



MALARIA AND ANTIMALARIAL DRUGS: FACTS AND FIGURES FROM THE RURAL SINDH, PAKISTAN

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Abstract:

Background: Malaria is a very common and very ancient disease caused by the malarial parasites following bites by female mosquito of genus anopheles. There are four common variants of this parasite namely Plasmodium Vivax, Falciparum, Ovale and malarae. **Objective:** This research was planned to estimate the frequency distribution and nature of malaria cases in the remote rural area (Tando Adam District) of Sindh Province of Pakistan. **Settings and duration of research:** Pediatric and medical outpatient department of Teaching hospital of Suleman Roshan Medical College was the site of study while the research was conducted over one-year period of time (January 2024 to December 2024). **Methods:** Participants were chosen through non-probability convenient sampling, suspected malaria cases with age limits 5 to 50 years broadly divided into <12 years and above 12 years of age. Patients suspected for pyrexia due to respiratory infections and urinary tract infections were not included in the study. Biographic data and blood samples were collected following informed written consent. Malaria tests were performed in the hospital lab and data was calculated analyzed using SPSS version 22. **Results:** The frequency and percentage of male and female patients in this study was 787(60.12%) and 522(39.88%) respectively. Out of total 1309 patients 1066(81.44%) patients were malaria negative whereas the positive cases were 243(18.56%) out of which 124(9.47%) were males and 119(9.09%) were females. Patients with positive malarial test below the age of 12 years were 78(32.23%) out of which 66(27.27%) were suffering from plasmodium vivax while 12(4.96%) patients were plasmodium Falciparum positive. Patients above 12 years with malaria

positive were 164(67.77%) out of which 137(56.61%) were found to be vivax positive and 27(11.16%) were falciparum positive.

Conclusion: Malaria caused by plasmodium vivax was most common in this region followed by falciparum with no major gender difference was observed. Majority of cases were observed in months from June to October. Artemether and Lumefantrine combination was the mostly prescribed antimalarial agent.

Key Words: Malaria, Vivax, Falciparum, Antimalarials

Introduction:

Malaria is a very common and very ancient disease caused by the malarial parasites following bites by female mosquito of genus anopheles. There are more than 200 species of plasmodium but five are commonly known variants of this parasite namely Plasmodium Vivax, Falciparum, Ovale, malariae and knowlesi responsible for malaria in human beings [1]. Malaria caused by plasmodium Falciparum is of serious nature and most dangerous form of malaria [2-4]. The malarial parasite has a complex life cycle in vertebrate hosts and the vector (mosquito), It consists of sexual and asexual cycles making the development of drugs and vaccines a difficult task [5]. Malaria is mostly prevalent in poor countries where there is no proper sanitation, drainage and waste management system available favoring the growth and spread of the parasite and no proper preventive measures. Complications include cerebral malaria, severe anemia, hepatic failure, renal failure, splenic rupture, respiratory distress, metabolic acidosis and death [6]. It was reported in year 2019 that as per estimation there were 229 million malaria cases in 87 countries (malaria-endemic) out of which 215(94%) million cases were from African region while 3% were from Southeast Asian region and 409,000 deaths were reported due to malaria in the same year out of which 67% were children [7].

Treatment is available for all types of the malaria but drug resistance is a growing challenge. Efforts for the development of new antimalarial drugs and vaccine for the prevention of malaria are under process worldwide. Antimalarial drugs include chloroquine, quinine, artemether and Lumefantrine, mefloquine, pyrimethamine, quinidine and primaquine etc. [8]. Lumefantrine combination with halofantrine is very effective against the erythrocytic stage whereas primaquine is effective for hepatic stage and the gametocytes of the malarial parasites [9,10]. To prevent or delay the spread of antimalarial drug resistance, World Health Organization's recommendations are the use of combination therapy for the treatment of malaria with a minimum of two effective drugs (antimalarial agents) with different mechanism of action as a measure to prevent or delay the drug resistance against the antimalarial agents [7]. Preventive measures against Malaria includes casual prophylactic use of the antimalarial drugs active against the hepatic stage (pre-erythrocytic) of the malaria parasite and the suppressive prophylactic use of antimalarials against the erythrocytic stage (asexual stage). It is recommended to stop the casual prophylaxis after exit from the endemic area while to continue drugs till 4 weeks after the exit in order to eliminate the parasites emerging from the liver weeks after exposure [11]. According to the CDC (Centers for Disease Control) no antimalarial agent is 100% effective to prevent malaria so personal protective measures need to be adopted along with the approved chemoprophylaxis (atovaquone/proguanil, chloroquine, doxycycline, mefloquine etc.). However, the selection of the appropriate drug is multi factor dependent decision the pregnancy, renal, cardiac and socioeconomic status of the patient along with the drug history and geographical location etc. [11].

Methodology:

This research work was done at the Suleman Roshan medical hospital outpatient department. Patients suspected for malaria (n=1309) were tested for malaria. High grade fever with a short history of 1-2 days were included from both sexes while low grade fever, chronic fever, fever with respiratory symptoms or fever due to UTIs were excluded. Consent was taken from parents and patients for children and adult patients respectively. Blood samples were drawn under aseptic measures and tested for malaria positive and negative along with Vivax and falciparum evaluation. Obtained data was

statistically analyzed using SPSS version22, frequency and percentage was calculated for various variables. Results were presented in tables and figures.

Results:

The frequency and percentage of male and female patients in this study was 787(60.12%) and 522 (39.88%) respectively. Total malaria positive cases were 243(18.56%) out of which 124(9.47%) were males and 119(9.09%) were females. Whereas 1066(81.44%) patients were found to be malaria negative out of which 663(50.65%) were males and 403(30.79%) were females [Table-I]. Patients with positive malarial test below the age of 12 years were 78(32.23%) out of which 66(27.27%) were suffering from plasmodium vivax while 12(4.96%) patients were plasmodium Falciparum positive. Patients above 12 years with malaria positive were 164(67.77%) out of which 137(56.61%) were found to be vivax positive and 27(11.16%) were falciparum positive [Table-II]. Maximum vivax cases were reported in the month of July (46) followed by September (39), June (34) October (30) and November (18) whereas maximum falciparum cases were reported in the month of October (14) Figure [I]. As a whole majority of the malaria cases were reported between June and November 220(90.53%) while less than 10% (20) were reported from December to May Figure [II].

Table-I: Frequency and percentage distribution of the study participants

Parameter	Male	Female	Total
Malaria Positive	124(9.47%)	119(9.09%)	243(18.56%)
Malaria Negative	663(50.65%)	403(30.79%)	1066(81.44%)
Participants	787(60.12%)	522(39.88%)	1309(100%)

Table-II: Frequency and percentage distribution of Vivax and Falciparum cases

Parameter	Below 12 Years	Above 12 Years	Grand Total
Vivax	66(27.27%)	137(56.61%)	203(83.88%)
Falciparum	12(4.96%)	27(11.16%)	39(16.12%)
Total	78(32.23%)	164(67.77%)	242(100%)

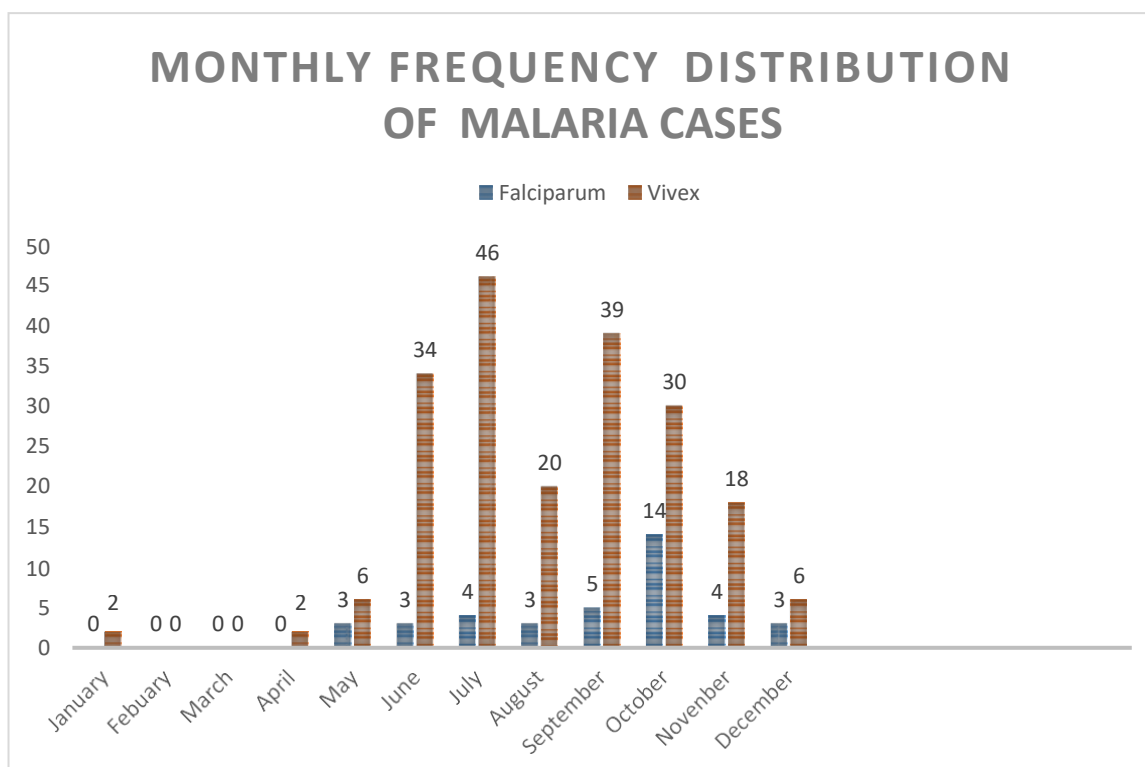


Figure-I: Monthly distribution of Vivax and Falciparum Malaria cases

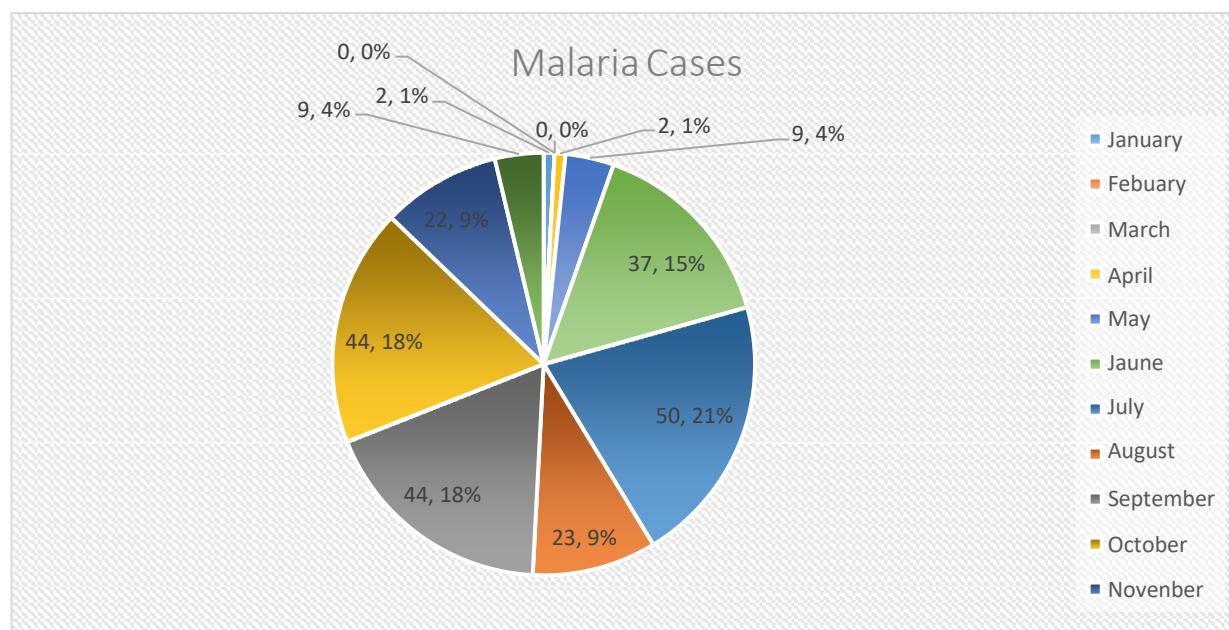


Fig-II: Pie chart of the monthly frequency distribution of malaria cases

Discussion:

Gebremichael et al. (2025) reported the prevalence of *P. Falciparum* as 58% and *P. Vivax* whereas we found 30% 203(83.88%) and 39(16.12%) for vivax and falciparum respectively the reason may be the geographical area difference [12].

The vector control is mainly achieved through ITNs (Insecticide-treated nets) and IRS (Indoor residual spraying) as per the recommendations of WHO (World Health Organization) [7]. Bed nets are the physical impediment to protect from insects and their protecting capability gets increased when they are impregnated with insecticides like permethrin and deltamethrin (Pyrethroids) [13]. The PBO (pyrethroid–piperonyl butoxide) is the best alternative that kills the parasite by inhibiting the mixed function oxidases of the parasite, where there is resistance against the pyrethroids [14]. IRS provides the advanced protection by inhibiting the entry of the mosquito into the houses and the effects exist longer [15]. WHO has recommended the use of carbamates, organochlorines, organophosphates, neonicotinoids and pyrethroids as IRS due to their safety and efficacy level being up to the mark [16]. Multiple vaccines are being tested as a strong preventive measurement against the malarial parasite [11]. Antimalarial resistance is not a recent phenomenon, it has been reported since long like chloroquine, quinolones and antifolate are resistant in the majority of the regions with various mechanisms behind like efflux pumps, P-glycoprotein and enzymatic degradations etc. [17]. In our current study all malaria positive patients were treated with artemether and Lumefantrine combination as the follow up and compliance is a big challenge in the rural population. Artemisinin along with its derivatives are very effective treatment option against malaria so they are the most common antimalarial prescriptions globally the development of resistance against these agents is also being reported so there is a need of developing new agents [18]. Seasonal variations exist in occurrences of the malaria cases as in the rainy season there is damming up of the water and uncovered body parts due to hot weather etc. exposes the rural community more commonly while in winter season there is drop of the malarial cases possibly due to lesser exposure of the body parts along with other factors. Health education is needed at rural level and for this at school, college and community levels workshops should be arranged where the preventive, diagnostic and therapeutic domains of the malaria should be taught to the common men.

Conclusion:

Vivax malaria is more common and more cases are found from June to October and most physicians prefer artemether/Lumefantrine combination over other antimalarial agents.

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