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Original Article

A retrospective study of Malaria and its effect on Hematological indices in a hospital in Jizan, Saudi Arabia

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Abstract: Malaria is a leading cause of morbidity and mortality with a major public health importance. Nearly half of the world population is at risk of malaria. In Saudi Arabia, a series of malaria outbreaks occurred in Jizan area and vigorous action was taken by the Saudi Ministry of Health to control malaria in this area. This study aimed at investigating the incidence of malaria Jizan area in 2014 and the effect of malarial infection on several hematological indices. Data were retrospectively collected for the year 2014 from Samtah General Hospital for all malaria positive cases. A total of 44 patients results were obtained for those who were diagnosed as positive for malaria together with their hematological indices and demographic data. A total of 3674 cases were suspected of malaria and only 44 cases were positive. The highest peaks of malaria cases were seen during the months of March and December. A statistically significant reduction in the WBC and Platelet count was observed in malaria positive cases. This study suggests that the malaria control in Jizan area be continued. Providing highly qualified lab personnel and microscopist in the area is very beneficial in order to achieve the malaria eradication goal.

Keywords: Malaria, *Plasmodium falciparum, Plasmodium vivax*, Saudi, Jizan.

1. Introduction

Malaria is a leading cause of morbidity and mortality with a major public health importance [1-3]. Nearly half of the world population is at risk of malaria [4]. Globally, an estimated 3.3 billion people in 97 countries and territories are at risk of malaria, and 1.2 billion are at high risk. The disease is concentrated in low-income and lower income countries and the most severely affected communities are those that are the poorest and most marginalized. In 2013 the disease caused an estimated 219 million cases and 660,000 deaths with almost 80% of the cases and 90% of the deaths reported from Africa [4].

There are many risk factors that play important roles in the transmission of malaria. Of these factors, the socio-economic factor and its influences seem to be the most repeated factor in many studies that has investigated the prevalence and transmission of malaria [4-10]. Moreover, almost every country is striving to reduce the prevalence of malaria and eradicate the disease. The World Health Assembly and Roll Back Malaria (RBM) targets for malaria control and elimination aim to achieve at least a 75% reduction in malaria incidence and deaths by 2015 [1, 11-12].

In Saudi Arabia, a series of malaria outbreaks occurred in Jizan area and vigorous action was taken by the Saudi Ministry of Health to control malaria in this area [13-14]. The prevalence of malaria decreased in Jizan in the past 7 years. In 2007 there were 1794 cases of malaria reported in Jizan compared to 631 cases reported in 2013 [15-21].

This study aimed at investigating the incidence of malaria and the causative species in Samtah General Hospital in Jizan area in 2014 and the effect of malarial infection on several hematological indices.

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2. Materials and Methods

Parasitological and hematological data were retrospectively collected for the year 2014 from Samtah General Hospital for all malaria positive cases after obtaining the required research ethical approval. A total of 44 patients results were obtained for those who were diagnosed as positive for malaria after being confirmed by thick and thin blood films. Their hematological indices, including WBC, RBC, Hgb, Hct, MCV, MCH, MCHC, and Platelet count were obtained. Moreover, demographic data were also obtained. Data of representative negative controls were also obtained as 4-5 control samples for every month.

Data were processed by computer and statistical analysis was performed using SPSS.

3. Results

Parasitological and hematological data were retrospectively collected for the year 2014 from Samtah General Hospital for all malaria positive cases as described above.

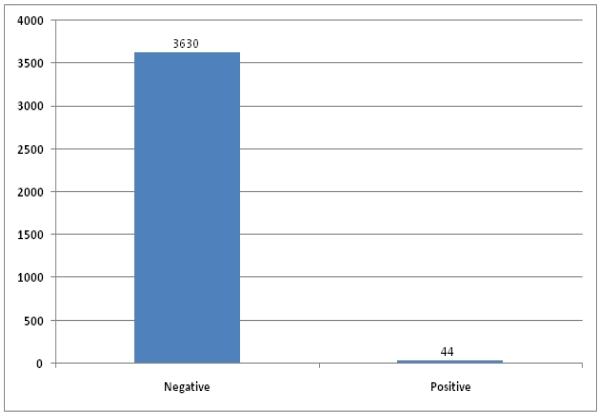

Fig. 1. Suspected and positive cases of malaria.

During 2014, a total of 3674 cases were suspected of malaria in Samtah General Hospital. Of these, 44 cases were positive for malaria parasites (Fig. 1) with *Plasmodium falciparum* seen in 40 cases and *Plasmodium vivax* seen in 4 cases. Only 17 (38.64%) were Saudi nationals (Fig. 2). More than 80% of cases were for male patients and 45.5% were aged 16-30 years (Figs. 3 & 4). The highest peaks of malaria cases were seen during the months of March and December. However, there was no statistically significant correlation between the amounts of rainfall or the average temperature and the incidence of malaria (Fig. 5). A statistically significant reduction in the WBC and Platelet count was observed in malaria positive cases. Other hematological indices had no statistically significant relation to the presence or absence of malaria. The mean figures for blood cell count and hematological indices are shown in Table 1.

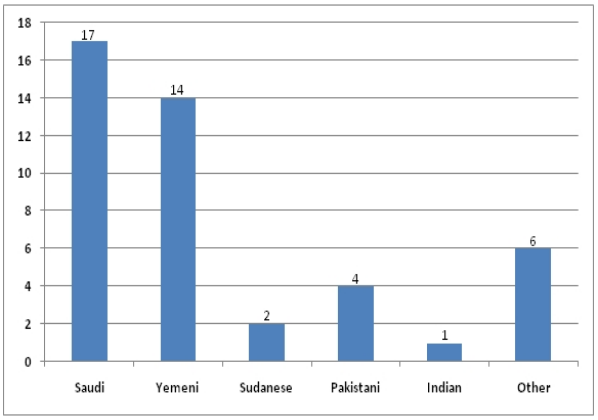

Fig. 2. Nationality of infected individuals.

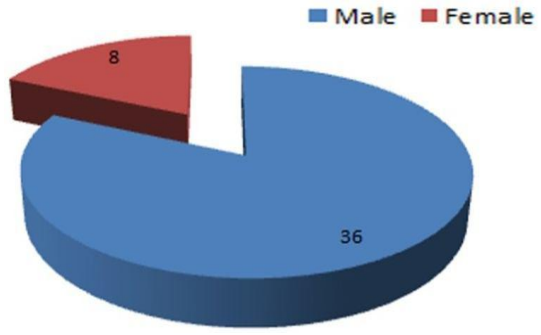

Fig. 3. Gender of malaria-infected individuals.

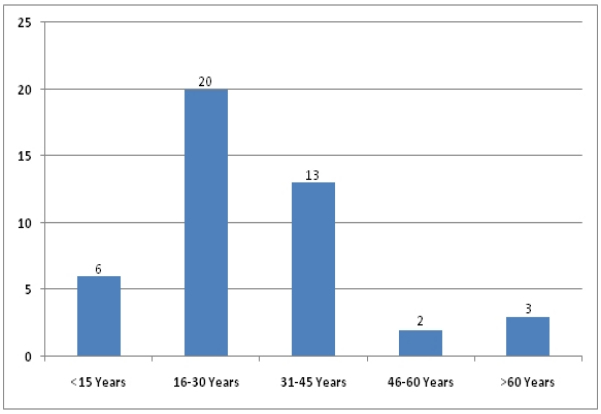

Fig. 4. Age distribution of malaria-infected individuals.

Table 1. Hematological indices of malaria-infected and negative cases.

	Positive			Negative		
	Mean	**SD**	**SE**	**Mean**	**SD**	**SE**
WBC	6.74	3.94	0.54	10.46	5.07	0.67
RBC	4.79	1	0.16	4.91	1.32	0.18
Hgb	11.98	2.61	0.4	11.63	2.33	0.31
Hct	36.21	7.63	1.18	36.08	6.35	0.85
MCV	76.72	9.32	1.44	75.91	10.51	1.39
MCH	25.22	3.62	0.56	24.52	4.06	0.54
MCHC	32.8	1.67	0.26	32.19	1.9	0.25
Platelet	116.64	88.93	13.72	307.17	182.6	24.19

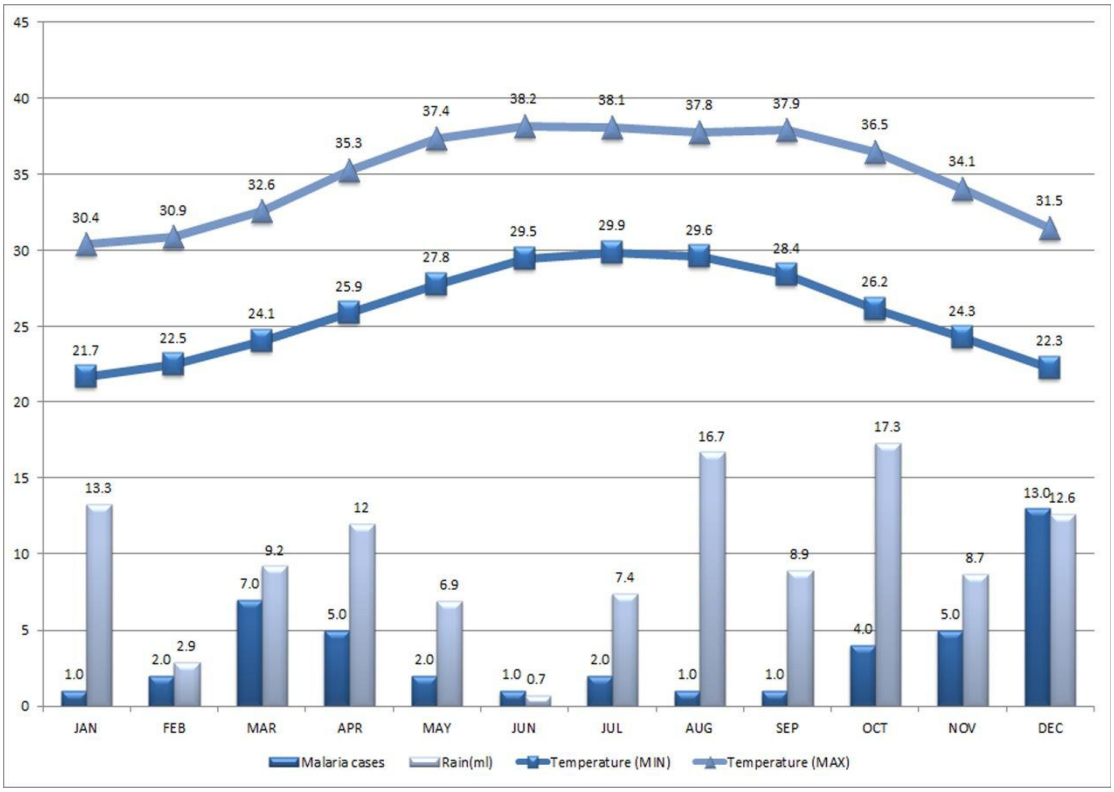

Fig. 5. Positive malaria cases during 2014 in contrast to rainfall and temperature.

4. Discussion

Malaria is a leading cause of morbidity and mortality in the world. The disease is well known for its morbidity and mortality. *Plasmodium falciparum* caused malaria produces the most severe form of the disease. Hence, it is quite reasonable to name this type as malignant malaria since it can cause cerebral disease due to its Cytoadherence phenomena. Malaria control in Saudi Arabia was initiated in 1948 by the Arabian American Oil Company in the Eastern province, primarily to protect employees living around the oases [22]. However, there are still a few endemic foci for malaria in Saudi Arabia with Jizan area being the most accused. This study investigated the incidence of malaria cases in Samtah General Hospital which is a major referral hospital in Jizan area. The results of this study revealed that almost 1.2% of suspected malaria cases were positive during 2014. The figure is high compared to the average positive rate (0.31) in the Jizan area [15]. This could be due to the fact that this hospital is a referral hospital with well-equipped laboratories and qualified microscopist. Most malaria positive cases were due to *Plasmodium falciparum*. In fact, Jizan area is known to have the *P. falciparum* species since a long time and *P. vivax* was only imported and introduced to the area in the early 21st century [21].

More than 80% of positive cases were males. This is expected and in agreement with the fact that females in the area are mostly housewife and are not exposed to mosquito bites, and hence to malaria infection, as much as males.

Malaria cases peaked in March and in December 2014. This coincides with about 4-8 weeks of rainy seasons in the area. However, there was no statistically significant correlation between these peaks and the amount of rainfall or the average temperature.

Several studies have reported on the reduction of WBC and platelet count among malaria-infected individuals in addition to other hematological indices [23-28]. Results of hematological indices in this work revealed that there is a statistically significant reduction in the WBC and Platelet count among malaria positive cases compared to normal individuals. The mean WBC count in malaria-infected individuals was 6.74 (+3.94) compared to 10.46 (+5.07) in non-infected individuals. On the other hand, the mean platelet count in malaria-infected individuals was 116.64 (+88.93) compared to 307.17 (+182.60) in non-infected individuals. This is in agreement with the work of others and, hence, may open a new door to use such findings in suspecting malaria infection especially in the situation of lack of a qualified microscopist.

In the light of this study, we can recommend that the malaria control program in Jizan area be continued and further assessed in the near future. Providing highly qualified lab personnel and microscopist in the area is very beneficial in order to achieve the malaria eradication goal.

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