Iranian Red Crescent Medical Journal

Editorial

Malaria, Control and Diagnosis

In the third millennium in spite of considerable success in the control of human malaria, it still remains as one of the most important subjects of public health, so its reduction and complete control is one of the global health developmental goals. It is estimated that more than half of the world's population live in the endemic regions of malaria. Iran is in Eastern Mediterranean region, where mainly the population of three provinces in the Southeastern areas are exposed both to *Plasmodium falciparum* and *Plasmodium vivax.*[1, 2] Fortunately in the last decades, considerable attempts and suitable control policies were done by ministry of health and effective programs led to reduction of malaria and subsequently achieving a relative stability in control of the disease in Iran. In recent years, expansion of tourism, wars and also socioeconomic and political factors has resulted into higher numbers of imported malaria cases, in some regions of the world where a comparable increase of mortality has been generally attributed to late or wrong diagnosis.[3]To begin a successful control, a precise evaluation of the environmental distribution of the disease is needed.[4]

In this issue, two articles on malaria are reviewed. The first one is by Salehi *et al.* focusing on analysis of malaria epidemic features and trends in the Southeast of Iran (2005-2008). Their work is in Sistan and Baluchestan Province in the Southeast of Iran as one of the most important foci of malaria in the country reporting the annual cumulative numbers of malaria cases from March 2005 to March 2008 in this area. They reported that more than 50% of malaria cases in the last two years were in Chahbahar and Nikshahr towns in the South of the Province and *P. vivax* was the main and *P. falsiparum* the second causative agent of malaria with the mean incidence of 86% and 14 %, respectively. The investigators have also determined the annual parasitic index (API) and annual incidence rate (AIR) of malaria in various parts of the geographical region of study. The majority of cases were reported from rural areas and in males between 15 and 44 years old as the most likely age and sex group at risk. 15-20% of the total malaria cases had Afghani or Pakistani nationality. However this article confirmed the previous studies about the situation of malaria in Iran but such kinds of researches are essential and useful for forecasting any possible new epidemic situation of malaria in Iran. Accordingly, such surveys are extremely recommended.

Iran is located in a very important geopolitical district in the Middle East. It is situated in the west of Afghanistan and Pakistan as two important foci of malaria, involving very complicated political conditions including war, terrorism, prohibited migrations and opium traffic. There are thousands of Afghan refugees in Iran and annually thousands of forbidden trips from the wide borders between these two countries and Sistan Baluchestan Province are taking place. This report has confirmed the important role of migrants in imported malaria in Iran. Several important problems have been reported that are against malaria control programme (MCP) and subsequently malaria eradication programme (MEP) in the Southern parts of Iran. Including variation of malaria vectors, their different behaviors, resistance of the main vector against some insecticides, transportation issues, constructions of houses, socio-economic conditions, immigration from malarious neighboring countries and some other operational problems.[5,6] One of the main problems in the control of malaria is resistance of *P. falciparum* to chloroquine and some other antimalarial drugs, being now more or less common in the malaria endemic areas in the world.[7]

In Sistan Baluchestan Province a few chloroquine-resistant cases were found in the *in vivo* test in 1983,[5] and the resistance gradually increased in this district.[8] Since for years ago, national guideline for treatment of malaria has been continuously updated to confront these difficulties. Today, Artemisinin-based combination therapies (ACTs) are the most effective antimalarial and recommended for control of the disease in the endemic countries. [1]

It has been suggested that the first step in removal of malaria is planning a suitable strategy for its control in the countries on the borders of areas with high malaria transmission. Achieving considerable success in these areas could progressively roll back malaria. The literature shows that by present tools eradication is not accessible in areas where the transmission of malaria is high and stable.[9,10]

If we consider the studies in other malarious regions especially in Africa and South America, large size variations in intensity of malaria transmission was mapped across this regions by combining malariometric indices applying geographical information

systems (GIS).[11 12] This kind of study is very important and must be seriously started in the endemic foci of malaria in Iran as soon as possible.

The second article in this issue is in the field of diagnosis of malaria by Nateghpour *et al.* entitled "A parasitological and serological study in malaria suspected patients in Hormozgan Province, Southeastern Iran." Hormozgan Province is located in the Southeast of Iran. A total of 408 patients suspected to malaria symptoms were considered in this study by using conventional microscopic examination and serological IFA test. Microscopic examination showed that 17% were *P. vivax* and 1.7% *P. falsiparum* but in the serological survey this rate was 54.2% and 32.1% respectively.

Serological and parasitological surveys were undertaken on malaria in endemic areas and also comparison between the methods. Indirect fluorescent antibody method (IFAT) with *P. falciparum* and *P. vivax* antigens as well as microscopy examinations of the usual and concentrated Giemsa stained thick blood have been implemented in infected areas in Iran.[5]

A more precise test is examination of thick and thin blood slides by microscopy. This is highly sensitive and specific in specialist hands. However, because of absence of expertise in many labs, and negative results in the lack of parasites from the peripheral blood or in the low parasitaemia, IFAT and rapid diagnostic tests (RDTs) are now commonly used in addition to blood slides.[5,13] According to Nateghpour *et al*'s article, about one week after the parasites erythrocytic schizogony, the related antibodies can be detected in the blood by specific serological tests. The antibody level persists as long as parasitological crisis is observable. Finally, the levels of antibody reduce and they enforce that these two methods can be used together for detection of malaria infection in different scopes. It must be remembered that serological tests mainly detect the past history of malaria infection, but it is not helpful in detection of current infections. On the other hand, some false positives may occur because of cross reactions. The necessity of such study is very clear but could be done with some other complementary methods, including RDTs and nested PCR.

RDTs which are based on detection of parasite antigens or enzymes are now commonly used in addition to blood slides and can be recommended as an alternative method. Although they are slightly less sensitive than good quality blood films, they are easier for the non-professionals to use them for detection of *P. falciparum* infections. It must also be remembered that RDTs are not a substitute for microscopic tests and all patients ought to have microscopic examinations.[13]

Nested PCR is another reliable method which is recommended as specific and sensitive tools for diagnosis of malaria. Ebrahimzadeh *et al.* in their research in Sistan Baluchestan Province showed that nested PCR assay was more sensitive and specific than microscopy. The PCR detects not only all microscopy positive samples, but also several mixed infections and other infections missed by microscopy.[14] Finally such valuable studies that could lead to establishment of effective controls in the Southeast of Iran should be encouraged because our geopolitical situation is very important for control of malaria in Iran and subsequently Eastern Mediterranean region.

Keywords: *Plasmodium;* Serology; Malaria; Epidemic features; Iran

Conflict of interest: None declared.

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Received: December 25, 2009 Accepted: February 1, 2010

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