :** 8-13 and 12-17 days respectively. Some strains of *p. vivax*, especially those from the temperate regions (*P.v. hibernans*, *P. v. multinucleatum*) may have very long incubation periods (250-637 days). The prepatent and incubation periods for *P. ovale* are 9-14 and 15-18 days respectively. *Vivax* and *ovale* malarias have persistent hepatic cycles which may give rise to relapses every 2-3 months for 5-8 years in untreated cases. Only about one-third of the imported cases of *vivax* malaria present within a month of returning from malarious area. More than a year later 5-10 per cent will present.
- C. **Prepatent and incubation periods for *P. malariae*:** 15 -16 and 18 - 40 days respectively. *P. malariae* is unique among the species in its ability to persist in the circulation at undetectable levels for long periods (up to 52 years in one case) without causing any symptoms. *P. malariae* does not relapse but persistent undetectable parasites in the blood may cause relapses (that is, development of clinical malaria as a result of replication of blood-stage parasites following a period of sub-clinical infection) for more than 50 years. Relapses of *P. malariae* infection have also been documented after patients have undergone splenectomy or received immunosuppressive drugs.

## PREVALENCE

- A. Malaria is the most important of the parasitic diseases of humans. As of the early 1990's it affected 103 endemic countries with a population of over 2.5 billion people and caused between 1 and 3 million deaths per year. It has been eradicated from North America, Europe, parts of the Middle East, and Russia; however, despite enormous control efforts, a resurgence of the disease took

place in many parts of the tropics. It occurs throughout most of the tropical regions of the world. A significant number of cases occurs in the Amazon basin, where *P. falciparum* predominates. *P. falciparum* also predominates in sub-Saharan Africa, New Guinea, and Haiti. *P. vivax* is more common in Central America and the Indian subcontinent. *P. malariae* is found in most areas but is less common. *P. ovale* infection is relatively unusual outside Africa.

- B. Information on Malaria morbidity during World War II is more comprehensive for the US troops; however one may assume similar rates of infection for the Allied forces in the same areas served by the Allied forces. In 1943, the annual Malaria rate was 84 per cent of the total strength of the British army and still higher among the forwarding troops. On the island of Éfaté, part of the Vanuatu Islands of the Pacific, the primary attack rate of malaria peaked for all U.S. and Allied forces in April 1942. In Espiritu, part of the Vanuatu Islands of the Pacific, the primary attack rates experienced for all Allied forces were in January 1943. Good information on primary attack rates was unavailable for Guadalcanal, Solomon Islands, until June 1943; however the total malarial attack rate, including all relapses, among all US and Allied forces was high in November 1942. The primary attack rate among all US and Allied forces on Bougainville peaked in December 1943.
- C. During the Korean War, *P. vivax* was the main malarial infection.
- D. In the Vietnam Conflict, the majority of cases was *P. falciparum* malaria rather than *P. vivax* malaria.
- E. In Somalia close to a hundred cases of Malaria have been reported in the US troops serving in Operation *Restore Hope*. The etiology was mainly *P. vivax* and a few *P. falciparum* cases. Patients with *falciparum* malaria had onset of symptoms an average of 34 (range 10-86) days after return to the US and 18 days (range 0-58 days) after discontinuation of prophylaxis. Patients with *vivax* malaria had onset at intervals of 60 days (range 12-119 days) after return and 42 days (range 0-102) days after discontinuation of prophylaxis. Most of the Malaria cases developed in troops stationed in southern riverine area of Somalia, where Malaria transmission is intense and is characterized by seasonal exacerbations from May to August and November and December.

## **CLINICAL FEATURES**

Malaria is a treatable disease using a number of anti-malarial medications, e.g. quinidine, Sulfadoxine-Pyrimethamine (Fansidar). The first clinical symptoms are

non-specific, including lack of well being, headache, fatigue, and muscle aching followed by fever as in a minor viral illness. Some persons present with headache, chest pain,

abdominal pain, arthralgia, myalgia, or diarrhoea. The classical Malaria paroxysm with fever spikes, chills and rigours occurring at regular intervals are rare. Many clinical abnormalities have been described in acute Malaria. Most uncomplicated infections have few abnormal findings other than mild anemia, and in some cases a palpable spleen. Symptoms commonly wax and wane. It is possible to contract more than 1 strain of Malaria without the signs and symptoms being distinguishable for individual strains. The literature suggests that only infection with *P. falciparum* is a potentially fatal disease, but fever, anemia and risk of spontaneous splenic rupture associated with the other infections could have serious consequences for certain persons.

Health Canada, in a 1996 report titled "Fatal *Falciparum* Malaria in Canadian Travellers", determined that approximately 90% of travellers who acquire *Falciparum* Malaria will not become symptomatic until they return home, and that malaria can progress from an asymptomatic state to death in 36 to 48 hours. Early recognition and appropriate management are stated to be critical, given the resurgence of malaria worldwide, increasing drug resistance, and travel and immigration patterns.

## **PENSION CONSIDERATIONS**

Application may be made for any disability that developed as a consequence in whole or in part as a function of Malaria, even where Malaria may have been successfully treated and would not constitute a "disability" under the operative legislation **but would be otherwise pensionable if it had resulted in a disability** (the *Pension Act*). In such cases the primary condition may be submitted with a descriptor noting its medical status, e.g. "Malaria (Resolved)".

### **A. CAUSES AND/OR AGGRAVATION**

**THE TIMELINES CITED BELOW ARE NOT BINDING. EACH CASE SHOULD BE ADJUDICATED ON THE EVIDENCE PROVIDED AND ITS OWN MERITS.**

1. Mosquito bites from an infected female anopheles mosquito
2. Injection of blood infected with plasmodia sporozoites

3. Inability to obtain appropriate clinical management

**B. MEDICAL CONDITIONS WHICH ARE TO BE INCLUDED IN ENTITLEMENT/ASSESSMENT**

**C. COMMON MEDICAL CONDITIONS WHICH MAY RESULT IN WHOLE OR IN PART FROM MALARIA AND/OR ITS TREATMENT**

- rupture of spleen

Although the following conditions normally resolve completely, in some instances, permanent sequellae may result and consideration for pensioned entitlement could be considered. Medical consultation(s) should be requested on the following:

- acute renal failure
- acute pulmonary edema
- convulsions
- bacillary dysentery
- cholera
- pyogenic pneumonia

## REFERENCES FOR MALARIA

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  - 4) Nicholas JW (1992) Writing in *Harrison's Principles of Internal Medicine* 12<sup>th</sup> Edition Pub. McGraw-Hill Inc. New York pg 783.
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4. Manson-Bahr, P.E.C., and D.R. Bell. *Manson's Tropical Diseases*. 19<sup>th</sup> ed. Toronto: Ballière Tindall, 1987.