

Frequency of Plasmodium Falciparum in Patients Having Uncomplicated Malaria

DR. ZUNAIRA TANVIR RAMZI, MBBS
NISHTAR HOSPITAL MULTAN

DR. KHADIJA GHAFOOR, MBBS
MEDICAL OFFICER, BAKHTAWAR AMIN HOSPITAL, MULTAN

ZARMINA TANVIR
MEDICAL STUDENT, NISHTAR MEDICAL UNIVERSITY, MULTAN

Abstract

Background: Malaria which is potentially life threatening disease that is spread by protozoan parasites. Malaria yet remains to be a important public health concern among most of the endemic regions of world. There are 5 most common human species of plasmodium referred as “Plasmodium falciparum, P. vivax, P. ovale, P. knowlesi, and P. malariae” which can spread the disease. The major complications are caused by P. falciparum and P. vivax, with P. falciparum being the more virulent. This study was conducted to determine the frequency of plasmodium falciparum among patients with uncomplicated malaria in our population. **Objective:** To determine the frequency of Plasmodium falciparum in patients with uncomplicated malaria. **Study Design:** Descriptive, Cross-sectional study. **Setting:** Department of Medicine, Nishtar Hospital, Multan. **Results:** Of these study cases, 93 (56.4 %) were male patients while 72 (43.6%) were female patients. Mean age of our study cases was noted to be 35.52 ± 10.39 years. Majority of our study cases i.e. 101 (61.2%) were from rural areas while 64 (38.8%) were from urban areas, 129 (78.2%) were poor and 65 (39.4%) had positive history of using anti – malarial drugs. Mean duration of disease was 4.37 ± 2.82 days and majority of our patients i.e. 107 (64.8%) had disease duration up to 5 days. Plasmodium falciparum was diagnosed in 36 (21.8%) while plasmodium vivax was diagnosed in 129 (78.2%) patients. **Conclusion:** High frequency of plasmodium falciparum was noted in our study, among patients with uncomplicated malaria. Plasmodium falciparum was significantly associated with female gender and previous use of anti-malarial drugs.

Keywords: plasmodium falciparum, malaria, plasmodium vivax,.

Introduction

Malaria is generally by *Plasmodium falciparum*, and it is important public health issue of many developing countries¹⁻⁴. Globally, every year more than 200 million people suffer from the disease and leading to approximately 627,000 deaths. Most of the regions sub-Saharan African countries are predominantly more affected from malaria^{5, 6}. There are four 4 species of *Plasmodium* which can infect human beings which are referred as “*P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*”^{7, 8}. In its endemic forms, it is prevalent in more than 100 countries which is regarded as one of the mostly commonly spread parasitic disease among human beings. In tropical as well as sub-tropical regions particularly in Sub-Saharan Africa and countries of Southeast Asia, it ranks first with reference to the socioeconomic and public health importance⁹⁻¹¹. This infectious disease exhibits significant spatial heterogeneity on local, regional and global scale. Furthermore efforts taken to relate differences of prevalence of the disease in terms of varying situations in environment and modes of transmission at these levels¹². Whilst it has further been complicated to distinguish different prevalent species of plasmodium to describe underlying causes of associated local heterogeneity.

In Pakistan, in recent years, there has been a six times rise in the prevalence of falciparum malaria as reported by national Malaria control Program which estimates around 42% among all patients. Various underlying factors involved in its rise may include chloroquin resistance, ambient temperatures in autumns which favors extraordinary transmission and rapid decrease in vector control activities across the country¹³.

Plasmodium falciparum and vivax malaria are major health problems in Pakistan.¹³ Yasinzai et al¹⁴ reported 57.1% plasmodium falciparum from Balochistan. In another study was 75% in Qallat district while P. falciparum was 25 %.¹⁵ Fazal et al¹³ 12.2% plasmodium falciparum from Mardan.

From the available literature, it is evident that frequencies of different species of plasmodium varies from population to population due to genetic diversity and natural adaptation of the parasite. So this study was conducted to ascertain the role of P. falciparum in patients with malaria.

Material and Methods

A specialized proforma has been developed to record the findings of this study. All the cases of malaria having fever ≥ 101 F° assessed on thermometer plus positive test with ICT malaria were recruited from Department of

Medicine Nishtar Hospital, Multan. Known patients with CAD, Coagulopathy & bleeding disorders such as hemophilia, those with history of intake of anti-malarial drugs within 48 hours, Previously diagnosed cases of brain tumors, tuberculous meningitis, viral or bacterial encephalitis and multiple sclerosis were excluded from our study. Venous blood (5 ml) sample was drawn and sent to the central laboratory of Nishtar Hospital Multan for routine investigations like ICT malaria, CBC, smears to be observed under light microscope for detection of Plasmodium falciparum and plasmodium vivax in Giemsa stained blood smears which were observed under light microscope. Data was entered and analyzed by computer program SPSS-18. Mean and standard deviation for the age of patients was calculated. Frequencies and percentages were calculated for categorical variables like gender, age groups, intake of anti-malarial drugs, plasmodium falciparum.

Results

Our study comprised of a total of 165 patients with uncomplicated malaria who met inclusion criteria of our study. Of these study cases, 93 (56.4 %) were male patients while 72 (43.6%) were female patients. Mean age of our study cases was noted to be 35.52 ± 10.39 years and most of our study cases i.e. 115 (69.7%) were aged 20 – 40 years. Majority of our study cases i.e. 101 (61.2%) were from rural areas while 64 (38.8%) were from urban areas, 129 (78.2%) were poor and 65 (39.4%) had positive history of using anti – malarial drugs. Mean duration of disease was 4.37 ± 2.82 days and majority of our patients i.e. 107 (64.8%) had disease duration up to 5 days. Plasmodium falciparum was diagnosed in 36 (21.8%) while plasmodium vivax was diagnosed in 129 (78.2%) of our study cases.

Table No. 1
Distribution of plasmodium falciparum with regards to gender.
 (n = 165)

Gender	Plasmodium falciparum		P - value
	Yes (n = 36)	No (n = 129)	
Male (n = 93)	13	80	0.019
Female (n = 72)	23	49	
Total	165		

Discussion

Malaria which is potentially life threatening disease that is spread by protozoan parasites. Malaria yet remains to be a important public health concern among most of the endemic regions of world. There are 5 most common human species of plasmodium referred as “Plasmodium falciparum, P. vivax, P. ovale, P. knowlesi, and P. malariae” which can spread the disease. The major complications are caused by P. falciparum and P. vivax, with P. falciparum being the more virulent¹⁶⁻¹⁸. This study was conducted to determine the frequency of plasmodium falciparum and plasmodium vivax among patients with uncomplicated malaria in our population. Our study comprised of a total of 165 patients with uncomplicated malaria who met inclusion criteria of our study. Of these study cases, 93 (56.4 %) were male patients while 72 (43.6%) were female patients. Such male gender predominance has been reported in many different studies, a study conducted by Khattak et al¹⁸ also reported male gender preponderance over female gender. A study conducted by Leghari et al¹⁹ in Bahawalpur has also reported 56% male gender predominance which is close to our study results. Yasinzai et al²⁰ reported high male gender predominance in as many as 76 % patients which is similar to that of our study results. A study conducted in KPK by Shah et al²¹ has also documented 52.3 % male gender predominance.

Mean age of our study cases was noted to be 35.52 ± 10.39 years. Yasinzai et al²⁰ also has reported similar results. A study conducted in KPK by Shah et al²¹ has also documented malaria being more common in young patients, supporting our findings.

Malaria is predominantly more common in slum areas with inadequate sanitation, sewage facilities and lower socioeconomic status²¹. Majority of our study cases i.e. 101 (61.2%) were from rural areas while 64 (38.8%) were from urban areas, 129 (78.2%) were poor and 65 (39.4%) had positive history of using anti – malarial drugs. Mean duration of disease was 4.37 ± 2.82 days and majority of our patients i.e. 107 (64.8%) had disease duration up to 5 days. A study conducted in KPK by Shah et al²¹ has also documented similar findings.

Plasmodium falciparum was diagnosed in 36 (21.8%) while plasmodium vivax was diagnosed in 129 (78.2%) of our study cases. A study conducted by Khattak et al¹⁸ also reported 86 % cases with malaria were diagnosed with plasmodium vivax and remaining 14 % with plasmodium falciparum which is in compliance

with that of our study results. A study conducted by Leghari et al¹⁹ in Bahawalpur has also reported plasmodium vivax being more prevalent causative agent which is in compliance with our study results. Yasinzai et al²⁰ reported plasmodium falciparum in 70 % malaria patients which is different from our study results. In another study by Yasinzai et al¹⁵, in Qallat district while P. falciparum was 25 % which is close to our study results. Fazal et al¹³ reported plasmodium vivax 87.8% and 12.2% plasmodium falciparum from Mardan.

Conclusion

High frequency of plasmodium falciparum was noted in our study, among patients with uncomplicated malaria. Plasmodium falciparum was significantly associated with female gender and previous use of anti-malarial drugs.

References

1. Mohammed H, Mindaye T, Belayneh M, Kassa M, Assefa A, Tadesse M, et al. Genetic diversity of Plasmodium falciparum isolates based on MSP-1 and MSP-2 genes from Kolla-Shele area, Arbaminch Zuria District, southwest Ethiopia. *Malar J.* 2015;14:73. doi: 10.1186/s12936-015-0604-8.
2. White NJ. Plasmodium knowlesi: the fifth human malaria parasite. *Clin Infect Dis.* 2008;46:172-73.
3. Laufer MK, Takala-Harrison S, Dzinjalama FK, , , . Return of chloroquine-susceptible falciparum malaria in Malawi was a reexpansion of diverse susceptible parasites. *J Infect Dis.* 2010;202:801-8.
4. Skarbinski J, Ouma PO, Causer LM, , , , et al. Effect of malaria rapid diagnostic tests on the management of uncomplicated malaria with artemether-lumefantrine in Kenya: a cluster randomized trial. *Am J Trop Med Hyg.* 2009;80:919-26.
5. Crawley J, Sismanidis C, Goodman T, . Effect of intermittent preventive treatment for malaria during infancy on serological responses to measles and other vaccines used in the Expanded Programme on Immunization: results from five randomised controlled trials. *Lancet.* 2012;380:1001-10.
6. Gosling RD, Gesase S, Mosha JF, , , , et al. Protective efficacy and safety of three antimalarial regimens for intermittent preventive treatment for malaria in infants: a randomised, double-blind, placebo-controlled trial. *Lancet.* 2009;374:1521-32.
7. Murray CJ, Rosenfeld LC, Lim SS, , , , et al. Global malaria mortality between 1980 and 2010: a systematic analysis. *Lancet.* 2012;379:413-31.
8. Hamid MM, Mohammed SB, El Hassan IM. Genetic Diversity of Plasmodium falciparum Field Isolates in Central Sudan Inferred by PCR Genotyping of Merozoite Surface Protein 1 and 2. *N Am J Med Sci.* 2013;5(2):95-101.
9. Worku L, Damtie D, Endris M, Getie S, Aemero M. Asymptomatic malaria and associated risk factors among school children in Sanja town, Northwest Ethiopia. *Int Scholarly Res Notices.* 2014;2014: Article ID 303269. Doi: <http://dx.doi.org/10.1155/2014/303269>
10. Fançonny C, Gamboa D, Sebastião Y, Hallett R, Sutherland C, Sousa-Figueiredo JC, et al. Various pfcrt and pfmdr1 genotypes of Plasmodium falciparum cocirculate with P. malariae, P. ovale spp., and P. vivax in northern Angola. *Antimicrob Agents Chemother.* 2012 Oct;56(10):5271-7. doi: 10.1128/AAC.00559-12.
11. Maltha J, Guiraud I, Kaboré B, Lompo P, Ley B, Bottieau E, et al. Frequency of severe malaria and invasive bacterial infections among children admitted to a rural hospital in Burkina Faso. *PLoS One.* 2014;9(2):e89103. doi: 10.1371/journal.pone.0089103.
12. Mueller I, Widmer S, Michel D, Maraga S, McNamara DT, Kiniboro B, et al. High sensitivity detection of Plasmodium species reveals positive correlations between infections of different species, shifts in age distribution and reduced local variation in Papua New Guinea. *Malar J.* 2009;8:41. doi: 10.1186/1475-2875-8-41.
13. Fazil M. The frequency of various human malaria parasite infections at private clinic in Mardan district of Khyber Pakhtunkhwa: a study of 230 cases of Malaria Pak Paed J. 2013;37(3):173-6.
14. Yasinzai MI, Kakarsulemankhel JK. Frequency of various human malaria infections in hottest areas of central Balochistan, Pakistan: Duki, Harnai and SibiPak Armed Forces Med J. 2008;58(3):276-85.
15. Yasinzai MI, Kakarsulemankhel JK. Frequency of malaria infection in Qallat and Qilla Saifullah districts of Balochistan, Pakistan Pak J Med Res. 2008;47(3):50-4.
16. Asidi A, N'Guessan R, Akogbeto M, , . Loss of household protection from use of insecticide-treated nets against pyrethroid-resistant mosquitoes, benin. *Emerg Infect Dis.* 2012;18:1101-6.
17. Olotu A, Fegan G, Wambua J, , , , et al. Four-year efficacy of RTS,S/AS01E and its interaction with malaria exposure. *N Engl J Med.* 2013;368:1111-20.
18. Khattak AM, Khan J, Batool N, Khan H. The magnitude and pattern of malaria in District Kohat. *Gomal J Med Sci.* 2013;11(2):208-11
19. Leghari AR, Hussain MS, Idris M, Saleem M. Laboratory surveillance of malaria at District Bahawalpur Punjab, Pakistan. *J Shaikh Zayed Med Coll.* 2014;5(3):668-70.
20. Yasinzai MI, Kakarsulemankhel JK. Prevalence of human malaria infection in District Ziarat and Sanjavi,

-
- Pakistan. Pak J Zool. 2009;41(6):475-82.
21. Shah H, Khan R, Naz F, Haseeb A, Jan A, Ullah R. Prevalence and distribution of malaria parasites in general population of district Dir Lower, Khyber Pakhtunkhwa, Pakistan. J Entomol Zool Studies. 2016;4(4):1211-15.