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Pattern of National and International Importation of Malaria Infection: Jeddah Province, Saudi Arabia

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Abstract

Background: understanding the epidemiological characteristics of imported malaria help the workers in the field of international health as well as the decision makers to establish a comprehensive strategies for the prevention and control of imported as well as local malaria.

Aim and Objectives: the study aim to describe epidemiological pattern of malaria cases in terms of seasonal variation, commonest causative parasite as well as identifying both external and internal original source of infection in Jeddah Governorate at western region of Kingdom Saudi Arabia.

Methods: through a retrospective study design, all records of confirmed cases of malaria between 1998 and 2006 were obtained from the Health Directorship of the Ministry of Health and vector control department in Jeddah Province (n= 2210). Data were collected through a constructed checklist; coded and analyzed using Statistical Package for Social Science version 20.0 (SPSS program).

Result: The epidemiological curve showed sharp decline in the number of confirmed cases starting in 1998 and continued till 2000 where the curve showed sloppier trend till 2004 then plateau at low level till 2006, the curve pointed to salient bimodal seasonal elevations on February and October. Most of the internationally imported cases in the period from 1998 to 2002 were from Sudan, in contrast with the period from 2003 to 2006 where most of the cases were imported from Yemen. Locally, most cases were imported from Gizan in the south western region of the Kingdom.

Conclusion: The study illustrates that malaria prevalence in Jeddah has shown a remarkable decrease in recent years, probably due to active malaria control program. Most of internationally imported cases come from Sudan (51.6%), but starting from year 2003, cases from Yemen become more, that might be attributed to the increased number of Yemeni workers than Sudanese in the western region due to the shared borders and

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some of them are entering the Saudi borders illegally. The most prevalent organisms is Plasmodium Falciparum.

Keywords: Malaria, Plasmodium Falciparum, Saudi Arabia

1 Introduction

Malaria has been known for more than 3500 years, primarily found in Africa, Asia, South and Central America (1). Currently, up to three million deaths are reported annually worldwide due to Malaria infection; with Africa having the majority of this burden (2), and an estimated new cases ranging between 300 to 500 million. Most of the deaths occur in Sub-Saharan Africa where Malaria is endemic and the most causative parasite is Plasmodium Falciparum (3). Malaria is also recognized as a significant problem for travelers to endemic areas (1).There is noticeable increase in the number of imported Malaria cases acquired by international travelers due to increased number of travelers to Malaria endemic areas (4). Annually 25-30 million people from non tropical countries visit areas where malaria is endemic, about 10,000 to 30,000 of those travelers contract malaria (5). Therefore, Malaria is still viewed as a real threat to international travelers to endemic areas with high transmission rate, especially among migrants and foreign born residents visiting friends and relatives in endemic counties (6).

1.1 Diagnosis and Screening of Malaria

Thin and thick blood film microscopy are the gold standard for malaria diagnosis. Recently there were more developed diagnostic tests which have sensitivities and specificity equal or higher than thin and thick blood film, these tests includes fluorescence microscopy of malaria parasites, dipstick immunoassays which detect species specific parasite antigens and detection of parasite nucleic acids after amplification by PCR, the later is the more specific and sensitive diagnostic tests for Plasmodium Falciparum DNA or RNA than any other tests (7). Because Malaria is a blood parasitic disease that might transfer through blood transfusion, preventive measures have been undertaken to screen blood donors according to medical history and travel history (8). Furthermore on global scale malaria remains one of the most common transfusion transmitted infections which might have serious fatal consequences in particular with Plasmodium Falciparum that was proven rapidly fatal in some cases (9).

Malaria control and program progress: In Saudi Arabia, although Malaria was eliminated since 1970 in the eastern, central and northern regions and only imported cases were reported (10); it is still endemic in Asir region and the Southwestern Province probably due to its geographical proximity to Yemen where there is a continuous importation of Malaria (11). In 2003 a total of 1724 confirmed cases were reported, of which 582 were domestic, therefore and in order to eliminate the parasitic infection from this area, an elimination strategy was launched in 2004 to interrupt local transmission by 2010 and to prevent resurge of malaria in malaria free areas (10;12).

Among other approaches, this strategy endorsed mutual coordination between Saudi and Yemeni parts, particularly regarding exchange of information about confirmed Malaria cases; the commitment included in addition, standardizing malaria drug policy and

training of Yemeni public health personnel at Jazan national training centers (10). The adopted strategy resulted in marked reduction of local cases, in 2005 after one year of its commence, only 204 local cases were reported (12).

Geographic and meteorological factors play crucial role in existence and distribution of Malaria in Saudi Arabia, for example, while the risk exists in rural and urban areas of the Tihama coastal region and the Asir highlands in the southwest (Jazan, Asir, and Al Bahah Provinces), risk in the western provinces (Makah and Al Medina) is limited only to rural valley foci in the Hejaz Mountains. In endemic areas, transmission occurs year-round, with a seasonal peak from October through April (13). The primary vectors in endemic areas are An. sergentii and An. arabiensis; both feed on humans indoors. Plasmodium falciparum causes over 80 percent of the indigenous cases, with P. vivax causing nearly all other cases. A low level of chloroquine-resistant falciparum malaria is suspected in the southwest. (Resistance has been confirmed in adjacent areas in Yemen.). In non endemic areas, imported cases generally are attributable to expatriate workers (13).

Subjects and methods : Data were collected from the period between 1998 and 2006. The records were obtained from the Health Directorship of the Ministry of Health and victor control department in Jeddah. A total of 47303 blood samples were taken as suspected cases of malaria during a period of 9 years, the confirmed cases were 2210. Data entry and statistical Data were collected through a constructed checklist, Coded and analyzed using Statistical Package for Social Science version 20.0 (SPSS program).

Ethical considerations: The collected data of the patients will be kept confidential and it will not be disclosed except for the study purpose.

2 Main Result

There is a Sharp decline in the number of confirmed cases starting in 1998 and continued till 2000 where the curve showed sloppier trend till 2004 where the curve continued almost as a plateau at low level till 2006 [Figure 1] and the epidemiologic curve showed bimodal seasonal elevations on February and October [Figure2]. Locally, most of the cases were imported from Gizan in the south western region of the Kingdom, while most of the internationally imported cases were from Sudan (51.6%) and Yemen (27.74%) in the period from 1998 to 2002, a reversed proportions were recorded in the period from 2003 to 2006 where the cases imported from Yemen represented (43.8%) and those from Sudan (33.18%).

Of all cases, the most prevalent organisms was Plasmodium Falciparum (71.35%), followed by Plasmodium Vivax (28.37%) and the least was Plasmodium Malaria (0.22%).The overwhelming majority of the cases (81%) were older than 15 years.

Comparison of present and prior data of malaria prevalence in Jeddah has shown a remarkable decrease in recent years.

Major seasonal elevations can be detected in the prevalence of malaria in the province of Jeddah at February and October. Therefore an active fight against malaria is still carried out.

Classification of the cases according to their origin (local or immigrant) shows that:

Most of locally imported cases come from Gizan, Most of international imported cases come from Sudan (51.6%) and Yemen (27.74%), and this is from year 1999 until 2002, But starting from year 2003 until 2006 the number of imported malaria cases from Yemen (43.8%) is becoming more than malaria cases from Sudan (33.18%). Cases of imported

malaria peaked in the late 1990s (1998) to around 1577 (71.35 % Plasmodium falciparum) annually. Of all cases most prevalent organisms is Plasmodium Falciparum 71.35%, followed by Plasmodium vivax 28.37% and Plasmodium malaria 0.22%. The most prevalent age group that is subjected to Malaria is older than 15 years were it constitute (81%) of all cases.

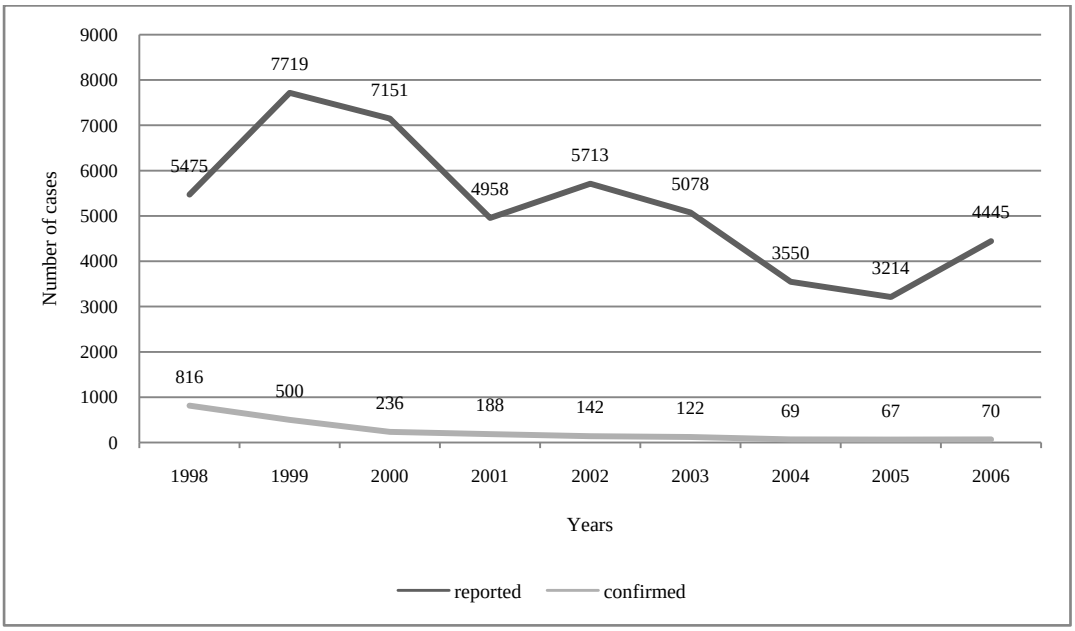

Figure 1: Confirmed malaria cases reported in Jeddah in the period from 1998-2006.

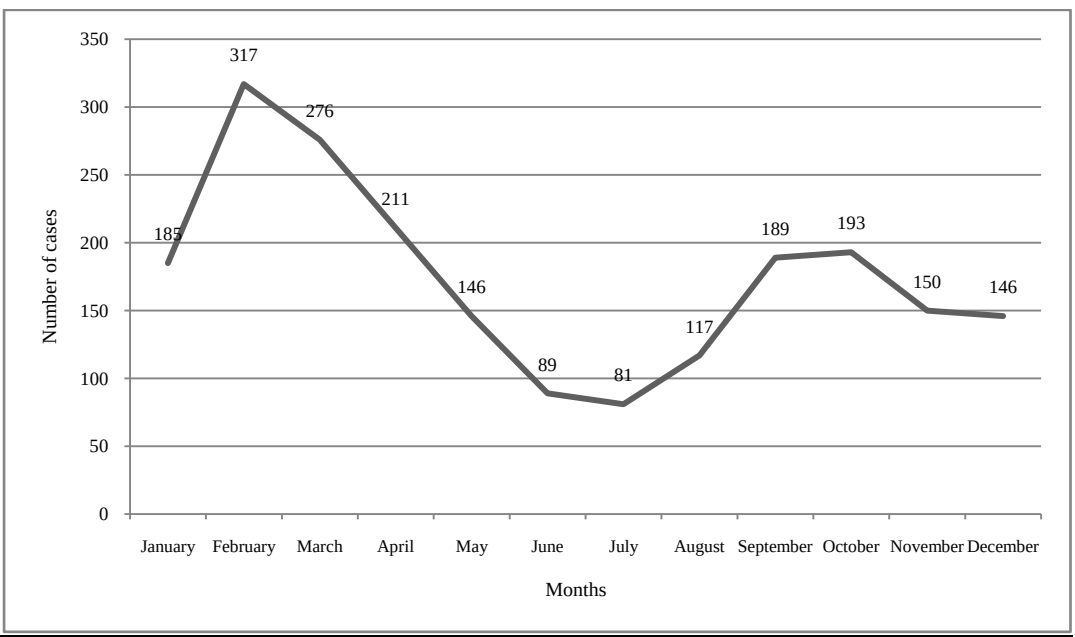

Figure 2: Seasonal bimodal distribution of confirmed malaria cases in the period from 1998-2006.

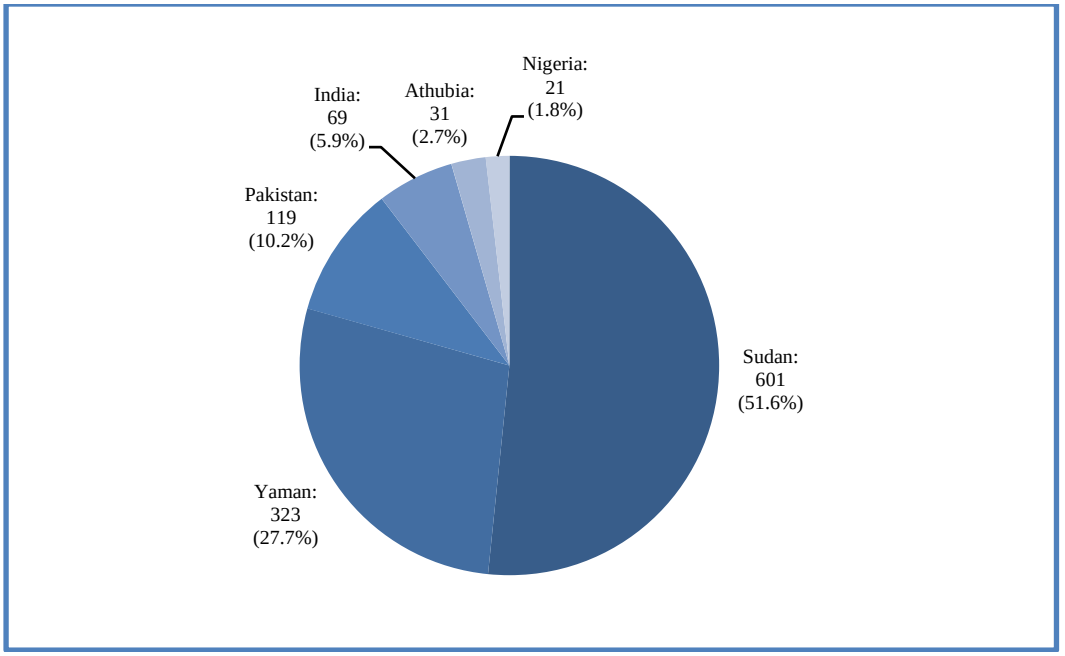

Figure 3: Proportional distribution of imported malaria cases according to countries in the period from 1998-2006.

Table 1: International Imported Malaria cases in Jeddah 1998-2006 according to Country

	1998	1999	2000	2001	2002	2003	2004	2005	2006	No (%)
Pakistan	**37**	**20**	**9**	**10**	**12**	**13**	**7**	**6**	**5**	**119 (10.20%)**
Yemen	**43**	**58**	**58**	**42**	**23**	**32**	**18**	**21**	**28**	**323 (27.74%)**
India	**40**	**8**	**9**	**3**	**1**	**1**	**-**	**4**	**3**	**69 (5.92%)**
Sudan	**100**	**235**	**72**	**71**	**48**	**26**	**16**	**16**	**17**	**601(51.63%)**
Nigeria	**4**	**6**	**3**	**3**	**4**	**-**	**-**	**-**	**1**	**21 (1.80%)**
Ethiopia	**-**	**6**	**1**	**5**	**7**	**11**	**1**	**-**	**-**	**31 (2.66%)**

3 Discussion

Malaria is currently considered the world's most important parasitic infection. The global impact of malaria is incalculable and appears to be worsening over the past decades (4). Although most of this burden of disease is carried by developing tropical countries, cases of imported malaria acquired by international travel are increasingly reported. Saudi Arabia, as being the land of the two holy mosques, receive about three million individuals annually from over the world who come for Hajj or Umra, some of them are coming from endemic areas. Putting into consideration existence of the vector, therefore continuous monitoring is vital for preventing resurge of the disease. The sharp decline in the spread of malaria in Jeddah along the past period could be attributed to the active malaria control program deployed by the preventive health and vector control department; this program is

endorsed as a part of the national vertical program aiming at elimination of malaria from the Kingdom which is adopted from WHO guidelines, the program includes mostly indoor spray, insecticide-treated nets, dealing with breeding places and improved patient care which proved its effectiveness in decreasing mortalities in sub-Saharan Africa by 33% (14). The results of the current study is supported by what was stated by the National Center for Infectious Diseases which pointed to the decrease in the number of cases reported in Africa and Asia in 2004 than 2003 (15). Yet, the continuity of success of the program is challenged by imported cases especially from the southern border of the Kingdom from Yemen where malaria is endemic (16). The movement of individuals seeking work in the Kingdom across this border is accepted as a substantial risk for importation and resurge of the disease (17). This movement and shifting of individuals across the borders showed itself in the results of the current study in the remarkable preponderance of the reported malaria cases among Yemenis. This claim explains also the existence of malaria in the southern region of the Kingdom adjacent to Yemen particularly in Gizan.

The salient seasonal elevations observed in the current study are not different from what was reported in other studies (18;19); these studies put forwards several explanations to clarify reasons of the seasonal variations; most of which are principally conceptualized around the impact of the meteorological factors on the biology and life style of the vector; it points to the modified breeding habits of the vector according to the wet or dry seasons. The intense transmission occurring during the wet season reflects the availability of suitable larval sites for the mosquitoes which is usually rain-dependent (20;21). The two episodes observed in the current study, particularly the first one which usually occurs in February coincides with the optimal rainy season in the Kingdom (22).

Classification of the cases according to their origin (domestic or imported) showed that most of the imported cases come from Sudan, Yemen and Pakistan; these results are partly consistent with what was found by Al-Khalifa in a study conducted in Riyadh in 2003 (13) to explore the pattern of imported malaria; it showed that most of the imported cases were from Sudan, India, Pakistan and Yemen.

In most of the cases reviewed within the study period, Plasmodium Falciparum was the commonest identified organism followed by Plasmodium Vivax, which were consistent with what was reported in previous study in Saudi Arabia in 2002 (23). The same distribution of the commonest organisms in terms of popularity was found also in similar studies, for example, in Japan, it was found that almost 45% of the cases are caused by Plasmodium Falciparum and another 45% by Plasmodium Vivax infections; the former species is likely to be seen in travelers coming back from African countries and the latter is mainly from Asian countries (24). However, the findings of the current study contradict what was reported in Qatar where they found that P. Vivax is the most common cause of imported malaria which are mainly acquired from the Indian subcontinent (25); this difference points to the variation in the commonest nationalities of expatriates who are coming to work in the two countries.

The peak of imported malaria cases recognized in the late 1990s (1998) which reached to about 1577 cases which were mainly caused by Plasmodium Falciparum came in accordance with a study done by Bashwari 2001 in eastern region of Saudi Arabia 2001 which showed that frequency of cases was observed in the years 1992, 1994 and 1998 and 40% of the cases were diagnosed during the months of February, March and September (26).

4 Conclusion and Recommendations

Imported Malaria infections still poses a significant health problem. A high index of suspicion should be maintained in those with suggestive travel history. Implementation of health education program to resident of the Gizan city as most of locally imported cases come from there. Increase awareness of Malaria preventive measures in Jeddah city especially during Major seasonal elevations from October to April. Efforts to reduce the incidence of transfusion malaria should aim at formulation of appropriate policies for selection of blood donors and for screening of blood.

Prompt diagnosis and treatment is necessary. Chemoprophylaxis, when traveling to endemic areas is mandatory, as well as the use of other primary preventive measures to protect against mosquito bites.

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