

A Comparative Evaluation of Microscopic and Immuno-Chromatographic Diagnostic Tests for Detection of Malaria

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ABSTRACT

The diagnosis of Malaria largely depends on clinical judgment, microscopy and recently by rapid immuno-chromatographic diagnostic tests. The present study was conducted in the Department of Microbiology, Parasitology Laboratory, AIMSAR (Bathinda). The main objectives of the study were detection and identification of malarial parasite microscopically in blood films and malarial antigen by immuno-chromatographic Rapid diagnostic test. Comparison of the results of microscopic and immuno-chromatographic rapid diagnostic test was then made. Out of 82 blood samples, 7.31% (6) samples were found positive for malarial parasite by microscopy and 6.09% (5) were found positive by immuno-chromatographic test. Equal number of *P. falciparum* was detected in blood smears and Immuno-chromatographic tests but detection of *P. vivax* by blood smears was more as compared to Immuno-chromatographic tests. The comparative analysis thus concludes that though, immuno-chromatographic tests are rapid, do not require expertise and are useful in routine diagnosis, their sensitivity of antigen detection test is lower (97.4%), when compared to microscopy.

Keywords: Immuno-chromatographic test, Microscopy, Jaswant Singh Bhattacharji stain, Malarial parasite.

INTRODUCTION

Malaria is known as the king of diseases. Malaria is caused by a protozoan

parasite of the genus Plasmodium. [1] The term Malaria is derived from the Italian word 'mal-aria' or bad air. [2] It is transmitted by female *Anopheles mosquito*. [3]

Malaria inflicts great socio-economic burden on humanity. Around 36% of the world population is exposed to the risk of malaria. In the South East Asian Region of WHO, out of about 1.4 billion people living in 11 countries, 1.2 billion are exposed to the risk of malaria, most of who lives in India. The South East Asian countries contribute only 2.5 million cases to the global burden of malaria, where India alone contributes 76% of the total cases. [4]

Female anopheles mosquitoes transmit Plasmodium species that commonly cause illness in humans: *P. falciparum*, *P. vivax*, *P. ovale* and *P. malaria*. Mixed infections with multiple species are possible and occur in areas where more than one species are in circulation. *P. falciparum* and *P. vivax* are the major cause of morbidity worldwide. *P. falciparum* is the most pathogenic species causing malaria. Rarely human can be infected by *P. knowlesi*. [5]

The diagnosis of Malaria largely depends on clinical judgment, microscopy and recently by rapid immuno-chromatographic diagnostic tests. Microscopy is considered the gold standard for detection of Malaria. [6] The commonly

accepted diagnostic method for detecting malaria is microscopic examination of Giemsa stained blood films. In expert hands, microscopy is highly sensitive (lower limit of parasites down to 0.0001% parasitemia), and very specific. Microscopy can determine the stage and species of circulating parasites. [7]

A rapid assay detects plasmodium specific lactate dehydrogenase. It can detect plasmodium species by detecting antigenic differences between various p-LDH iso-enzymes. P-LDH antigen is detected in lysed whole blood. P-LDH is released by live malarial parasites and differentiation of plasmodium species is based on antigenic differences between its various forms. A pan specific pLDH monoclonal antibody recognize all other plasmodium species: *P.vivax*, *P. malariae*, *P. ovale*. [8]

MATERIALS AND METHODS

The present study was conducted in the Department of Microbiology, Parasitology Laboratory, AIMSR (Bathinda). The study included all IPD and OPD blood samples collected from suspected patients of malaria, which comprised all age groups, over a period of six months.

All the blood samples were first examined by a thin smear blood film, stained with J.S.B (Jaswant Singh Bhattacharji) stain. Films were examined for presence of malarial parasite by light microscopy. Each blood smear was examined for a minimum of 15 minutes and if malarial parasite was detected, speciation of parasite was done.

All the blood samples were then subjected to immuno-chromatographic test. Antigen was detected by ICT method with PAN + Pf card for malaria antigen test kit, manufactured by J. Mitra Co. Pvt. Ltd. [9] Test procedure was done as per the manufacturer's instructions. Results of both the methods were then compared.

Statistical Methods: Percentages

RESULT

A total of 82 blood samples from patients suspected to be of malaria were received from various departments of AIMSR, in the Parasitology laboratory of the Department of Microbiology, over a period of six months.

Out of these 82 blood samples, 7.31% (6) samples were found positive for malarial parasite by microscopy and 6.09% (5) were found positive by immuno-chromatographic test.

Microscopy demonstrated 5 peripheral smears with presence of *P. vivax* and 1 peripheral smear with presence of *P. falciparum*.

Among immuno-chromatographic tests, 4 out of 5 (80%) were positive for *P.vivax* and only 1 (20%) was positive for *P.falciparum*. Equal number of *P.falciparum* was detected in blood smears and Immuno-chromatographic tests but detection of *P.vivax* by blood smears was more as compared to Immuno-chromatographic tests.

DISCUSSION

The present study demonstrated a positivity of 7.31% by microscopic method. This compares well with that of studies done by Muhammad et al (8.47%) [6] and Dhodpkar et al. (10.90%). [10]

In our study the results by immuno-chromatographic antigen detection assay method indicated a positivity of 6.09 % which delineate well with that of studies by Mannur S et al. (7.4 %) [11] and Bankole HS et al. (9.8 %). [12]

In the present study, Positivity of *P.vivax* was higher than *P.falciparum* as detected by Microscopy (81.82%). Higher prevalence of *P. vivax* in our study compares well with Pawandeeep et al. (96.77%). [13]

The comparison of malaria positivity by Microscopy 7.31% (6 out of 82) and Immuno-chromatographic test 6.09% (5 out of 82) is well established in our study. The results of microscopic detection go well with the findings of Dhodapkar et.al.

(10.90%)^[10] Pawandeeep et.al. (11.21%)^[13] and Mannur et.al. (12 %).^[11] In detection by Immuno-chromatographic test our study goes well with Mannur et.al.(7.4%),^[11] Bankole et.al. (9.8 %),^[12] and Pawandeeep et.al. (1.6 %).^[13]

This clearly tests that Immuno-chromatographic test has lower sensitivity than microscopic examination of malaria and Microscopic method is gold standard method for detection of malaria.

CONCLUSION

In present study, a total of 82 blood samples from suspected patients of malaria were tested for the presence of malarial parasite by microscopy and simultaneously tested for malarial antigen by rapid immuno-chromatographic assay. 6 samples were found positive for malarial parasite by microscopic method and only 5 were found positive by immuno-chromatographic method.

The comparative analysis thus concludes that though, immuno-chromatographic tests are rapid, do not require expertise and are useful in routine diagnosis, their sensitivity of antigen detection test is lower (97.4%), when compared to microscopy. On the other hand Microscopy is simple, economical, sensitive and specific, hence still remains the gold standard method for diagnosis of malaria. Though microscopy is fairly time-consuming, it has the advantage of high sensitivity, quantifiable results and accurate speciation. In assessing the method for detection of malaria, sensitivity, rapidity, availability and cost are to be taken into consideration. Microscopy meets all of these requirements and is still considered the gold standard method for detection of malaria.

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