Orthopedics and Rheumatology
Open Access Journal
ISSN: 2471-6804

Juniper Publishers
key to the Researchers

Research Article
Volume 5 Issue 3 – March 2017
DOI: 10.19080/OROAJ.2017.05.555662

Ortho & Rheum Open Access

Prevalence of Malarial Fever in Local Area of Mansehra

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Submission: March 14, 2017; **Published:** March 22, 2017

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Abstract

Malaria is one of the most severe life threatening disease worldwide. It is a leading cause of death and disease in many developing countries, where young children and pregnant women are the groups most affected. The methods of molecular biology, immunology, and cell biology are now being used to develop an antimalarial vaccine. The Plasmodium parasites that cause malaria have many stages in their life cycle. Each stage is antigenically distinct and potentially could be interrupted by different vaccines. However, achieving complete protection by vaccination may require a better understanding of the complexities of B- and T-cell priming in natural infections and the development of an appropriate adjuvant for use in humans. In fact, new antibiotic and possible vaccine are needed but the importance of effective anephelos mosquitoes control and education of the community is compulsory. Malaria kills 3000 children everyday world wide. In Pakistan, half million malaria cases occur annual are more affected in Khyber pakhtunkhwa province especially in distract Mansehra. Malaria is cause of estimated 50000 deaths each year worldwide mostly in infants, children and pregnant women, he added. In countries where Malaria is common, women are 4 times more likely to suffer malaria attacks during pregnancy resulting in low weight babies and stillbirths. Moreover, nearly 60% of miscarriages in hyper endemic areas are also due to malaria. Morocco a Muslim country remarkably reduced malaria cases to 00% Vector control measures; strong political will and Community participation are main way to reduce malaria transmission at the community level. It is the only intervention that can reduce malaria transmission from very high levels to close to zero. Malaria in Mansehra was mainly caused because of a lack of awareness and improper sewerage system and also unhygenic conditions. For this, a proper method of prevention and treatment should be designed which not only provide benefit to the patient and facilitate the physician but also provide an important socioeconomic benefit to everyone.

Keywords: Malaria; Anephelos mosquitoes

Introduction

The word malaria is a combination of two Italian words "Mala" means bad and "Aria" means the air [1]. It was the belief of that time (in 1753) that the bad air transmits the disease, inhalation of poisonous gases emanating from a marshy place was supposed to be the chief factor [2]. About Seven Million years ago, Malaria was identified as one of the most serious and deadliest among blood infections, particularly found in Chimpanzees, but in few hundred thousand years it was observed that malaria not only attacks on chimpanzees but also targets human beings swell [3]. Malaria is documented in a Chinese medical document Nei Ching (Canon of the drugs) about 2700 BC. Nei Chinwags abbreviated by Chinese royal leader *"Huang Ti" in which several clinical signs and symptoms were named as Malaria.*

In Fourth century BCE Malaria killed a large number of populations in Greece, hence it was hot issue of that time [4]. Ancient Greeks starts studies on Malaria. Empedocles of Agrigentum in 550 BC, Homer in 850BC while Hippocrates in 400 BC became conscious of the Malarial Signs and symptoms like Poor Health of the patients living in Marshy places, Enlargement of the Spleen and fevers etc. [5] Malaria was then called "fever and ague" in United States, because that time early American people were unaware about the parasites that transmits malaria [6]. USA has no historical roll in the tragedy of Malaria. It was estimated that in USA Malaria incidence was very high in 1875. But after 1914 more than 600,000 occurs per year. During Vietnam War and the World War II, Malaria was a serious issue in USA military campaigns. US military lost more time due to malaria than to ammunition and bullets [6].

In 1880 a French military doctor Charles Louis Alphonse Laveran examined the blood of a human being infected with Malaria and found Parasites in Red Blood Cells. For his discovery he was rewarded in 1907 with Nobel Prize [4]. An Italian

neurophysiologist Camillo Golgi (discoverer of the Golgi Bodies in the cell) suggested that the parasites (merozoites) that reside in the RBCs, upon maturity produce a large number of new parasites which are releases in the bloodstream. He also observed that there are about 2 types of the malaria infection, one with the fever of every other day (tertian periodicity) and a new with the fever of every 3rd day (quartan periodicity) In 1890 Raimondo Filetti and Giovanni Batista Grassi introduced the terms *Plasmodium malariae* and *Plasmodium vivax* for two of the malarial parasites whichattacks on human [4].

Laveran believed that there was only one specie that infects human being and named it as Oscillariamalariae but later on in 1897 William H. Welch identified malignant tertian malaria parasite and named it as *Plasmodium falciparum.* In 1922 Plasmodium knowlesi and *Plasmodium ovale* were identified by Biraj Mohan Das Guptaand Robert Knowles in long-tailed macaques (Monkeys). In 1965 the first case of human infection with *Plasmodiumknowlesi was reported. Later on in an experiment* Giuseppe Bastianelli and Amico Bignami collected mosquitos of the specie *Anopheles claviger* and they were fed by *Plasmodium*. As a result, an absolute sporogonic round of *Plasmodium malariae, P. vivax and P. falciparum* was observed. In 1899,infected mosquitoes that were fed by a patient in Rome, they were sent to London where they fed on 2 volunteers, as a result of which both of them were infected by malaria [4].

Malaria Parasite

A Single cell protozoon parasite which belongs to genus Plasmodium is the main cause of malarial infection. More than one hundred species of Plasmodium exists which cause malaria in humans, birds, reptiles and in chimpanzees' as well. There are about four species of plasmodium that infects human beings i.e. *Plasmodium vivax, Plasmodiumfalciparum, Plasmodium malariae and Plasmodium ovale* [7]. Moleculer studies revealed that *Plasmodium vivax* is derived from an antientparqaa site of macaque from Africa [8]. All the Malarial parasites have different morphologies and appearances, and can be differentiated from one another. They also cause different clinical symptoms [9] .

In high endemic areas there are many chances of multiple infections. At the same time two or more than two species of a parasite may attack a single host [9]. Among all plasmodium species, Infection with the *Plasmodium falciparum* is deadliest because of its severity of infection and serious complications [10,11]. It causes life threatening fever that leads to high level mortality in a population [9]. Any stage of the Red Blood Cells can be easily invaded by *Plasmodium Falciparum* which results in high parasitemia that makes it a virulent Parasite. Cerebral malaria, black water fever, non-cardiopulmonary edema, lower Glucose level, Anemia and acute renal failure are the most serious clinical manifestations that are linked with the infection of *P. Falciparum* [10,11].

The multiplication of the parasite is so high that they become twenty fold just in two days [12]. *Plasmodium vivax* is the 2nd most common parasite that is distributed worldwide and comparatively less severe than *P. Falciparum P. vivax* is mostly found in tropical areas especially in entire Asia [13]. *P vivax* affects about 75 million people worldwide. Most of the cases are in S. America and Asia [9]. *Relapse cases of the Plasmodium vivaxcan occur up to 3 years* [13]. Infection of the Plasmodium ovale is very rare, but sometimes found in W. Africa. Plasmodium malariae is *eliminated from temprate regions, aperson who is infected with the* Plasmodium malariae may be *asymptomatic (show no symptoms),* and the Plasmodiummalariae can stay in the blood for *decades without anymalarial signs and symptoms* [13]. In Pakistan only two species of Plasmodium are dominant i.e. *Plasmodium falciparum and Plasmodium vivax* [14].

Vector of the Malaria Parasite

In 1897 a British officer Ronald Ross studied on birds and mosquitoes, and suggested that malaria can be transferred from infected bird to healthy bird through Anopheles mosquito. This study revealed the secrets of the life cycle of the parasite that a part of the life of Plasmodium is spent in mosquitoes, later on it was termed as Sporogonic Cycle. Ronald Ross was then rewarded by Nobel Prize in 1902for his discovery [4].

Major vectors for the transmission of Plasmodium are *Anopheles funestus, A. bwambae, A. nili, A.merus, A. arabiensis and A. gambiae*. About six other speciesin *A. gambiae* also act as vectors of malarial infection in South and Eastern Africa [15-17]. Genus Anopheles of mosquitoes is an important vector of plasmodium transmission on islands and coastal areas of Southeast Asia. Molecular studies showed a large number of polymorphism in *A. funestus, A*n. Gambiae and *A. arabiensis* [18].

Vectors of Malarial parasites in Pakistan

Studies were conducted on the Plasmodium vectors of Pakistan which resulted that there are about 24 species of anopheles mosquitoes including A. sergenti, A. pulcherrimus,

A. *subpictus, A. dthali, A. culicifacies, An. pallidus, A. turkhudi, A. annularis, A. fluviatilis, A. stephensi, A. superpictus, A. multicolor, A. willmori, A. lindesayi, A. moghulensis, A. theobald, A. maculates, A. claviger, A. gigas, A.barianensis, A. splendidus, A. barbirostris, A. nigerrimus.*

B. *peditaeniatus, A. culicifacies and A.* stephensi are the species that gain resistance to many of the insecticides including Dieldrin, DDT, carbamates and organophosphates(malathion, fenitrothion) [19]. Primary vector species in Pakistan are A. culicifacies and A. Stephensi [20-23]. In Khyber Pakhtunkhwa province of Pakistan, a large number of *A. stephensi and A. culicifacies* were reported as vectors of plasmodium [24]. But the number of *A. stephensi* is much more then *Anopheles culicifacies*.

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Anopheles culicifacies is dominant in Punjab province of Pakistan. It is more active before September while it disappears after the month of September [20-24]. An. stephensi is a sub-tropical species which is distributed in the entire the middle east and South Asia. In Arid and Semi -arid zone of Rajasthan and Gujarat *A. subpictus* Grassi were found to be more common species [25]. An. stephensi is an exclusive vector of malaria in Pakistan, India and in Afghanistan. It has *an amazing* characteristic of proficient breeding in underground water reservoirs mostly in urban areas [26].

Epidemiology

Malaria is a tropical disease which worldwide distributed mostly in tropical areas, in entire Sub-Saharan Africa and in South Africa, South America Southeast Asia, India, Central America and Pacific Islands. Pakistan is located in the middle of the malaria belt around the globe encompassing tropical and subtropical areas [27]. Malaria cause approximately 8,63,000 deaths in 2008 and About 243 million malaria cases are reported every year [28]. *About 1.2 billion populations ofthe Pacific countries and South East Asia are at higher risk of malarial transmission, representing about one third of total world population* [29,14].

There are about 109 of malaria-endemic countries, where about 3.3 billion people are at risk for malaria. 50% of global population at risk for malaria, whereas 90% deaths in Africa are caused by Malaria in which 5.85% are children [30]. Plasmodium vivax is chiefly a widespread cause of malaria in Asia and Central and South America [31]. Probable figure of yearly malaria episodes in Pakistan is 1.5 million [28]. *Plasmodiumvivax* is *internationally distributed and is the chief species in many countries* [29,14]2.6 billion Population is at risk of vivax infection throughout the world [31]. Infection by *Plasmodium vivax is generally regarded as benign malarias with low mortality level* [29,14]. On the other hand, the rate of infection of the P. falciparum is comparatively narrower than that of Plasmodium vivax but it is the serious cause of mortalities in Pakistan. In 2005, falciparum malaria was one of the 33percent of reported definite malaria cases, this rate reduced to 24 percent in 2008 [28].

In 2004 the number of malaria cases were 103,416, in 2006 they were 124910, in 2007 they were 128570 while in 2008 the number of malaria cases were 104454 (WHO, 2005). Pakistan is a tropical country with the improper irrigation and dumping of garbage system and other wastes. Majority of the population of Pakistan live in rural areas where there is unhygienic environment, all these factors leads to malariogenic potential [29]. Because of a countrywide malaria eradication fight in 1961, malaria was almost eradicated in Pakistan for the period of 1960s with 9500 positive cases in 1967 but due to Financial and administrative crises and political disturbances Malaria again arouse in 1970s reaching epidemic level in 1972-73 [30].

It is estimates that the rate of malarial infections is enlarged by 40 percent in the middle of 1970 and 1997 in sub-Saharan Africa [31]. While the number of deaths due to malaria worldwide has decreased from 985,000 in 2000 to 781,000 in [32]. To deal with this infection, public health personnel selected cautiously many avoidance methods appropriate to a exacting area or environment [6] Latest studies reveled that there were 225 million cases of malarial infection and an estimated 781,000 deaths reported in 2009 [33].

About 300-500 million people infected with the malaria infection while 1.1 - 2.7 million deaths occur worldwide annually. Children under age group <5 years are more susceptible for the mortality rate caused by malarial infection. In 2004, 20 percent deaths of the children were reported [33]. In Eastern Mediterranean Region (EMR), there were 5.7 million confirmed malaria cases, of which 17% cases were registered in Pakistan [34]. In 2010, Due to flood estimated cases reported from Pakistan [35]. In 2003 Malaria control program stated serious outbreaks in many districts. This may clarify the elevated rates of authenticated cases in 2002 and 2003 in KP. By 2005 guidance had been imparted in 16 districts of KP. Improved investigative techniques (diagnostic tools) could have condensed false identification, and afterward report for the decrease in figure of confirmed malaria cases after 2003, and the outbreaks could have been controlled [36-41].

Transmission of the Parasite

Ronald Ross discovered in 1897 that the avian malaria parasite *Plasmodium relictum transmitted* by culicinemosquitoes. He suggested that human malaria may also be transmitted by mosquitoes. After his study and research then he proved that human malaria is indeed transmitted by anopheline mosquitoes. It was proved by many of the Italian scientist. Ross was a well-known military medical doctor he was operational in India till 1894 he didn't believed that a parasite is the cause of malarial infection that resides in blood, but Manson proved him with the malarial positive slides that this infection is actually a blood infection that is transmitted by blood meal of female *Anopheles* mosquito [5].

Life Cycle

Asexual Stage

Asexual stage begins when a female Anopheles mosquito (infected with malaria) bites a healthy human being and infuses the sporozoites in the bloodstream of that healthy person. These sporozoites move in the hepatic circulation and attack the liver cells [5].

Incubation Period

Incubation Period of the *Plasmodium vivax* & P. *ovale* is 14 days, P. *falciparum* 12 days while P. *malariae* has 30 days [4].

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Exoerythrocytic Schizogony

In liver cells sporozoites undergoes multiple rounds of asexual division as a result of which many uninucleated merozoites are produced. These merozoites released in the general circulation and attack on Red Blood Cells [5].

Erythrocytic Schizogony

Merozoites invade RBCs and each merozoite undergoes second phase of asexual multiplication as a result of which 8-16 new merozoites are produced in each RBC. Each new merozoite again invades a new RBC, this cycle continues and clinical manifestations (fever, Headache, Anemia) are appeared [5].

Gametogony

Some of the young merozoites are transformed into gametocytes (male and female) that flow in the peripheral bloodstream until they are gulp by a female anopheles' mosquito during blood meal [5].

Sexual Stage

In the gut of the mosquito ex-flagellation of the male gametocytes takes Place. Then both the male and female gametocytes become fuse together and converted in to a motile zygote. Zygote is then transformed into ookinete [5]. The ookinete then penetrate the wall of the gut and converted in to a conspicuous oocyst, which is then converted in to spookiest. Spookiest results in the development of sporozoites which migrate towards the salivary glands of female anopheles mosquito and are ready to be infuse in to the new host during blood meal of the mosquito [5] The life cycle of the plasmodium within the mosquito is about 8-35 days, after [4] Sometime the malarial parasites become dormant in the host body, show no signs and symptoms (Hypnozoite stage) parasite wakes up suddenly and cause attacks of malarial fever [42]. Human malaria is caused by any species of the plasmodium [43]. But In spite of human the parasitic *Plasmodium* species also infect rodents, birds, monkeys, chimpanzees and reptiles [44]. Number of White Blood Cells becomes low in the malaria infection [45].

Symptoms

Clinical symptoms and manifestations appear in the asexual stage of the parasite, mostly in Erythrocytic cycle when the parasite reproduces in Red Blood Cells. Parasite count in the blood is directly proportional to the clinical presentations [46]. Sometime the parasite remains inactive in the human body, intemperate areas one out of five cases of *Plasmodium vivax* began relapse in a year after mosquito bite, which is called thehypnozoite stage of the parasite [47]. Neutrophils are activated in the infection of *Plasmodium falciparum* which results in endothelial damage and organ failure [48]. Other clinical presentations in the Malaria infection includes Temperature, Headache, juindus, enlargement of spleen and liver, thrombocytopenia (platelets deficiency), diarrhea, apnea, respiratory distress [49].

Hemolysis cytokine disturbances and decreased rate of RBC production and maturation which leads to anemic condition or dyserythropoiesis (defective development of erythrocytes) [50]. Enlargement of spleen may lead to death of an individual [51]. Plasmodium infection is a major cause of paediatric anaemia in malaria patients. During Erythrocytic cycle when RBCs are under attack, Haemoglobin concentration becomes lower due to RBC destruction and also due to the removal of parasitized and non-parasitized RBCs [52]. When the Haemoglobin level become less or equal then 11.0 gm/dl then this condition may be termed as mild anaemia [52]. This criterion was used 1995 to investigate the anaemia burden [53]. When the Hb level becomes 7- 8 gm/dl, that condition is called moderate anaemia while if it is less than 5 gm/dl then the anaemia is called severe anaemia [52].

Methodology

Malaria Parasite Diagnosis

Diagnosis of malaria includes identification of *Plasmodium* or its antigens within the blood of the infected person. Malaria may be diagnosed by various techniques available commercially [54].

Microscopy

A gold standard technique and established method for the diagnosis of malarias is the Microscopy. But without technical expertise it may not produce a good result [55]. It is based on finger pricked blood which is poured on a slide, thin and thick blood films are prepared. Giemsa stain is used for staining then with the help of immersion oil slides are examined under x100 lens of the compound microscope [56,57]. But here me used only strip method for both *Plasmodium vivax* and *Plasmodium falciparum* against malarial patients in Mansehra during my four months of work.

Rapid Diagnostic Test

RDT tests are based on the finding of antigens of the malarial parasites in RBCs by using an immunochromatographic technique. RDT also called Immunochromatographic Technique (ICT). It is based on antigen-antibody interaction. For the field diagnosis it is very good and sensitive diagnostic technique. Malaria diagnosis is improved with the help of worldwide implementation of RDTs [28,58]. ICT tests that detect P. *falciparum* are based on histidine rich protein 2 (HRP-2), that is specific to *P. falciparum* While those that detect P. vivax are based on Plasmodium aldolase and *Plasmodium lactate* dehydrogenase (LDH) detection using monoclonal antibodies which start reaction with LDH of all species including P. *falciparum.* Trophozoites and gametocytes of the P. falciparum produced Histidine-richprotein II (HRP-II) which is a water- soluble protein. HRP-2 may persist in the blood for days or weeks after treatment, whereas LDH is only detected if live parasites are present. Parasite lactate dehydrogenase (pLDH) is an enzyme which is produced by gametocytes of plasmodium.

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Currently Test kits are available to detect pLDH from all four Plasmodium species. They can distinguish P. falciparum from the non-falciparum species, but cannot differentiate between P. vivax, P. ovale and P. malariae. Some of the RDT kits detect all four malarial parasites mention in their brand name or their marketing material only two species i.e. "PF/PV". This lead to confusion about their diagnostic capabilities [59]. ICT tests are obtainable in many designs like plastic cards, cassettes or dipsticks. The quality of the ICT format depends upon producer as well as on conditions in which it is being stored. This test is 90 percent more sensitive than microscopy. For the field diagnosis RDT/ ICT can tolerate temperature and humidity depending upon the manufacturer [58].

Mode of action

RDT format consists of a nitrocellulose strip, on which dye labeled specific antibodies are coated on a thin line for malarial antigen. And either antibody specific for the labeled antibody, or antigen, is bound at the control line. A drop of blood is poured on the nitrocellulose strip then a buffer is also added which flush the blood towards the antibodies. RBCs are lysed and the parasite antigen becomes naked and mixed with the labeled antibody. If there is specific antigen, that will react with the antibody on the strip and become visible in the test line. While other labeled antibodies will be tapped on the control line [32].

Results

A list of positive malarial fever patients of local area of Mansehra

During four months of work, 100 fever suffering patients were handled, there were only some patient that suffer from malarial fever. There are total 29 patients of malarial fever out of 100. In 29 malaria patients only 5 patient were suffering from P. Falciparum which is most severe and life threatening condition of malaria (Table 1).

Table 1: A list of positive malarial fever patients of local area of Mansehra

S.No	Patient I.D	P. falciparum	P. vivax	
1.		103		+
2.		108		+
3.		148		+
4.		149		+
5.		160		+
6.		209		+
7.		212	+	_
8.		232		+
9.		290		+
10.		300		+
11.		309		+
12.		323	+	_
13.		325		+
14.		380		+
15.		417		+
16.		470		+
17.		476		+
18.		480		+
19.		497		+
20.		498	+	_
21.		510		+
22.		512		+
23.		518		+
24.		532	+	_
25.		543		+
26.		555		+
27.		566	+	_
28.		578		+
29.		589		+

Treatment

For the development of malarial drugs sexual stages malarial parasites were cultured but they gain resistance to drug, as culturing of liver stages, were extra hard to accomplish, made it probable to build up and experimentally test the drugs in opposition to this stage, this provided significant information about the immune reaction in the liver. Finally, the culture of sporogonic stages has enabled researchers to discover that in the mosquito vector what happens to the parasite [5].

Two types of Treatment

i. Allopathic: Drugs that is required for malarial treatment includes sulfadoxine/pyrimethamine, mefloquine, atovaquone-proguanil, quinine or quinidine, clindamycin, doxycycline, chloroquine, and primaquine [60]. The artemisinin are the most effective medicines that have ever been invented for [32]. A lot of work has been done on malarial vaccines with limited success [61]. The circum sporozoite protein (CSP) is an antigen that is present on the outside of sporozoites, has been used broadly as an objective for the development of vaccines [62].

Intermittent preventive treatment (IPT) that is taken time to time regardless of malarial infection is recommended by the World Health Organization especially for pregnant women. IPT immune the body for the specific parasite encounters [43]. Malaria, especially Falciparum malaria, is a medical emergency that requires a hospital stay. Chloroquine is often used as an anti-malarial medication. However, chloroquine-resistant infections are common in some parts of the world. Possible treatments for chloroquine-resistant infections include:

I. The combination of quinidine or quinine plus doxycycline, tetracycline, or clindamycin

II. Atovaquone plus proguanil (Malarone)

III. Mefloquine or artesunate

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IV. The combination of pyrimethamine and sulfadoxine (Fansidar)

The choice of medication depends in part on where you were when you were infected.

Medical care, including fluids through a vein (IV) and other medications and breathing (respiratory) support may be needed.

ii. Homeopathic

a. Advantage of Homeopathic Treatment: Homeopathy is the science that takes a holistic approach to healing. Natural and safe, Homeopathic medicines are deep acting and have no side effects on the body. Unlike the conventional mode of medicine, Homeopathic medicines do not suppress the disease and its symptoms. In fact, they attack the disorder at the root and set off the body's own restorative processes, making it strong enough to completely eradicate the disease. Supressing the disease process makes it stubborn. Homeopathic medicines are a natural, healing alternative [62].

b. Homeopathic Medicines for Malaria: Top rated Homeopathic medicines for malaria are China, Arsenic Album and Chininum Sulphuricum. China is one of the most prescribed Homeopathic medicines for malaria at any stage of progression. The symptoms to look out for include chill in the mornings with debilitating night sweats. In malaria cases with high temperature with marked periodicity and great restlessness Arsenic Album shows the best results. Chininum Sulphuricum is most effective in malaria cases with great chill and shivering in the body [61,62].

a) Chininum Sulphuricum and Nux Vomica – Homeopathic medicines for malaria with marked chill and shivering (cold stage): Chininum Sulphuricum and Nux Vomica are two well indicated Homeopathic medicines for malaria with marked chilliness and shivering (cold stage). Chininum Sulphuricum is very effective where the chill occurs at 3 pm every day. The person experiences great shivering even in a warm room. For malaria in the cold stage, with blueness of fingernails, Nux Vomica is recommended as one of the most effective Homeopathic medicines. Also, in cases where the person feels chilliness on being uncovered, yet will not want to be covered, Nux Vomica is prescribed as one of the most effective Homeopathic medicines for malaria [62].

b) Boletus and Eupatorium Perfoliatum – Top Homeopathic medicines for malaria with profuse sweating (sweat stage): The most useful Homeopathic medicines for malaria with profuse sweating (sweat stage) are Boletus and Eupatorium Perfoliatum. Homeopathic medicine Boletus is prescribed in malaria cases with profuse perspiration, especially at night, along with severe chills and fever. Eupatorium Perfoliatum works as one of the best Homeopathic medicines for malaria cases where all complaints, except headache, are relieved by perspiration. The person experiences chills, mostly between 7 am and 9 am, preceded by strong thirst and aching bones [62].

c) Arsenic Album and China – Best Homeopathic medicines for malaria with high fever (heat stage): Malaria with high fever (heat stage) is attended well with Homeopathic medicines Arsenic Album and China. Arsenic Album is one of the most excellent Homeopathic medicines for malaria with high grade fever with marked periodicity. Great restlessness accompanying high fever that gets worse after midnight is also treated well with Arsenic Album. China is one of the most effective Homeopathic medicines for malaria with high temperature that returns every week. The person complains of chill in the morning with debilitating night sweats [62].

d) Natrum Muriaticum and Pulsatilla – Effective Homeopathic medicines for malaria with headache: Natrum Muriaticum and Pulsatilla are rated among the most effective Homeopathic medicines for malaria with headache. Natrum Muriaticum is prescribed in case of continued chilliness along with the headache, especially on waking in the morning. Malaria cases with headache that persists from sunrise to sunset are also best treated with Homeopathic medicine Natrum Muriaticum. In case of chill with pains in certain spots, especially in the evening, Pulsatilla is one of the best Homeopathic medicines for malaria. Complaints of wandering stitches in the head during sweat are also treated well with Homeopathic medicine Pulsatilla [62].

e) China, Alstonia and Ferrum Phosphoricum – Top grade Homeopathic medicines for malaria with notable weakness: The most prescribed Homeopathic medicines for malaria with notable weakness are China, Alstonia and Ferrum Phosphoricum. China acts well in all stages of malarial fever with great exhaustion. Debilitating night sweats with fever that returns every week are also treated well with China, making it one of the sought after Homeopathic medicines for malaria. Alstonia is a great Homeopathic tonic for debilitating and exhausting malarial fever. On the other hand, cases of chill occurring daily at 1 pm, with marked prostration, are attended well with Ferrum Phosphoricum, making it one of the most remarkable Homeopathic medicines for malaria.

iii. Prevention: With the discovery mosquitoes in the malaria transmission, provided researches with a new weapon against malaria. It is experimentally proved that by the reducing the contact of the healthy person with the infected persons declines the risk of malarial infection. Other methods to prevent the malarial infection include the distraction of mosquito breeding places, use of anti-mosquitoes oils and use of mosquito nets, appropriate clothing, mosquito repellents, particularly in the evening and after dark (long-sleeved shirts, trousers, socks, etc.) [32].

Biological control includes larvivorous fish that eatupon the lavas of the mosquitoes. Some entomopathogenic bacteria, such as Bacillus thuringiensis serovar. Israelensis (Bti) and

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Bacillus sphaericus (Bsph) are used to control the vectors. Chemoprophylaxis of Malaria is recommended for those people who travel to malaria-endemic areas and travel medical specialists must be contacted before travel. As malaria is a blood infection, blood donors must be properly examined for the history of malarial parasites [4]. People who are taking anti-malarial medications may still become infected. Avoid mosquito bites by wearing protective clothing over the arms and legs, using screens on windows, and using insect repellent.

Chloroquine has been the drug of choice for protecting against malaria. But because of resistance, it is now only suggested for use in areas where Plasmodium vivax, P. oval, and P. malariae are present. Falciparum malaria is becoming increasingly resistant to anti-malarial medications. For travelers going to areas where Falciparum malaria is known to occur, there are several options for malaria prevention, including mefloquine, atovaquone/proguanil (Malarone), and doxycycline.

Conclusion

From the obtained related study it may be concluded that malaria is a life threatening disease. Prevention and treatment should be designed which not only provide benefit to the patient and facilitate the physician but also provide an important socioeconomic benefit to everyone.

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How to cite this article: Muhammad Z k, Shahid I, Mujaddad U R, Azam H, Ayub J, et al. Prevalence of Malarial Fever in Local Area of Mansehra. Ortho & Rheum Open Access 2017; 5(3): 555662. DOI: 10.19080/OROAJ.2017.05.555662

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DOI: 10.19080/OROAJ.2017.05.555662

How to cite this article: Muhammad Z k, Shahid I, Mujaddad U R, Azam H, Ayub J, et al. Prevalence of Malarial Fever in Local Area of Mansehra. Ortho & Rheum Open Access 2017; 5(3): 555662. DOI: 10.19080/OROAJ.2017.05.555662