American Journal of Microbiological Research, 2016, Vol. 4, No. 6, 164-167
Available online at http://pubs.sciepub.com/ajmr/4/6/1

DOI:10.12691/ajmr-4-6-1

Prevalence of *Plasmodium vivax* Malaria among Children in Kassala State, Eastern Sudan

Mamoun Magzoub[1,*], Mustafa A Alkawad[1], Mohamed A Mohamed[1,2], Hamza M Ali[1], Abdallah M Osman[1], Elhady E Elmubarak[1], Shamselfalah M Osman[1], Osman E Osman[3]

[1]Faculty of Medicine, University of Kassala, Kassala, Sudan
[2]College of Medicine, University of Bisha, Bisha, Saudi Arabia
[3]Faculty of Medicine, Al-Neelain University, Khartoum, Sudan
*Corresponding author: mosmanmm@hotmail.com

Abstract **Background:** All over the world 2.6 billion people per year are at risk of *Plasmodium vivax* malaria, 56% of all malaria cases outside Africa are due to *Plasmodium vivax*, also about 70-80 million malaria cases per year worldwide are due to *Plasmodium vivax*. To the best of our knowledge, there is no epidemiological study assessing the prevalence of *Plasmodium vivax* malaria in Sudan. **Methods:** This retrospective study was carried out at Kassala state, eastern Sudan. Thick and thin blood films were prepared from capillary blood sample from two thousand, eight hundred and seven febrile patients. The slides were stained with Giemsa and screened for the presence of malaria parasites and parasite species. Stained blood films were examined microscopically with (X100) oil immersion lens. **Results:** *Plasmodium vivax* was detected in 41 blood samples (1.5 %) when examined microscopically. Most of them 28 (1.0 %) were Rashieda tribe (p value = 0.03). **Conclusion:** The prevalence of *Plasmodium vivax* malaria was low in our study area comparing with the neighbor countries like Ethiopia. More researches can be performed in this area where *Plasmodium falciparum* is predominant.

Keywords: *vivax, prevalence, children, Kassala, Sudan*

Cite This Article: Mamoun Magzoub, Mustafa A Alkawad, Mohamed A Mohamed, Hamza M Ali, Abdallah M Osman, Elhady E Elmubarak, Shamselfalah M Osman, and Osman E Osman, "Prevalence of *Plasmodium vivax* Malaria among Children in Kassala State, Eastern Sudan." *American Journal of Medicine Studies*, vol. 4, no. 6 (2016): 164-167. doi: 10.12691/ajmr-4-6-1.

1. Background

Malaria is a big health problem and is endemic in an area where around two billion people Live [1]. *Plasmodium falciparum* and *Plasmodium vivax* are the two major species of malaria infecting humans [2]. *Plasmodium vivax* threatens nearly half the world's population [3]. It is responsible for approximately 70 to 80 million cases of malaria worldwide annually, and is the major cause of human malaria in parts of Pacific region and Central and South America [4]. Compared to *Plasmodium falciparum*, *Plasmodium vivax* has a much wider distribution outside Africa and it extends far into the temperate zones.

Clinical manifestations include symptoms that are non specific and can not be distinguished reliably from other febrile illnesses or other malarias. High fever and rigors are more common in *Plasmodium vivax* than *Plasmodium falciparum* malaria, reflecting synchronicity of schizont rupture [5,6].

Recently, *Plasmodium vivax* has been shown to be not as benign as it was previously thought and is associated with complications, such as severe anaemia, respiratory distress, malnutrition, and even coma [7] in addition to severe anaemia, jaundice, thrombocytopenia, hypotension, cerebral malaria, epistaxis, renal impairment, hypogylcaemia and more than one manifestation in children [8]. prevalence of *Plasmodium vivax* was found 66% when a study was conducted for the prevalence of *Plasmodium vivax* malaria in children < 10 years old living in 10 rural villages on the island of Espiritu Santo, Vanuatu, south-west Pacific [9]. In Korea, 53 (53 %) patients were infected with *Plasmodium vivax* when blood smears were examined under microscope when a study carried out there. [10] In Pakistan the prevalence of *Plasmodium vivax* in children among 7899 suspected cases of malaria was 642 (8.1 %) [11]. A study carried out in southern Papua, Indonesia revealed the prevalence of *Plasmodium vivax* of the 187 infants aged <3 months was102 (56%). [12] Out of seven thousand eight hundred fifty two suspected cases of malaria, 2092 (26.64 %) were found to be positive for vivax malaria in children. On the other hand, suspected cases, 896 (24.58 %) were found to be positive for malarial parasites with 52.67 % (472/896) identified as *Plasmodium vivax*. And out of 4208 suspected cases, 1196 (28.42 %) were found to be positive for malarial parasites with 69.89 %(836/1196) identified as *Plasmodium vivax*. (These were in Mastung and Khuzdar areas of Pakistan respectively.) [13] A study was conducted for prevalence of *Plasmodium vivax* in primary school students (5-15 years) from 11 schools in rural areas of Bannu district, Pakistan were examined by smear survey, a total of 556 blood smears were studied of which17 (3.05%) were

found positive for malarial parasite. Screening of all these blood films showed that prevalence of *Plasmodium vivax* was (2.69%) [14]. Prevalence of *Plasmodium vivax* malaria is relatively high in Ethiopia (32.6 %) [15]. *Plasmodium vivax* malaria is treated by Artemether-lumefantrine (AL), the most commonly deployed Artemisinin-based combination therapy (ACT), has shown rapid clearance of *Plasmodium vivax* parasitemia and fever. The relatively short half-life of lumefantrine would appear beneficial in terms of reducing risk of resistance when compared to other (ACT) [16]. *Plasmodium vivax* species produce hypnozoites, a persistent liver stage. Elimination of these dormant-stage parasites (socalled radical cure) is necessary to prevent relapse that may otherwise occur weeks to months after the original infection. Primaquine (0.5 mg [base form]/kg/day, up to 30 mg/day, for 14 days) is recommended by the U.S. Centers for Disease Control and Prevention. G6PD deficiency should be ruled out prior to treatment with primaquine to avoid drug-induced hemolysis. The WHO guidelines for radical cure differ from CDC's, recommending a lower dosage of primaquine: 0.25 mg[base form]/kg/d (up to 15 mg/day) for 14 days, perhaps out of concern for G6PD deficiency [17]. The aim of this study was to determine the prevalence of *Plasmodium vivax* malaria among children attending at AlKiwety Paediatric Hospital in Kassala, eastern Sudan.

2. Methods

Two thousand, eight hundred and seven febrile children attended at Alkiwety Paediatric Hospital, in Kassala city (Figure 1), they were come from different areas of Kassala state, during January and February 2012 screened for P.vivax, were received from records of the hospital. One thousand, four hundred and fifty three (51.8%) of them were males and 1354 (48.2 %) were females. Thick and thin blood films were prepared, directly from capillary blood. The films were made soon after collecting the blood and stained with Giemsa stain. Thick films were handled with care to prevent the blood being washed from the slide during staining and examined under microscope with X100 oil immersion lens, for malaria parasites. Blood films were considered negative if no parasites were detected in 100 oil-immersion fields of a thick blood film. [18].

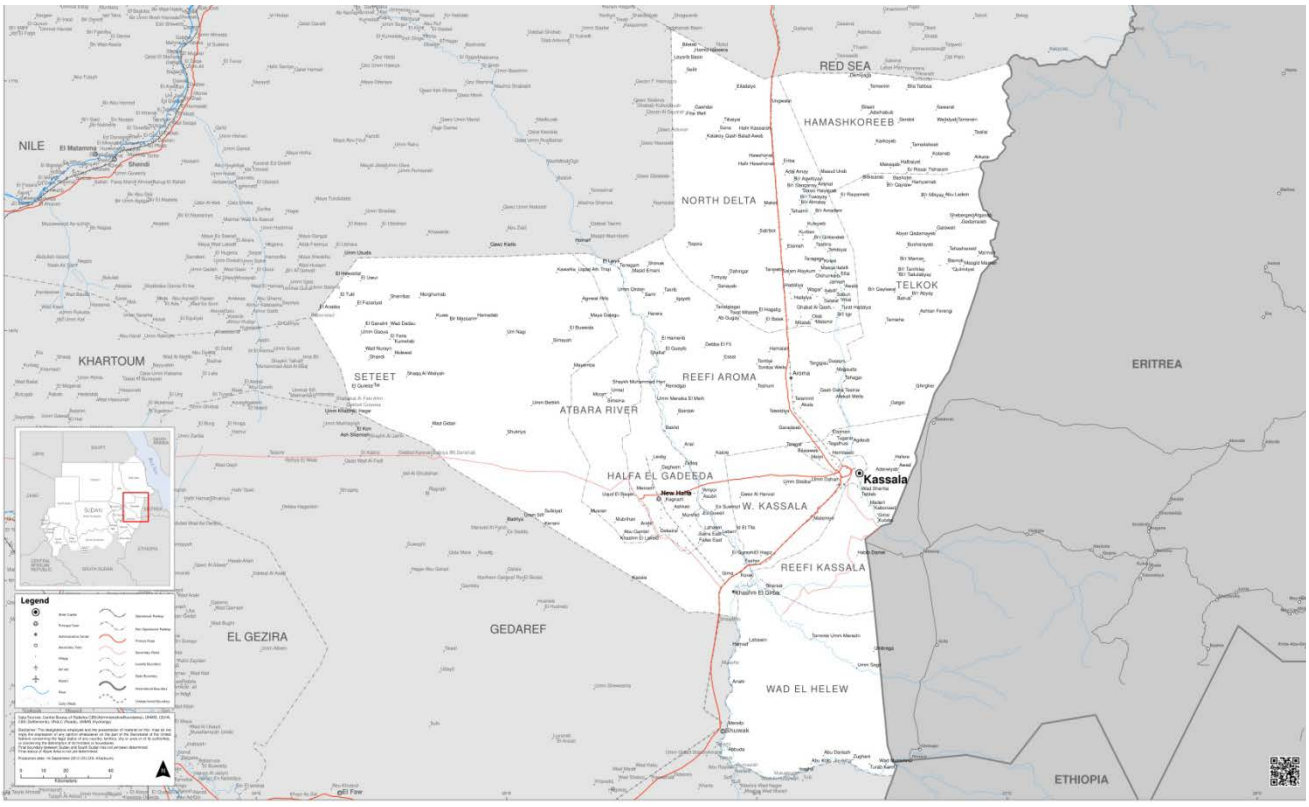

Figure 1. Kassala Map

3. Data Analysis and Ethical Approval

Data were entered in computer using SPSS for windows version 16.0. Compared between the blood film for malaria and different variables using Chi Square test and *P* value < 0.05 was considered significant. All authors read and approved the final manuscript.

4. Results

Two thousand, eight hundred and seven febrile children (from inside Kassala and also rural areas around Kassala who attended at Alkiwety Paetiatric Hospital, were screened for malaria by blood film, 2305 (82.1 %) were under five year and 502 (17.9) were more than five and up to 18 year. 1453 (51.8 %) were males and 1354 (48.2 %) were females.1272 (45.3%) lives in Urban area and 1535 (54.7%) lives in Rural area. 1330 (47.4%) were Rashiada, 477 (17%) were Bija, 378 (13.5%) were Housa, 527 (18.8%) were Northern and 95 (3.4%) were Others. 2163 (77.1%) presented complain of Fever, 156 (5.6%) presented complain of Headache, 526 (18.7%) presented complain of vomiting, 73 (2.6%) presented complain of Nausea,. 41 (1.5%) having *Plasmodium vivax* and 2766

(98.5%) having other types of malaria and negatives. There was significant relationship between *Plasmodium vivax* malaria and tribes (Table 1) and residence (p value = 0.03 & 0.04) respectively. There was no significant relationship between *Plasmodium vivax* infection and gender, age, headache, nausea and fever (p value: 0.70, 0.49, 0.23, 0.36 and 0.60) respectively.

Table 1. Vivax malaria and Tribes

		Tribe					Total
		Rashiada	Bija	Housa	Northern	Others	
BFFM	*Plasmodium vivax*	28 (1.00 %)	7 (0.29 %)	2 (0.07 %)	2 (0.07 %)	2 (0.07 %)	41 (1.50 %)
	Other types of malaria and negative blood film for malaria	1302 (46.40 %)	470 (16.71 %)	376 9 (13.39 %)	525 (18.70%)	93 (3.30 %)	2766 (98.50 %)
Total		1330 (47.40 %)	477 (17.00 %)	378 (13.46)	527 (18.77)	95 (3.37 %)	2807 (100.00 %)

P.value: 0.03.

5. Discussion

Two thousand and eight hundred and seven children were screened for malaria by blood film, in the study area, 2305 (82.1 %) were under five year and 502 (17.9) were more than five and up to 18 year. 1453 (51.8 %) were males and 1354 (48.2 %) were females. The prevalence of *Plasmodium vivax* malaria was 1.5 % (41/2807). Our result was different from a study carried out in sub-Saharan Africa [19]. In additions, it was different from a study carried out in Venezuela, [20] also it was different from a study performed in the Brazilian Amazon [21] and different from a study conducted in southern Papua, Indonesia [12]. The study carried out in Pakistan same as ours; it may be due to the same environment and tribes. In our study the prevalence of *Plasmodium vivax* malaria was low (1.5 %) comparing to the neighbour countries such as Ethiopia (32.6 %) [15]. Also in our study *Plasmodium vivax* malaria was more prevalent in Rashida tribe, it may be due to the traveling of Rashida to Ethiopia for trading. Besides, the infection of *Plasmodium vivax* malaria was high among rural people than urban, this may be due to Rashida tribe, who are inhibiting the rural areas commonly.

6. Conclusion

Educational health programs should be introduced in the study area particularly among rural people. Also people should be encouraged to use impregnated bed nets. Health authority in Kassala state should provide rural health care centers with anti-malarial drugs especially for the dormant stages of the parasites such as Primaquine. Moreover, Record Centers should be established for P.vivax distribution in Kassala State.

Ethical Clearance

This study was approved by ethical clearance committee, research board, Faculty of Medicine & Heal;th Science, University of Kassala, Kassla, Sudan.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgements

We are grateful to Alkiwety Paediatric Hospital staff, in Kassala city for their helping to receive the recorded data of this study.

References

[1] Abdallah TM, Abdeen MT, Ahmed IS, Hamdan HZ, Magzoub M, and Adam I. Severe *Plasmodium falciparum* and *Plasmodium vivax* malaria among adults at Kassala Hospital, eastern Sudan. Malar J. 2013; 12: 148.

[2] Naing C, Whittaker MA, Nyunt Wai V, Mak JW (2014) Is *Plasmodium vivax* Malaria a Severe Malaria?: A Systematic Review and Meta-Analysis. PLoS Negl Trop Dis 8(8): e3071.

[3] Douglas NM, Anstey NM, Buffet PA, et al. The anaemia of *Plasmodium vivax* malaria. *Malaria Journal* 2012, 11:135.

[4] Muhamad P, Ruengweerayut R, Chacharoenkul W, Rungsihirunra K, Na-Bangchang K. Monitoring of clinical efficacy and in vitro sensitivity of *Plasmodium vivax* to chloroquine in area along Thai Myanmar border during 2009-2010. *Malaria Journal* 2011, 10: 44.

[5] Price RN, Tjitra E, Guerra CA, Yeung S, White NJ, Anstey NM: Vivax malaria: neglected and not benign. Am J Trop Med Hyg 2007, 77(Suppl 6):79-87.

[6] Luxemburger C, Thwai KL, White NJ, Webster HK, Kyle DE, Maelankirri L, Chongsuphajaisiddhi T, Nosten F. the epidemiology of malaria in a Karen population on the western border of Thailand. Trans. R. Soc Trop Med Hyg 1996, 90:105-11.

[7] Yangzom T, Gueye CS, Namgay R, Galappaththy GN, Thimasarn K, Gosling R, Murugasampillay S, Dev V: Malaria control in Bhutan: case study of a country embarking on elimination: *Malar J*. 2012. 9;11:9.

[8] Mahgoub H, Gasim GI, Musa IR and Adam I. Severe Plasmodium vivax malaria among sudanese children at New Halfa Hospital, Eastern Sudan. Parasites & Vectors 2012, 5:154.

[9] Maitland K, Williams TN, Bennett S *et al*. The interaction between Plasmodium falciparum and *Plasmodium vivax* in children on Espiritu Santo island, Vanuatu. *Trans R Soc Trop Med Hyg*. 1996; 90(6): 614-20.

[10] Tong-Soo Kim,Hyung-Hwan Kim,Sun-Sim Lee2 *et al*. Prevalence of Plasmodium vivax VK210 and VK247 subtype in Myanmar. *Malaria Journal* 2010, 9:195.

[11] YasinzaiM. Kakarsulemankhel J Prevalence of human malaria infection in bordering areas of East Balochistan, adjoining with Punjab: Loralai and Musakhel. *Journal Pakistan medical association* 2009; 59:132.

[12] Jeanne, R, Fobia, W, Kenangalem, E, *et al*. Vivax Malaria, A Major Cause of Morbidity in Early Infancy. *Clinical Infectious Diseases* 2009 (48) 12:1704-1712.

[13] Yasinzai MI, Kakarsulemankhel JK. Incidence of human malaria infection in central areas of Balochistan: Mastung and Khuzdar. Rawal Medical Journal. 2007; 32 (2): 176-178.

[14] Awan Z, khan A, Shah A *et al, Assessment Of Malaria Prevalence Among School Children In Rural Area Of Bannu Distrect Khyber Pakhtunkhwa, Pakistan, Pakistan J, zool* 2012; 44(2): 321-326.

[15] Tsige Ketema and Ketema Bacha. Plasmodium vivax associated severe malaria complications among children in some malaria endemic areas of Ethiopia. *BMC Public Health* 2013, 13:637.

[16] Bassat Q (2011) The Use of Artemether-Lumefantrine for the Treatment of Uncomplicated Plasmodium vivax Malaria. PLoS Negl Trop Dis 5(12): e1325.

[17] World Health Organization. Guidelines for Treatment of Malaria. 2nd ed. Geneva: WHO; 2O15.

[18] Monica Cheesbrough. District Laboratory Practice in Tropical Countries Part 1, Second Edition, Cambridge University Press 2009; 245.

[19] Kassa.D, Petros.B, Messele.T *et al*. Parasito-haematological features of acute *Plasmodium falciparum* and *Plasmodium vivax* malaria patients with and without HIV co-infection at Wonji Sugar Estate, Ethiopia. *Ethiop.J.Health Dev*. 2005; 19 (2):132-139.

[20] Rodulfo.H, de Donato.M, Ada Peña. High prevalence of malaria infection in Amazonas state, Venezuela, *Rev. Inst. Med.* trop. S. Paulo 2007; (49)2: 79-85.

[21] Bruno.B, Reis.A, Sebastião M *et al*. Severe *Plasmodium vivax* malaria exhibits marked inflammatory imbalance. Malaria Journal 2010, 9:13.