

Research Article

Evaluation of Automated Hematology Analyzer (DXH 800) Flags in Detection of Plasmodium vivax: A Comparative Study with Peripheral Blood Smear

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ABSTRACT

Malaria remains a major parasitic disease in endemic regions. Peripheral blood smear (PBS) examination is the gold standard for diagnosis; however, it is time-consuming and observer dependent. Automated hematology analyzers such as DXH 800 provide rapid screening and generate abnormal flags that may indicate malaria (World Health Organization et al. [1]). This study evaluates 50 confirmed cases of Plasmodium vivax and correlates analyzer findings with PBS. All cases showed analyzer flag positivity. One case initially missed on smear was later detected after analyzer alert. The study emphasizes the importance of automated systems as adjunct tools in malaria, detection.

Keywords: Malaria, Plasmodium Vivax, DXH 800, Peripheral Smear, Hematology Analyzer.

INTRODUCTION

Malaria continues to contribute significantly to global morbidity and mortality (World Health Organization et al. [1]). Peripheral blood smear examination allows visualization and species identification but may miss low parasitemia (Bain et al. [2]). Automated hematology analyzers have gained importance due to their ability to process large volumes and provide indirect indicators of infection such as abnormal scatterplots and thrombocytopenia (Campuzano-Zuluaga et al. [4]). Among the various species, *Plasmodium vivax* is widely prevalent in South Asia and is known for its relapsing nature, posing diagnostic and therapeutic, challenges.

The conventional gold standard for malaria diagnosis is the examination of peripheral blood smear (PBS), which allows direct visualization of parasites and accurate species identification. However, this method is labor-intensive, time-consuming, and highly dependent on the expertise of the observer. In cases of low parasitemia or suboptimal smear preparation, parasites may be missed, leading to delayed diagnosis and treatment. With advancements in laboratory technology, automated hematology analyzers such as the DxH 800 have emerged as valuable tools in routine hematological evaluation. These analyzers process large sample volumes

rapidly and generate flags based on abnormalities in cell populations, scatterplots, and parameters such as thrombocytopenia and leukocyte distribution. Several studies have suggested that malaria infection can produce characteristic alterations in scattergrams and abnormal flags, raising suspicion even before microscopic confirmation.

Given the increasing workload in diagnostic laboratories and the need for rapid screening tools, it is important to evaluate the utility of automated analyzers in malaria detection. This study aims to assess the role of DxH 800 analyzer flags in detecting *Plasmodium vivax* infection and to correlate these findings with peripheral smear examination, thereby highlighting its potential as an adjunct diagnostic modality.

MATERIALS AND METHODS

This prospective observational study from December 2025 - May 2026 included 50 EDTA blood samples confirmed as Plasmodium vivax. Samples were analyzed using Beckman Coulter Unicel DXH 800 and peripheral smear. Analyzer flags and scatterplots were correlated with smear findings.

RESULTS

All 50 cases were positive on smear and flagged by analyzer. One case was initially missed on smear but detected after analyzer alert, reinforcing findings by Moody et al. [3].

DISCUSSION

Automated analyzers provide rapid screening and improve early suspicion of malaria, (Campuzano-Zuluaga et al. [4]). The present study demonstrates that automated hematology analyzers, particularly the DxH 800, can serve as effective screening tools in the detection of *Plasmodium vivax* infection. All 50 confirmed cases in this study showed analyzer flag positivity, indicating a strong correlation between analyzer abnormalities and parasitic infection. Notably, one case that was initially missed on peripheral smear examination was later identified following analyzer alert, underscoring the importance of automated systems in reducing false-negative results.

Malaria infection is known to induce several hematological alterations, including thrombocytopenia, anemia, and changes in leukocyte distribution. Automated analyzers detect these variations and reflect them as abnormal scatterplots or flags, which can

prompt further microscopic evaluation. These findings are consistent with previous studies that highlight the role of analyzer-derived parameters and graphical patterns in raising early suspicion of malaria

One of the major advantages of automated analyzers is their ability to process a high volume of samples quickly, making them particularly useful in busy laboratories and endemic regions. They provide an objective and standardized assessment, reducing observer variability associated with microscopy. Additionally, analyzer flags can act as an early warning system, especially in cases with low parasitemia where parasites may not be readily visible on initial smear examination.

However, despite these advantages, automated analyzers have certain limitations. The abnormalities detected are not specific to malaria and may overlap with other infectious or hematological conditions. Furthermore, analyzers cannot differentiate between species of malaria parasites, which is crucial for appropriate clinical management. Therefore, peripheral smear examination remains indispensable for.

Figure: 1

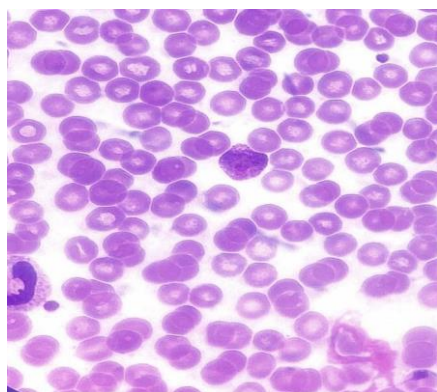
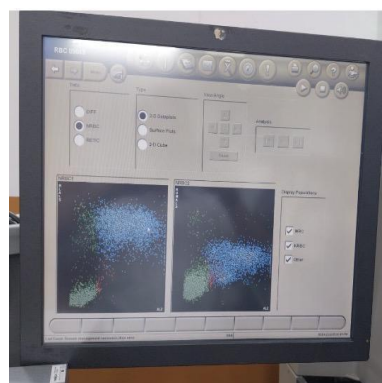


Figure: 2



Limitations: Only *Plasmodium vivax* cases were included. Analyzer cannot differentiate species. **Conclusion:** DXH 800 is a useful

adjunct screening tool but cannot replace microscopy

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