

**Original article:**

## **Study of assessment of feasibility of Modified Centrifuged Blood smear (MCBS) test in early detection of malaria parasite**

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### **Abstract:**

**Introduction:** The laboratory diagnosis of malaria is done by different techniques such as the conventional thin and thick peripheral blood smears (PBS), concentration techniques such as centrifuged buffy coat smears (CBCS) and fluorescent (QBC ®) technique, Serologic tests such as the detection of parasite-specific proteins' Rapid Diagnostic Tests (RDT) and Polymerase Chain Reaction (PCR). Herewith present study was planned to Study of assessment of feasibility of Modified Centrifuged Blood smear (MCBS) test in early detection of malaria parasite.

**Material and methods:** The present study was done in a tertiary care hospital for two years duration. 328 patients with symptoms suspicious of malaria (fever with chills, headache and nausea and vomiting) were enrolled in the study. Blood from 200 other patients, who had no clinical suspicion of malaria, was also taken and they acted as controls. MCBS test was done alongwith other tests to assess its comparative advantage over other methods.

**Results:** MCBS could detect 77.39% cases in our study. Our study showed that MCBS performed through capillary tubes was easy to perform, affordable and could detect 12.33% cases more than PBS.

**Conclusion:** The Modified Centrifuged Blood Smear method (MCBS) utilizes some special equipment but these are cheap and can be easily mobilized in far flung areas. The technique improves the sensitivity of peripheral blood smear method without compromising on specificity. The principle of centrifugation, which is employed in Quantitative Buffy coat technique, is employed here and direct visualization of parasites is also possible, thus eliminating disadvantages of quantitative buffy coat technique.

### **Introduction:**

The laboratory diagnosis of malaria is done by different techniques such as the conventional thin and thick peripheral blood smears (PBS), concentration techniques such as centrifuged buffy coat smears (CBCS) and fluorescent (QBC ®) technique, Serologic tests such as the detection of parasite-specific proteins' Rapid Diagnostic Tests (RDT) and Polymerase Chain Reaction (PCR).<sup>1</sup> These techniques have their own advantages and disadvantages with respect to sensitivity, specificity, time consumption, cost effectiveness, ease of procedure etc. The problem of drug resistance and substitution of newer costlier drugs bring with it the need for rapid, accurate, inexpensive diagnostic procedure. It would be of great help if MCBS (modified centrifuged blood smear), a

technique that utilizes most of the advantages, while eliminating most of the disadvantages of the above techniques, is implemented<sup>2</sup>.

Herewith present study was planned to Study of assessment of feasibility of Modified Centrifuged Blood smear (MCBS) test in early detection of malaria parasite.

**Material and methods**

The present study was done in a tertiary care hospital for two years duration. 328 patients with symptoms suspicious of malaria (fever with chills, headache and nausea and vomiting) were enrolled in the study. Blood from 200 other patients, who had no clinical suspicion of malaria, was also taken and they acted as controls.

From each of the 328 patients, detailed clinical history including age, sex, presenting complaints was taken. 2 ml of venous blood was collected in an EDTA bulb, subjected to three techniques for diagnosis of malaria; peripheral smear examination (PBS), Modified Centrifuged Blood Smear (MCBS) and Antigen detection (dipstick method).

The patient was declared to be having malaria if he was positive by any one of the methods employed and was called a CASE.

The blood was also subjected to analysis by a three part hematology analyzer (ERMA PCE 210) and Hb value, total WBC count, platelet count and RDW were noted.

Differential count was done by peripheral smear examination as our three part counter could not differentiate between eosinophils, monocytes and basophils. Similarly blood from 200 patients negative for malarial symptoms was subjected to assessment of the same hematological parameters. They were tested for malaria by all the three methods as well.

**MODIFIED CENTRIFUGED BLOOD SMEAR (MCBS) Technique : <sup>3</sup>**

The centrifuged buffy coat smear (CBCS) which has been used in the past involves collection of 2ml venous blood into anticoagulant bottles, filling the wintrobe’s tube and centrifugation for 20-30 min, finally obtaining buffy coat layer onto a slide; is a very cumbersome procedure. Although capillary tubes were used in the past, it was unacceptable due to problematic procedure and lack of standardization.

**Results**

Table 1 Results according to methods used for detection in study group

	PV	PF	MIXED	TOTAL POSITIVE	NEGATIVE	TOTAL
PBS	76	18	1	95	233	328
MCBS	90	22	1	113	215	328
ANTIGEN	111	34 <sup>#</sup>	0	145	183	328

**Table 2 Results according to methods used for detection in control group**

	PV	PF	MIXED	TOTAL POSITIVE	NEGATIVE	TOTAL
PBS	0	0	0	0	200	200
MCBS	0	0	0	0	200	200
ANTIGEN	2*	0	0	2	198	200

MCBS could detect 77.39% cases in our study. Our study showed that MCBS performed through capillary tubes was easy to perform, affordable and could detect 12.33% cases more than PBS.

The technique improves the sensitivity of peripheral blood smear method without compromising on specificity. The principle of centrifugation, which is employed in Quantitative Buffy coat technique, is employed here and direct visualization of parasites is also possible, thus eliminating disadvantages of quantitative buffy coat technique.

**Discussion:**

The impact of malaria morbidity and mortality continue to increase across malaria risk areas. The actual number of cases is probably underestimated by current surveillance approach. The World health organization has recommended prompt parasitological confirmation by microscopy or alternatively rapid diagnostic methods in all patients suspected of malaria before treatment is started<sup>4</sup>. Although microscopy by thick and thin smear is the gold standard for malaria diagnosis<sup>5</sup>, the risk of false negative microscopy is higher, especially if patient has received recent doses of antimalarial drugs. It is also labor intensive and requires considerable skill at interpretation, particularly at low levels of parasitemia. A major drawback of RDTs is that they are more expensive and sensitivities are variable. The other rapid modality is quantitative buffy coat, however is not affordable in most Indian hospitals, considering the cost. In our study, we used MCBS technique, which was found superior to conventional blood films, since it combined principles of both blood film and QBC.

MCBS could detect 77.39% cases in our study. Our study showed that MCBS performed through capillary tubes was easy to perform, affordable and could detect 12.33% cases more than PBS. However it took more time for preparation and examining as compared to PBS. Following table shows comparison of MCBS with other studies performed and that our findings were concordant.

**Conclusion:**

The Modified Centrifuged Blood Smear method (MCBS) utilizes some special equipment but these are cheap and can be easily mobilized in far flung areas. The technique improves the sensitivity of peripheral blood smear method without compromising on specificity. The principle of centrifugation, which is employed in Quantitative Buffy coat technique, is employed here and direct visualization of parasites is also possible, thus eliminating disadvantages of quantitative buffy coat technique.

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