

RESEARCH ARTICLE

High imported malaria incidence at a Moroccan military hospital

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ABSTRACT

Objective: To evaluate the importance of imported malaria at the Moulay Ismail Military Hospital of Meknes, we have led a descriptive study of the epidemiological, clinical, biological and evolutionary characteristics of the registered malaria cases.

Methods: A prospective study was carried out at the Department of Parasitology from January 2011 to December 2012. In this study, we have included all the patients who were confirmed to have malaria through a biological diagnosis.

Results: The number of the studied cases was 30; two in 2011 and 28 in 2012. The incidence has increased from 128.4 to 1798.3 per 100,000 travelers during this period among travelers. The average age was 31.3 ± 7.2 years (range 20 and 48 years). In all the cases, malaria was contracted in sub-Saharan Africa. Twenty six cases were in peacekeeping military mission; 15 of them have traveled and stayed in Ivory Coast and 11 in the Democratic Republic of Congo. The main clinical sign was fever *Plasmodium falciparum* was observed in 20 cases (66%), *P. ovale* in seven cases (24%), *P. malariae* in two cases (7%) and a combination of *P. falciparum* and *P. ovale* in one single case (3%). All patients received per oral mefloquine. The post therapeutic evolution was marked by a unique death from acute pulmonary edema, which was due to *P. ovale*.

Conclusion: This high occurrence of malaria in our hospital is partially explained by the deployment of half of our military forces in various high risk fields. *J Microbiol Infect Dis* 2014; 4(2): 44-49

Key words: Imported malaria, military, ivory coast, democratic republic of congo.

Fas'ta bir askeri hastanede artmış ithal sıtma sıklığı

ÖZET

Amaç: Meknes, Moulay İsmail Askeri Hastanesi'nde ithal sıtma olgularını değerlendirmek için, kayıtlı olguların epidemiyolojik, klinik, biyolojik ve gelişimsel özellikleri araştıran tanımlayıcı bir çalışma başlattık.

Yöntemler: Bu çalışma prospektif olarak 01.01.2011 ile 31.12.2012 tarihleri arasında Parazitoloji Bölümü'nde gerçekleştirildi. Çalışmaya mikrobiyolojik olarak tanı konulan sıtma olgularını dahil ettik.

Sonuçlar: Çalışmaya 2011 yılında iki ve 2012 yılında 28 olgu olmak üzere toplam 30 olgu dahil edildi. Seyahat için gidenlerde sıtma insidansı bu periyotta her 100.000 kişiye 128,4'den 1798,3'e yükseldi. Yaş ortalaması $31,3 \pm 7,2$ yıl idi (20-48 yıl arası). Sıtma olguları Sahra-altı Afrika kaynaklı idi. Yirmi altı olgu barış gücü askeri misyonunda çalışanlardan 15'i Fildişi Sahili'ne ve 11'i Kongo Demokratik Cumhuriyeti'ne görevli gitmişti. Hastalarda en sık klinik belirti ateş idi. Olguların 20'sinde *Plasmodium falciparum* (% 66), yedisinde *P. ovale* (% 24), ikisinde (% 7) *P. malariae* ve tek olguda (% 3) *P. falciparum* ve *P. ovale* bir arada görüldü. Tüm hastalar oral meflokin tedavisi aldı. Tedavi sonrası takiplerde *P. ovale* ile enfekte olan bir hasta akut akciğer ödemi nedeniyle öldü.

Sonuçlar: Hastanemizdeki sıtma olgularının sık görülmesi askeri kuvvetlerimizin yarısının değişik yüksek riskli bölgelerde olması ile açıklanabilir.

Anahtar kelimeler: ithal sıtma, askeri, fildişi sahili, kongo demokratik cumhuriyeti.

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INTRODUCTION

Imported malaria may be identified as an infection, which has been obtained in an endemic region by a person (either a visitor or even indigenous person) but detected in a non-endemic country after progression of the clinical disease.¹ It can still pose a real risk particularly when the areas visited have a high transmission rates such as sub-Saharan Africa. The symptoms, including typically fever and headache, appear seven days or more after the infective mosquito bite. If not treated within 24 hours, *P. falciparum* malaria can progress to severe illness, sometimes leading to death. Each year, some 25-30 million international travelers from non-tropical regions visit malaria-endemic countries. Up to 10,000 cases of malaria are imported into industrialized countries, with an average case fatality rate of around 1%. An increasing proportion of imported cases have been seen in migrants and foreign-born residents visiting friends and relatives in endemic countries.²

In Morocco, imported malaria is becoming increasingly common. In fact, 312 cases were registered in 2011, 218 cases in 2010 and 145 cases in 2009.³ The patients were mostly in peacekeeping military missions, occasional Moroccan travelers to Sub-Saharan Africa, expatriates, and migrants living in Morocco and returning to their country of origin.⁴ Risk assessment requires basic knowledge of true risk among travelers with specific potential exposure related their travel destination and living conditions in endemic areas. The evaluation of the burden of malaria in health facilities, combined with an analysis of the epidemiological context can also provide useful data for malaria prevention.⁵

We have tried through this descriptive study to analyze the epidemiological, clinical, biological, therapeutic and evolutionary characteristics of the observed and confirmed malaria cases.

METHODS

This is a prospective study conducted in the laboratory of Parasitology-Mycology of the Moulay Ismail Military Hospital in Meknes during the period between 01/01/2011 and 31/12/2012. This hospital receives patients from the northern-east and east of the country. Our hospital has a capacity of 300 Beds. The total number of hospital admission during 2011 was 9782, and 10367 during 2012.

In most cases, the requests for laboratory examination in search of malaria corresponded to

soldiers who have been deployed in peacekeeping contingents. In Ivory Coast (IC) were 726 and in Democratic Republic of Congo (DRC) were 831. They are from different areas of the country and exercise for almost all southern zone where there are other military hospitals. All patients who were admitted for malaria were included into this study. The positive diagnosis was made on the presence of parasitemia on thick and the blood smear.

On a sheet of preset operations, for each patient, we recorded: age, sex, profession, place and length of stay in an endemic area. We also noted whether or not subjects have taken chemoprophylaxis, its nature and its observance. In clinical terms we collected the presence or absence of malaria history, the period between the return and the onset of symptoms and clinical signs. Parasitological and laboratory data including *Plasmodium* species and parasitemia were also noted.

We also collected information about the logistical requirements in relation to the prevention of malaria from military patients from IC and the DRC, in which were deployed two Moroccan contingents.

RESULTS

Patients admitted were 76 in 2011 and 69 in 2012 with complains which resembling malaria. During the study period, 145 medical analysis requests for *Plasmodium* in the laboratory were received and 30 of them were positive. Two cases in 2011 and 28 cases in 2012 were diagnosed. The incidence of malaria increased from 128.4 to 1798.3 cases per 100,000 travelers during the period 2011-2012. The average age of patients was 31.3 ± 7.2 years (range 20 and 48 years). All cases were male.

Twenty-eight patients were of Moroccan origins: Twenty-six were militaries in a peacekeeping mission in IC and the DRC. They were from central and northern parts of Morocco. They had been deployed in the southern zone of Morocco. They were admitted to our hospital either before they went on vacation after returning from the missions in sub-Saharan Africa, or during a subsequent permission they received in their original units.

In the DRC, two patients came from the town of Bunia, in which were deployed 51 militaries. The other nine cases had stayed in Dungeni far to the north of the country where there was a battalion of 780 men.

A battalion of 726 men was deployed in IC. The cases that were registered there in 2012 were

from the towns of Tai, Guiglo, Duekoue and Toulepleu located in the south of the country (Figure 1). Previously, including in 2011, three companies were positioned in Duekoue. The three other units were placed in Bouake, Divo and San Pedro.

All these soldiers stayed for six months in an endemic area and had reported good compliance of using antimalarial chemoprophylaxis. Two cases were civilians: a merchant in Republic of Center Africa and a worker in Equatorial Guinea. They had resided for several years resident in those host countries and they had opted for not taking chemoprophylaxis.

The remaining two cases were soldiers from the Republic of Center Africa. Being natives of these endemic countries, they were without chemoprophylaxis. They spent a month of their annual summer leave in their home country (Table 1). Nine of our patients (30%) had a history of reported malaria. They were infected and treated in mission locations (not having reported the offending species): five cases have stayed in IC, three in the RDC and one in RCA.



Figure 1. Ivory Coast map showing the various villages of deployment of the Moroccan military. Source: maps.google.com/

Table 1. Epidemiological data of the studied population

Origin	Professional status	Residence	n	Length of stay (months)	Chemoprophylaxis
Morocco	Military	IC**	15	6	Doxycycline
		DRC***	11	6	Mefloquine
	Civil	RCA*	1	11	Without
		Equatorial Guinea	1	12	Without
RCA	Military	RCA*	2	1	Without

*RCA: Republic of Center Africa, **IC: Ivory Coast, ***DRC: Democratic Republic of Congo

The average duration between the return from the endemic area and the onset of symptoms was 42 days; with a minimum of two days and a maximum of 182 days. There was an average of 23 days for *P. falciparum*, eight days for *P. malariae* and 100 days for *P. ovale*.

There was no noticeable delay between consultation and diagnosis of malaria in all the cases.

All patients presented fever (Table 2). Two cases had applied with a severe attack. The first case of infection with *P. falciparum* had a parasitemia of 8% and also had neurological signs. The patient was transferred to the intensive care unit and the recovery was favorable. The other case had infection with *P. ovale* with a parasitemia of 0.2% which was fur-

ther complicated by an acute pulmonary edema and the final outcome was fatal. *P. falciparum* was found in 20 patients (66.7%), *P. ovale* in 7 cases (23.3%) and *P. malariae* in 2 cases (6.7%). One case (3.3%) had an association of *P. falciparum* and *P. ovale*.

Table 2. Clinical signs observed in the studied population

Clinical criteria	n	(%)
Fever	30	100
Headache	23	76,7
Digestive symptoms	12	40
Respiratory symptoms	06	20
Neurological symptoms	01	3,3

The average parasitemia was 1%, with extremes from less than 0.01% to 8%. One parasitemia level was found at 4%, two others at 2%. The rest of parasitemia levels were less than or equal to 1% (Table 3). Of the 30 malaria patients, six cases (20%) had anemia and 28 cases had (93.3%) thrombocytopenia. Treatment consisted of the oral administration of mefloquine each eight hours and for three times; with three tablets taken initially, two tablets and finally one tablet.

Table 3. Relationship between parasitemia and the time between the return of the endemic area and the onset of clinical signs depending on the species

Species	n	Incubation period (days)	Parasitemia (%)
<i>P. falciparum</i>	20	23	0,95
<i>P. malariae</i>	2	8	0,8
<i>P. ovale</i>	7	100	1,4

DISCUSSION

The *P. falciparum* malaria has been eradicated in Morocco following the efforts of the national program against malaria initiated by the Ministry of Health and no indigenous cases of *P. vivax* has been recorded since 2004, which has raised the obtaining international certification of country freedom from malaria in 2010.⁶

Malaria represents a serious health hazard for travelers to areas of endemicity. International travel is growing rapidly worldwide and this growth is particularly fast in the world's emerging regions and tropical and subtropical areas reflecting in a significant number of imported malaria cases in countries in which the disease is not endemic.⁷ We report in this paper the epidemiological situation of imported malaria in our hospital especially observed in much of our soldiers on peacekeeping mission on sub-Saharan Africa for the period 2011 to 2012 comparing with other studies conducted in regions suffering from the same problem.

In 2012, the number of cases of imported malaria has increased in our hospital. The majority of cases were soldiers who stayed mainly in IC and DRC. Half of the Moroccan battalion that was engaged in the United Nation Operation in Ivory Coast (UNOCI) has changed the deployment locations in 2012. This had probably resulted in a higher incidence of malaria in these units: in 2011, soldiers were properly installed in sealed prefabricated shelters with nets; however, in the new sites they had

been temporarily housed in tents before the prefabricated housing constructions were completed. The significant proportion of malaria history cases both in DRC and IC demonstrates transmission high intensity.

Malaria cases observed in our training corresponded only to soldiers from the north-east and east of the northern part of Morocco. They had malaria during their first received permission systematically after returning from the mission or during a subsequent permission received in their original units in the southern zone. In "south-south" cooperation framework, many Moroccans are in sub-Saharan Africa as a destination either to trade or to work in particular Moroccan companies that have invested in this part of Africa. The two Moroccan civil cases in our series illustrate the malaria risk to which this socio-professional category is exposed to. Similarly, Morocco receives students and sub-Saharan military trainees. They, after a period of non-exposure to malaria, gradually lose their acquired immunity to the disease.⁷ Therefore, once back to their native country during holidays, they become exposed to malaria. The two Central African militaries are a case in point.

The incidence of malaria in our hospital increased from 128.4 cases in 2011 to 1798.3 cases per 100,000 travelers in 2012. It was affirmed by the malaria program in the WHO European Region that the number of imported malaria cases was increased between 1972 and 1988 (from 1,500 to 12,000 cases). Adding to that, a more gradual rise was reported in 2000 (15,500 cases) including France, the UK, Germany and Italy estimated for more than 70% of all cases.⁸

Another study reported that the crude risk concerning travelers varied from 1 per 100,000 travelers to Central America and the Caribbean to 357 per 100,000 in Central Africa.⁷ One study performed in Jiangsu Province of China between 2001 and 2011 showed also a consistent increase in the number of malaria cases imported from other countries. This trend may be attributed to the increasing investment from China to Africa and the rising number of Chinese laborers working in Africa.⁹

In 26 EU (European Union countries) and one EEA (European Economic Area)/EFTA (European Free Trade Association) countries in continental Europe, it was confirmed 6049 cases of malaria during 2009 leading to an increasing trend in the number of imported malaria cases compared to 2008 (5912 proved cases). The major part (about 80%) of

these cases were reported by France, United Kingdom, Italy and Germany.⁸

In our series, the clinical signs appeared in the first quarter, especially the first three months after the return. This period was shorter for *P. falciparum* and longer for *P. ovale*, which is similar to the results found for the French militaries in Ivory Coast and reported by Migliani R and al.¹⁰

Fever was the major symptom of our cases (Table 2). This highlights that above all, it is neces-

sary to seek malaria during any classic fever after returning from an endemic area. The presence of this sign associated with headache and / or digestive, respiratory or neurological disorders increase the probability of diagnosing this disease especially if these symptoms occur during the six months after returning from the endemic area. Like the case series reported by the other studies with *P. falciparum* was the most predominant species similarly in our series (Table 4).¹⁰⁻¹⁵

Table 4. comparative table of various studies on military troops returning from malarious areas

	Moroccan military of our serie (n=26)	Tunisian military (n= 37) Ajili F et al. ¹⁴	French military (n= 12) Bellanger AP et al. ¹⁵
Endemic countries visited	IC, RDC	IC, RDC, Rwanda	IC
Mean age (years)	31,3	41	ND
Sex	Male	Male	ND
Chemoprophylaxis compliance (%)	100	51	60,4
Clinical signs (%)	Fever	100	ND
Species (%)	<i>P. falciparum</i>	66,7	50
	<i>P. ovale</i>	23,3	35,7
	<i>P. vivax</i>	0	0
	<i>P. malariae</i>	6,7	14,3
	Mixed	3,3	0
Parasitemia (%)	<0,01 – 8	3 – 6	ND
Attack rate (/100.000)		1798	10900

ND: not determined

Besides, this is the most dangerous kind because of the risk of cerebral malaria. Taking care of our patients on time avoided severe changes that are sometimes due to this species. The second found species was *P. ovale*. This is comparable to a Tunisian and French studies which *P. ovale* was the second species found in the military returning from Sub-Saharan Africa.^{14,15} The possibility of developing hypnozoites in the liver, which can delay the passage of parasites in blood and delay the onset of symptoms for this species, could lengthen the time to onset of clinical signs.⁷ Indeed, one of our patients with infection due to this species had a delay of the onset of symptoms of 6 months. The non-responsiveness of hypnozoites to drugs used for chemoprophylaxis made this last less effective for prophylaxis against this plasmodial type. The species *P. malariae* found in both cases is also characterized by its long incubation and chemoprophylaxis

is also less effective. In the series of Migliani and al that included 49 cases infected with *P. malariae*, the median time to the onset of symptoms was 98.5 days. However, for our series comprising only two cases, average time was only 8 days.^{11,12} This difference is due to the small number of patients in our series.

Parasitemia observed in our patients (1%) is low compared to the Tunisian study which ranged between 3% and 6%.¹⁴ Its could be explained by the effectiveness of the military awareness to seek urgent consultation of any symptoms such fever appear right after returning from malarious areas.

Given that the patient was non-immune, hospitalization was systematic and treatment was done by mefloquine orally. Resistance to this drug has not yet spread to Africa as it is the case in Southeast Asia. This remains the drug of choice in our context. The death implored among our cases and due to

P. ovale was a bit unusual, rare serious cases due to this species have been reported in the literature. This imposes the fact not to neglect infections due to species other than *P. falciparum*.¹¹⁻¹⁵

This study has limitation. Almost all cases concerned by this study corresponded to the military native from the north-east and east of the country and developed malaria during their leave home. We have no idea about the incidence of the disease among those native from other regions who have diagnosed in other hospitals. So it was impossible to assess the incidence of malaria in the whole of the military that have stayed in IC and the DRC. In addition to that, the high incidence of imported malaria from IC observed in 2012 in our hospital may be related not only to housing conditions. Other factors could also be contributing such as the proximity to water points and to the affected autochthonic people in the endemic regions and the annual rainfall in 2011 and 2012 area.

The increase in the number of malaria cases experienced in our hospital could be explained in part by the change in deployment locations for the half of the members of the military who are in mission in IC. However, the increase in the number of cases from the DRC remains unexplained.

In conclusion, malaria is a major and recurrent problem for the military (and travelers). Even with regular education about the disease and the need for preventive measures, the results are still unsatisfactory.

Conflict of interests: None

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