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Parasitemia Level of Falciparum Malaria in Elobied, North Kordofan State, Sudan

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Abstract: ***Background: The scope of this study is to identify the parasitemia level in Elobeid town, North of Kordofan State, Sudan. Methods: parasitological survey was carried out in Elobeid town by using thick and thin blood smears from 300patients to detect the parasite microscopically and the Parasitemia level was calculated. Results: The prevalence of malaria in the study sites was associated with rainy season; however, there were malaria incidences during the dry season. Theparasitemia is highamong the population studied in Elobeid (10000 parasite/µl). Conclusion: Highparasitemia of falciparum malaria show that malaria infection is high in the town. National health authorities in each country should be regularly monitored the percentage of parasitemia or the number of parasite count causing severe malaria of patients in countries.***

Keywords: Parasitemia, malaria, Plasmodium falciparum, malaria vectors

1. Introduction

Malaria infection is transmitted by Anopheline mosquitoes and is caused by two species of protozoans, Plasmodium falciparum, and P. vivax. Plasmodium falciparum is potentially lethal, whereas Vivax is more benign (Steve etal., 2004).The dynamics of transmission of malaria are not simple, with many factors influencing the situation of individual, (Smith and Ellis, 2004).Major problems affecting malaria in Sudan include malaria vectors. Problems specific to vector control include species identification, population diversity and choice of control strategy (Ana et.al, 2010). The situation is even worsening with the spread of drug resistant parasites strains, increase of insecticide resistance in vector populations and deleterious economic status of exposed population. The situation has led to increased densities of mosquitoes and greater risk of several vector borne diseases, such as malaria dengue (Andrew. et al., 2000). The national malaria control programhas distributed many impregnated bed nets since 2000, mainly to urban dwellers. However, this has had a limited impact on the disease burden. This may be partially due to insecticide resistance in malaria vector, which has increased across the country. There is clear need for a thorough assessment of malaria transmission risks across ecological foci, and an evaluation of the efficacy of Measures targeting the aquatic stages of mosquitoes which could constitute an important component of the vector control strategy in urban areas as it is already the case in several African cities. In Ethiopia, the prevention and control activities of malaria as guided by the National Strategic Plan (2006-2010) mainly focus on rural areas. This is because until recently, it was believed that urban development will generally reduce the risk of vector breeding, and thus malaria transmission (Abebe et.al. 2011). The endemicity of the diseases in Sudan ranges from hyper−endemic in Kordofan tohypo-endemic in the north. This follows, more or less, the natural geographical zones, as well as the natural transition in the amount of the rainfall in the country, which is zero in the north to over800mm in the south of Kordofan. Generally, malaria transmission season in most of the country

Occurs during the rainy season.The blood smear remains the first standard for detection, speciation, and determination of parasitemia level and for identification of diferent forms of the parasites (William. et al., 2009). Although malaria parasites may be detected in Giemsa-Stained thin blood films, detection is enhanced and facilitated by staining thick films at a higher pH level with either a Leishman or Giemisastain. Thick and thin blood films must be made. Finger stick blood is preferable, but fresh EDTA blood can give satisfactory results and is often submitted for other hematological tests. The examination of the thin film must be considered a state procedure. The estimated number of infected R.B.C expressed as a percentage of the total erythrocytes is known as the parasitemia level (Denis, et al., 2016). Although this is not a precise measurement, it is useful information to the clinician as a measure of the severity of the disease. When the presence of parasite is detected, laboratories must calculate the level of parasitemia. As a general rule, a parasitemia level of 5% (0.05 in SI units) or greater is considered critical, regardless of species, (Murray,1999).

2. Scope of the Study

Parasitological survey was carried out in Elobeid city during the period 2011-2012 to evaluate whether Plasmodiumfalciparum was endemic in the area. The study of the parasite decided by sampling of thick and thin blood smears.

3. Materials and Methods

The Study Area

Elobeid town is the capital of North Kordofan state, it lies at coordinates 11°N, 30° 13 E at altitude 570m above sea level. The study area occupies approximately 130 Km². Elobeid

population is 157505 with annual growth rate approximately 1.6 ٪. The people in the town are supplied with water by direct tap connation and by other methods, including wells and water venders. In the town people depend on underground storage basins which are estimated to be about 3200. The town economy is mainly based on commercial and agricultural activities.

Parasitological Survey of Plasmodium falciparum
A survey was undertaken in Elobeid city to evaluate whether Plasmodium falciparum was endemic in the area. The study of the parasite and its percentage among the population of the city was determined by taking 300 samples of thick and thin blood smears to investigate parasitemia in the respondents of thestudy.

Examination of Blood Films for Malaria Parasite
Blood samples taken from the patients were stained with Giemsa stain using the procedure described by Bruce-Chwat (1993), and blood films were examined microscopically for detection of malaria parasites. Peripheral blood was collected on microscopic slides, by medical personnel, from patients' fingers using disposable blood lancets. Thick and thin blood films were made on the same slide. After being air-dried in a horizontal position, the thin blood films were fixed in methanol for 30 seconds.

Giemsa Staining Method
The giemsa stain was prepared by adding one ml stain powder in 19 ml of buffer. The stain was then poured gently into a trough until the slides were completely covered with the stain. The slides were left to stain for 20 minutes. The whole trough was then gently immersed in a vessel filled with distilled water; slides were then dried on a sliderack.

Microscopic Examination
The microscopical examination of the standard giemsa-stained blood films was performed. Three hundred (300) blood films were examined with 100X magnification under oil immersion objectives. Positive and negative blood samples wererecorded.

Calculation of Parasitemia Level
Parasite density was evaluated as the number of parasite per µl of blood. It was counted as a parallel count of parasites and leukocytes separately. The result was recorded as parasite density per 200 leukocytes. The parasite count in relation to leukocytes count was converted to parasite per µl, taking an average of 8000 leukocytes per µl as standard by the formula:
Parasites per µl = No. of parasites × 8000/No of leukocytes

Statistical analysis
Data analysis was performed with Microsoft Excel and statistical tests were done using the Analyze-It package for SPSS

4. Results

4.1 Parasitological Survey

Microscopy Examination
Results of blood films from patients who were waiting to be seen by doctors in Elobeid central hospital and national health insurance were 60% positive for the presence of malaria parasite. 90% of the blood samples detected by microscopy in the area were Plasmodium falciparum while 10% were mixed infection with Plasmodium vivax.

Parasitemia Level
The estimated number of infected erythrocytes expressed as a percentage of the total erythrocytes is known as the parasitemia level. The total of 200 leucocytes were being counted, in the same time the ring present counted as ring/200 WBC (per field), also 20X ring per field to give ring per ml. The total number of WBC counted as the mean of WBCX500 (factor) to give the total of WBC. The ring per µl was counted by the formula:
Ring per µ l = No. of parasite X 8000/ No. of leucocytes.
Low-density parasitemia (LDP, ≤ 10000 parasites/µL and high- density parasitemia (HDP, ≥ 10000 parasites/µL) (Awandare, et al., 2006). The mean of parasitemia in the Elobeid site was 11171

(Table 1).This result shows that the prevalence of Plasmodium falciparum infection among patients presented during the transmission season indicate that the situation of the town is in high level of parasitemia (HDP≥10000 parasite/µl). The Relation between total number of WBC and parasite ring per µl is shown in Figure (1).

Table 1: Parasite per µl of blood and the total number of WBC in Elobeid site

RBC ring/ 200 WBC (per field)	Parasite Ring/ml of Blood WBC (per ml)	Total WBCs	Parasite Ring per µl
190	3800	1500	20266
225	4500	2000	18000
400	8000	600	106660
136	2720	3000	7253
140	2800	2000	11200
42	840	5000	1344
320	3200	2000	12800
92	1840	4000	3680
1040	20800	1250	133120
150	2950	1950	12102
200	4700	1430	26293
140	2800	4000	5600
210	4200	3000	11200
130	2600	5000	4160
152	3000	4000	6000
108	2160	4000	4320
200	4000	2500	12800
111	2220	3500	5074
135	2700	3500	6171
180	3600	3850	7480
102	2040	3750	4352
216	4320	3850	8976
120	2400	4000	4800
72	1440	3500	3291
150	3000	4000	6000
100	2000	4250	3764
150	3000	350	6857
88	1760	5000	2816
102	2040	3500	4662
123	2460	3500	5622
120	2400	3500	5485

90	1800	3750	3840
114	2280	4500	4053
68	1360	2000	5440
196	3920	2800	11200
80	1600	4500	2844
112	2240	2500	7168
50	1000	5000	1600
90	1800	3500	4114
140	2800	4150	5397
90	1800	3750	3840
210	4200	4000	8400

75	1500	3300	3636
92	1840	2600	5661
80	1600	8000	1600
63	1220	3600	2711
120	2400	6000	3200
96	1820	2500	5824
90	1800	2500	2760
69	1380	3500	3154

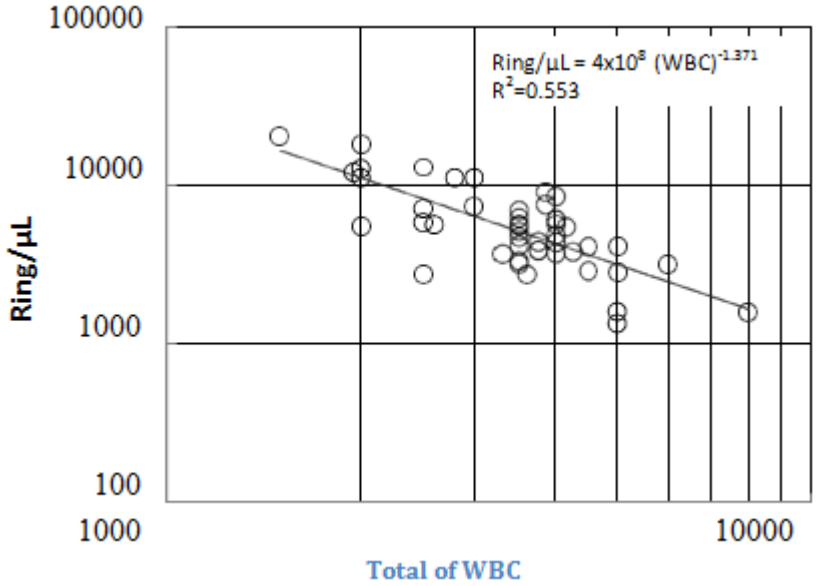

Figure 1: The Relation between total number of WBC and parasite ring per µl

5. Discussion

In this study, the parasitemia level was ≥10000 during the rainy season, this level indicates that the town was in high parasitemia level because of prevalence of the vector when there are establishment of temporary breeding sites. The evidence of malaria stricken being widely distributed in the beginning of rain fall at July, but malaria infection started to decline and be in low level. At the end of June to the beginning of August the infection of malaria increased gradually until the beginning of September through October where the rate of malaria infections reached the beak, and most of the patients who coming to the hospitals have the same symptoms. Also the people in the town were suffering from repeated malaria symptoms in less than two weeks, although they completed the dose of malaria according to the doctors' prescriptions. The malaria administration unit started to use outdoor spraying residual insecticides and sometimes using indoor spraying, but these activities for decreasing the incidence of malaria and controlling mosquitoes are insufficient due to limited financial support, no collaboration between people in the town and the agencies working in the field of controlling malaria. Because of that, more malaria transmission, morbidity and mortality among children less than five years was observed. The questions that arise are for how long will the people in Elobeid continue to suffer from malaria disease? Is there real planning for control of the vector and malaria transmission in the town? As a matter of fact, malaria prevalence is highest among the poorest sections of the society, since they cannot afford protection from malaria through improved housing, clean environment and are particularly vulnerable to the impact of ineffective diagnosis and treatment as revealed in this study and supported by previous studies (Staedke et.al.2003).

6. Conclusion

Malaria infection is still a major health problem and Plasmodium falciparum is predominant species in the region. The prevalence of malaria vector in the study sites was associated with rainy season when presence of breeding sites although there is malaria incidence during the dry season. Therefore, the solution must be among the environment of the human and his behavior.

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