CODEN [USA] : IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
http://doi.org/10.5281/zenodo.4009281

Available online at: http://www.iajps.com *Research Article*

PREVALENCE OF HUMAN MALARIA INFECTION IN PAKISTAN

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Article Received: June 2020 **Accepted:** July 2020 **Published:** August 2020

Abstract:
Introduction: *Half of the world's population is still at risk of malaria. In 2008, an estimated 243 million cases were reported and nearly 863000 deaths were attributed to the disease.* ***Aims and objectives:*** *The basic aim of the study is to analyse the prevalence of human malaria infection in Pakistan.* ***Material and methods:*** *This cross sectional study was conducted in Sheikh Zayed Medical College/Hospital Rahim Yar Khan during Janaury 2020 to July 2020. The data was collected from 200 male and female patients. Participants included in the study were under-5-year-old children, either admitted in the children's ward or attending any clinic on outpatient basis.* ***Results:*** *This study recruited 200 patients. Twelve patients were excluded due to incomplete data. 188 patients were tested using Paracheck-Pf RDT, while 167 patients were tested using thick-film microscopy. A total of 70 (41.9%) were found to be positive by microscopy and 62 (37.1%) by RDT. Thirty-four of the 70 positive results by microscopy were negative (false-negative rate of 48.6%), while 26 of the 97 negative thick-film microscopic results were positive (false-positive rate of 26.8%).* ***Conclusion:*** *It is concluded that interpreting test results without gold standard can be challenging. The use of RDTs in the diagnosis of malaria infection offers an easy-to-use, low-cost, and rapid testing.*

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Please cite this article in press Abdul Rehman et al, ***Prevalence Of Human Malaria Infection In Pakistan.,*** *Indo Am. J. P. Sci, 2020; 07(08).*

INTRODUCTION:

Half of the world's population is still at risk of malaria. In 2008, an estimated 243 million cases were reported and nearly 863000 deaths were attributed to the disease. In the East Mediterranean region, Plasmodium (P.) falciparum is the dominant species in Djibouti, Saudi Arabia, Sudan and Yemen, but the majority of cases in Afghanistan and Pakistan, and almost all cases in Iran and Iraq are due to P. vivax infection. In 2006, the Malaria Disease Surveillance Programme in Pakistan registered 3.5 million slides and 127,825 confirmed cases of malaria with an annual parasite incidence (API) of 0.8 cases per 1000 population [1].

However, the actual case load is estimated to be 5 times higher since public-sector diagnostic facilities cover 20-30% of the patient load, and the remaining get their treatment from the private sector [2]. The estimated number of annual malaria cases in Pakistan is 1.5 million.
In 2004, Punjab and the Azad Jammu and Kashmir (AJK) reported the lowest figures of malaria cases while Balochistan and the Federally Administered Tribal Areas (FATA) reported the highest frequency. Sindh and Khyber-Pakhtunkhwa reported moderate figures in the same period [3].

Among blood infections, malaria is the most widespread, a global threat and potentially a public health problem of the tropics with its morbidity and mortality at unacceptable high levels in the region. According to World Health Organization study group malaria is a major killer of mankind and is responsible for 300 to 500 million clinical cases and 1.5 to 2.7 million deaths per year [4]. Some 270 million new cases of malaria occur every year of which 95% are reported from these areas. Falciparum and vivax malaria are major health problems in Pakistan. In the last decade there has been a six fold increase in falciparum malaria, which now comprises 42% of all malaria cases recorded by National Malaria Control Program [5]. At least 39 districts, mainly from the two southern provinces of Balochistan and Sindh, have been classified at high risk, partly due to the weak public health infrastructure [6].

Aims and objectives

The basic aim of the study is to analyse the prevalence of human malaria infection in Pakistan.

MATERIAL AND METHODS:

This cross-sectional study was conducted in Sheikh Zayed Medical College/Hospital Rahim Yar Khan during Janaury 2020 to July 2020. The data was collected from 200 male and female patients. Participants included in the study were under-5-year-old children, either admitted in the children's ward or attending any clinic on outpatient basis. The patients were clinically evaluated and those suspected of having malaria (regardless of intake of antimalarial drugs or not) were selected to undergo testing by microscopy and RDT after an informed written consent has been signed by the parents/caregivers and assent obtained from the participants.

Statistical analysis

The data was collected and analysed using SPSS version 17.0. All the values were expressed in mean and standard deviation.

RESULTS:

This study recruited 200 patients. Twelve patients were excluded due to incomplete data. 188 patients were tested using Paracheck-Pf RDT, while 167 patients were tested using thick-film microscopy. Because of 91 patients who did not have matching microscopic tests, these patients' results were excluded from the analysis. The actual patients' results included for analysis were 167. A total of 70 (41.9%) were found to be positive by microscopy and 62 (37.1%) by RDT. Thirty-four of the 70 positive results by microscopy were negative (false-negative rate of 48.6%), while 26 of the 97 negative thick-film microscopic results were positive (false-positive rate of 26.8%).

Table 01: Overall sensitivity, specificity, predictive values, and likelihood ratios of rapid diagnostic test using microscopy as the standard

	Estimated values (%)	Percentage CI
Prevalence	41.9	0.3441-0.4978
Sensitivity	51.4	0.39274-0.6343
Specificity	73.2	0.6308-0.8145
PPV	58.1	0.4488-0.7025
NPV	67.6	0.5769-0.7623
PLR	1.92	1.2862-2.8622
NLR	0.66	0.5176-0.8507

PPV – Positive predictive value; NPV – Negative predictive value; PLR – Positive likelihood ratio; NLR – Negative likelihood ration; CI – Confidence interval

DISCUSSION:

Although the different test sensitivity in the dry and in the rainy season may be surprising, this difference appears to be caused almost entirely by the different mean parasite density in the two seasons: if the analysis is stratified for parasite density, the sensitivity is very similar in both seasons. The overall sensitivity was lower than 95%, the minimal level recommended by the WHO [7]. However, most false negative results occurred at the lowest parasite density. Over 400 parasites/µl the sensitivity was higher than 95% and approached 100% over 4,000 parasites/µl. Leaving without treatment patients with false negative results at low parasite density might be relatively harmless. Niama-Meya *et al* in Uganda showed that the missed treatment for patients with a false negative malaria microscopy never resulted in severe disease [8].

Accurate diagnosis is of utmost importance to good malaria case management, whether the test is RDT or microscopy based. Due to high diagnostic performance capabilities of quality-assured RDT and microscopy in detecting clinical malaria, their relatively low cost, and availability, they have been considered the diagnostic tools of choice for the confirmation and management of suspected clinical malaria even in areas of low transmission [9]. The joint WHO-FIND-CDC-TDR Malaria RDT Evaluation program which has gone up to 6 test rounds offers quality standard panels to assist RDT product developers come up with RDTs with high accuracy [10].

CONCLUSION:

It is concluded that interpreting test results without gold standard can be challenging. The use of RDTs in the diagnosis of malaria infection offers an easy-to-use, low-cost, and rapid testing alternative; however, the performance of these kits easily wanes owing to a number of factors ranging from manufacture, poor storage, and handling to usage and interpretation by end users.

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