

# Recent Trend in the Prevalence of Plasmodium Falciparum in Jazan Area, Kingdom of Saudi Arabia

KHALID OMER ABDALLA ABOSALIF<sup>1</sup>, HASAN EJAZ<sup>2</sup>, ABDULRHMAN ALMADINI<sup>3</sup>, SALEH ALGHAMD<sup>4</sup>, MUTEAP ALHAILY<sup>5</sup>, FARIS ALBALAWI<sup>6</sup>, ABUALGASIM ELGAILI ABDALLA<sup>7</sup>, KASHAF JUNAID<sup>8</sup>, SONIA YOUNAS<sup>9</sup>

<sup>1-2,7-8</sup>Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, Jouf University, Kingdom of Saudi Arabia.

<sup>3</sup>Jeddah Reginal Laboratory, KSA.

<sup>4</sup>Prince Mushari Bin Saud Hospital Albaha City KSA.

<sup>5</sup>Al Yamamah Hospital Riyadh KSA.

<sup>6</sup>King Fahad Specialist Hospital Tabuk KSA.

<sup>1,7</sup>Faculty of Medical Laboratory Sciences, Omdurman Islamic University, Sudan.

<sup>9</sup>Department of Microbiology, Al Razi Healthcare Lahore

Correspondence to Dr. Khalid Omer Abdalla Abosalif, Email: microparasitologyabosalif@gmail.com, Mobile +966 50 929 0730

## ABSTRACT

**Aim:** Our objective was to determine the frequencies of Plasmodium falciparum and compare the efficiency of various methods used for the diagnosis of P. falciparum in Jazan area.

**Methods:** A cross-sectional study conducted in September to December 2017 in Jazan Area. We collected the specimens from the three medical centres in Jazan for the identification of P. falciparum. A total of 249 samples were processed using microscopic and serological techniques. The data was collected using a questionnaire.

**Results:** A total of 249 peripheral blood samples were taken from for the diagnosis of P. falciparum. The overall incidence of P. falciparum from three healthcare facilities in Jazan found to be 2.4%. Majority of the cases were recorded at the Jazan hospital (3.6%). The majority of the positive cases were detected among the male patients 4(66.7%). The study indicated that the predominantly all of the positive cases had fever and vomiting. The two diagnostic tests, microscopy and serology found to be equally useful in the diagnosis of positive cases of P. falciparum.

**Conclusion:** The detection of malarial cases in the recent year in Jazan area is worrisome. Both of the techniques microscopy and serology can be used in the prompt diagnosis of malaria.

**Keywords:** P. falciparum, Microscopic examination, Serology test for malaria

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## INTRODUCTION

Malaria is a mosquito-borne febrile illness affecting people of all age groups, is endemic in 109 countries, spanning all continents, except for Australia and Antarctica. It is often fatal in children under the age of five years; however, the mortality rate in adults is notes high because adults have a better immune response than children<sup>1</sup>. Roughly, 300 million people are affected by malaria resulting in the deaths of 1-1.5 million people every year<sup>2</sup>. This preventable disease represents a dual burden in that it places an increased challenge in the health system and economic stress on individuals and the community as a whole<sup>3</sup>. Plasmodium falciparum is the predominant parasite strain causing malaria in Saudi-Arabia and Yemen. The WHO report of 2010 documented a 50% reduction in malaria cases in Saudi Arabia between 2000 and 2009 showing good progress in the country's efforts to get rid of malaria<sup>4</sup>.

Studies conducted in 2001 and 2006 indicated that the eastern province of Saudi Arabia is free of indigenous malaria transmission. From January 1994 to 2005 no indigenous cases were reported, but approximately 56 cases of imported malaria were identified at a site in the eastern province of Saudi Arabia<sup>5,6</sup>. In 2013, the Saudi Ministry of Health (MoH) reported 2,513 cases nationally, most of which occurred in the Jazan region<sup>7</sup>. The Plasmodium falciparum prevalence rate among school children in Jazan province was 4.9% in 1976 and reported as 1.4% among the school going children in 1984<sup>8,9</sup>.

The burden of malaria is also widespread in Asia, Africa and Latin America.<sup>10</sup> The cases of malaria are mostly associated with low socio-economic status<sup>11,12</sup>. We aimed our study to determine the frequencies of Plasmodium falciparum and to compare the efficiency of various methods used for the diagnosis of Plasmodium falciparum in Jazan area.

## METHODS

A cross-sectional study conducted in September to December 2017 in Jazan Area which is an agricultural area with a rainy climate that provides a good environment for malaria parasites. We collected 83 specimens from each of the three medical centres in Jazan (Jazan hospital, Faifa malaria centre and Alareda malaria centre) for the identification of P. falciparum. A total of 249 samples were processed using microscopic and serological techniques. The demographic data was collected using a questionnaire. The patients presented with the signs of fever, vomiting and diarrhoea were examined clinically by the physicians, and their blood samples were obtained by the laboratory personnel.

The microscopic analysis was performed by making at least two thin and two thick smears and stained by using Giemsa stain for the screening. The serological diagnosis was made using OptiMAL-IT (Cressier, Switzerland) rapid detection test using a dipstick coated with monoclonal antibodies against the metabolic enzyme pLDH (parasite lactate dehydrogenase)<sup>13</sup>.

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## RESULTS

All of the 249 peripheral blood samples were processed to rule out the cases of *P. falciparum*. There were 3 (3.6%) positive cases from Jazan hospital, 2(2.4%) from Alareda malaria centre and 1(1.2%) from Faifa malaria centre. The overall incidence of *P. falciparum* in Jazan found to be 2.4% from three different healthcare centres (Table-I). Among the positive cases, there were 4(66.7%) male and 2(33.3%) female patients. The study indicated that predominantly all of the positive cases had fever and vomiting (Table-II). The two diagnostic tests, microscopy and serology found to be equally useful in the diagnosis of positive cases of *P. falciparum* (Table-III).

Table-I: The prevalence of *P. falciparum* infection in different healthcare centres.

Healthcare Center	No. examined	Positive cases	%age
Jazan hospital	83	3	3.6
Alareda malaria center	83	2	2.4
Faifa malaria center	83	1	1.2
Total no. positive cases	249	6	2.4

Table-II: Gender distribution and symptoms of the positive cases of *P. falciparum* (n=6)

Gender	Positive cases	%age
Male (n=178)	4	66.7
Female (n=71)	2	33.7
Fever	6	3.5
Vomiting	6	100
Diarrhoea	0	0

Table III: Comparison of two diagnostic techniques

Technique	Positive cases	%age
Microscopic examination	6	2.4
Serology test (OptiMAL-IT)	6	2.4

## DISCUSSION

Twenty percent of the population in the southern region of Jazan had malaria, but in recent years it has dropped to only dozens. Malarial infections are transmitted by mosquitoes and infiltrate red blood cells in the human body and destroy them, and complications are severe, such as anaemia and liver and kidney failure. If malaria is not treated, sickle cell, the deadliest form of infection, can be fatal within hours. The disease is spreading in many parts of the world, most notably sub-Saharan Africa, where WHO has launched malaria control campaigns<sup>14</sup>.

The results of our study in the Jazan area showed a 2.4% prevalence of *P. falciparum* in the population. A previous study from Saudi Arabia reported 0.1% positivity during the 10-year period. The mean annual positivity was 63 slides per year. Out of the positive slides, 79 (11.5%) showed *Plasmodium falciparum*<sup>15</sup>. Several factors could be held responsible for the transmission of the disease which might include ongoing movement between Saudi Arabia and Yemen. The disease is prevalent in northern Yemen, makes control difficult, rainfall is an environment suitable for breeding and gathering mosquitoes. Another study conducted in Tihama Qahtan in the far south-east of the region, adjacent to Jazan and the Republic of Yemen,

reported 49(2.7%) cases positive for malaria. There were 48(2.6%) cases of *P. falciparum* and one case of *P. vivax*<sup>16</sup>.

Other studies conducted in Saudi Arabia revealed 56 malarial cases at Saudi Aramco Medical Services Organization. The number of male and females patients was 28 in each of the genders with a mean age of 28.2 +/- 19.7 (range, 1-80) years. Our study differs from the above study where we found that the incidence of infection in 4 males and 2 females<sup>6</sup>. Fever as the most common clinical features of malaria has been reported in other studies which are similar to our finding<sup>2</sup>.

The passive case detection PCD and rapid diagnostic test RDT survey indicated low rates of malaria (*Plasmodium falciparum*) prevalence in Tihamat Qahtan of the relatively stable hypoendemic status<sup>17</sup>. *Plasmodium vivax* presented as the significant pathogen responsible for malaria among the paediatric patients in a tertiary care hospital of Pakistan<sup>18</sup>. This similar to study showed that low rates of malaria prevalence of *Plasmodium falciparum* is 6(2.4%) out of 249 reflects a low level of malaria prevalence in the Jazan region using microscopic examination and rapid diagnostic test RDT. The malarial diseases pose serious threats to the human beings, and it is important to treat both the symptomatic and asymptomatic infection<sup>19</sup>. The use only a single serological test such as Widal test may lead to the misleading diagnosis and should be confirmed by other reliable diagnostic investigations<sup>20</sup>.

## CONCLUSION

The detection of malarial cases in the recent year in Jazan area is worrisome. Both of the techniques microscopy and serology can be used in the prompt diagnosis of malaria. The cases of malaria can be further reduced through active campaigns aimed at eliminating the carrier concerning draining swamps, spraying pesticides and mosquito nets.

## REFERENCES

1. World Health Organization. Global Malaria Control and Elimination: Report of a Technical Review. Geneva, Switzerland; 2008.
2. Winstanley P, Ward S, Snow R, Breckenridge A. Therapy of falciparum malaria in sub-saharan Africa: from molecule to policy. *Clin Microbiol Rev* 2004; 17(3): 612-637.
3. Mabaso ML, Sharp B, Lengeler C. Historical review of malarial control in southern African with emphasis on the use of indoor residual house-spraying. *Trop Med Int Health* 2004; 9(8): 846-856.
4. World Health Organization. World Malaria Report 2014. World Health Organization; 2015.
5. Bashwari LA, Mandil AM, Bahnassy AA, Al-Shamsi MA, Bukhari HA. Epidemiological profile of malaria in a university hospital in the eastern region of Saudi Arabia. *Saudi Med J* 2001; 22(2): 133-138.
6. Al-Tawfiq JA. Epidemiology of travel-related malaria in a non-malarious area in Saudi Arabia. *Saudi Med J* 2006; 27(1): 86-89.
7. Dunyo SK, Afari EA, Koram KA, Ahorlu CK, Abubakar I, Nkrumah FK. Health centre versus home presumptive diagnosis of malaria in southern Ghana: implications for home-based care policy. *Trans R Soc Trop Med Hyg* 2000; 1; 94(3): 285-288.

8. Mara L. Report on a visit to Saudi Arabia March 1976 in relation to Malaria Control project. World Health Organization, unpublished document EMRO, Cairo. 1976.
9. Ministry of Health. Malaria control programme in the Kingdom. 1404-1405 H. Kingdom of Saudi Arabia: Malaria Control Service, Ministry of Health; 1984-1985.
10. World Health Organization. World malaria report 2015. World Health Organization; 2016.
11. Gollin D, Zimmermann C. Malaria: Disease impacts and long-run income differences. Economics Working Papers. Paper 2007; 30.
12. Worrall E, Basu S, Hanson K. Is malaria a disease of poverty? A review of the literature. Trop Med Int Health 2005; 10(10): 1047-1059.
13. Ayeh-Kumi PF, Akalifa BG, Nkrumah NO, Asmah RH, Dayie NT. Performance of rapid DiaMed OptiMal-IT® malaria test in an endemic Ghanaian setting. J Parasit Dis 2011; 35(2): 129-133.
14. Alshahrani AM, Abdelgader TM, Saeed I, Al-Akshami A, Al-Ghamdi M, Al-Zahrani MH, El Hassan I, Kyalo D and Snow RW. The changing malaria landscape in Aseer region, Kingdom of Saudi Arabia: 2000-2015. Malar J 2016; 15 (1): 538.
15. <http://www.alarabiya.net/ar/saudi-today/2013/04/25>.
16. Al-Mohammed HI, Ferchichi MS. Epidemiological Trends over a Ten-year Period of Malaria in a non-Endemic Area of Saudi Arabia. Int J Curr Microbiol App Sci 2016; 5(3): 1-8.
17. Abdelmohsin M. O. Abdoon, Asim A. Daffalla El-Tayeb M. Al-khidir Ali Mohamed Alshahrani. Potential Larval Habitats of Malaria Vectors in Aseer Region, Saudi Arabia. The 3rd Medical Research Day Committees, faculty of medicine, university of Jazan, 27. February 2013.
18. Babar H, Rahim M, Sanaullah. Clinical Presentation and Outcomes of Severe Malaria among Vivax Positive Children Age 2 to 14 Years Admitted in a Tertiary Care Hospital at Quetta. Pak J Med Health Sci 2016; 10(4): 1240-1242.
19. Sumari D, Mwingira F, Selemani M, Mugasa J, Mugittu K, Gwakisa P. Malaria prevalence in asymptomatic and symptomatic children in Kiwangwa, Bagamoyo district, Tanzania. Malaria J 2017; 16(1): 222.
20. Naveed A, Bashir S, Naeem R. False Positivity of Widal Test in Malaria. Pak J Med Health Sci 2018; 12(2): 437-439.