

UTILIZATION OF LABORATORY SERVICES IN MANAGEMENT OF FEBRILE  
CHILDREN AT A REFERRAL HOSPITAL IN KENYA: A CLINICIANS' VIEW

Marete, I.K.<sup>1,2</sup>, Osiemo-Lagat, Z.<sup>2</sup>, Simba, J.M.<sup>1</sup>, Obala, A.<sup>1</sup>, Murithi, G.M.<sup>3</sup>, Chumba, J.C.<sup>4</sup>, and  
Mutugi, M.<sup>2</sup>

1. Moi University, School of Medicine
2. JKUAT, Department of Zoology
3. Moi University, School of Nursing
4. Moi Teaching and Referral Hospital

## UTILIZATION OF LABORATORY SERVICES IN MANAGEMENT OF FEBRILE CHILDREN AT A REFERRAL HOSPITAL IN KENYA: A CLINICIANS' VIEW

### ABSTRACT:

**Problem Statement:** Fever is the commonest manifestation of many paediatric infections present in many health facilities in sub-Saharan Africa. The use of laboratory diagnostic services is critical to support diagnosis and treatment of these infections.

**Setting:** Moi Teaching and Referral Hospital.

**Study Population:** Clinicians attending and supervising the outpatient paediatric clinic.

**Objective:** To describe the perception of and the extent of the utilization of the laboratory services to establish cause of fever in outpatient setting at a national referral facility in Kenya.

**Methodology:** A cross-sectional survey involving administration of a questionnaire to the clinicians between July 2010 and February 2011. Fifty four clinicians systematically sampled over the study period filled this questionnaire which captured data on the perception, utilization and reliability of the laboratory services to support outpatient treatment of the febrile children in outpatient setting.

**Results:** There was a high prevalence of presumptive diagnosis with 98.2% clinicians commencing antimalarial treatment without blood smears, 86.7% treating sepsis without blood culture, and 83.3% treating tuberculosis without AFB results. Most clinicians thought that the laboratory tests were reliable (72.3%) and accurate (83.3%). There were variations in the availability of the laboratory tests with malaria test being the commonest (83.4%) and blood culture being the least available (11%). The perceptions of the availability of these tests did not determine the frequency to which they were utilized to support diagnosis and treatment. However, only half of them (50%) perceived them to influence their clinical decision.

**Conclusion:** It is clear that clinicians treat their patients at MTRH based on presumptive diagnosis despite availability of laboratory services that were prescribed to be accurate.

**Recommendation:** Further research is needed to establish the difference between practice and perceptions of laboratory services by clinicians.

**Key Words:** Clinicians, Perceptions, Laboratory Tests, Febrile Child.

## BACKGROUND

Fever is the commonest sign of illness in young children in Kenya with malaria being the number one cause of fever and the leading cause of child mortality in sub Saharan Africa. As a result, the World Health Organization recommended treating any fever episode in African children with antimalarial drugs. The safety of this recommendation became questionable. This is because the rate of malaria transmission even in highly endemic areas has reduced. A sharp decline in transmission has been noted among age group 2 to 10 years from 37% in the years 1985-1999 to 17% in the years 2000-2007 in sub-Saharan Africa (1). The lower the transmission rate the lower the likelihood that any fever is malaria. Therefore the likelihood of missing other fatal illnesses is quite high. Currently, the WHO recommends parasitological diagnoses for all cases of malaria. Alternative diagnosis should always be sought where slides are negative for malaria to avoid problems associated with overdiagnosis of malaria including increased mortality (2).

A switch from presumptive to laboratory diagnosis of malaria is needed to address diagnostic and treatment challenges regarding malaria and other diseases that present with fever. However, delay in the introduction of reliable and simple diagnostic techniques for malaria and other diseases that present with fever such as upper respiratory tract infections, urinary tract infection (UTI), meningitis among others pose a major challenge. Barriers to defining illness are vast, and currently patients who present to hospital with “fever” are often presumptively given the “diagnosis” of malaria which results in a failure to treat alternative causes of fever which may include severe infections and hence leading to increase in childhood mortality. Several studies have shown that lack of confirmatory laboratory testing is associated with worse outcome (3-7). For this reason, laboratory medicine in Africa and other resource poor settings has become

a focal point in the fight to prevent and reduce disease morbidity and mortality by providing accurate diagnosis (8-10).

Moi Teaching and Referral Hospital (MTRH) is the primary hospital to an estimated 13 million people of western region of Kenya. The availability of current laboratory infrastructure at Moi Teaching and Referral hospital has not been evaluated. Some of the diagnostic tests such as blood cultures are not routinely available to clinicians for the evaluation of patients presenting with fever. Viral respiratory tract infections are the most common infections in children; yet, laboratory testing for common respiratory viruses is not available at MTRH.

The aim of this paper is to describe clinician's perception of the availability and reliability of laboratory services and the utilization of these services in clinical decision-making in management of children with febrile illness presenting at MTRH. This forms a baseline survey in evaluating the adequacy of services offered in this institution.

### **METHODOLOGY**

A cross-sectional survey was done between July 2010 and February 2011 at outpatient paediatric clinic of Moi Teaching and Referral Hospital, Eldoret Kenya. Healthcare providers (i.e. pediatricians, medical officers and clinical officers) attending and supervising the MTRH Sick Child Clinics were asked to be involved in the study. Clinicians who consented were systematically enrolled into the study. A minimum sample size of 51 clinicians was required (Calculated from Fischer's Exact Formulae Z at 95% Confidence Interval,  $\hat{P} = 88\%$  - from a Ghana study [6],  $e=5\%$  and adjusted for finite population). A total of 54 clinicians filled a questionnaire on their perceptions about the quality and utilization of laboratory services. Data was analyzed using SPSS version 16 and presented as descriptive statistics. Approval to carry

out the survey was granted by Moi University/MTRH Institutional Research and Ethics Committee.

## RESULTS

Sample included 54 clinicians taking care of febrile children at MTRH. Their cadres included clinical officers, medical officers and paediatricians (only 2 pediatricians were interviewed). Three laboratory tests (Blood slide for Malaria Parasites, Blood Cultures and Ziehl Neelsen Staining for Alcohol Acid Fast Bacilli) were used to illustrate the clinicians' perception.

Most clinicians, 83.4% and 62.9%, reported that the Blood Slide for Malaria Parasites and Ziehl Neelsen for Alcohol Acid Fast Bacilli respectively were either frequently or always available while 87.1% reported that blood cultures were either rarely or only sometimes available (*Table 1*).

**Table 1: Clinicians view on the availability of the laboratory services**

Test	Rarely /Sometimes	Frequently	Always
Bs for MPS	9 (16.6%)	19 (35.2%)	26 (48.2%)
Blood culture	47 (87.1%)	3 (5.6%)	3 (5.6%)
ZN for AAFB	20 (37.1%)	18 (33.3 %)	16 (29.6%)

The frequency of presumptive /clinical diagnosis is high among the clinicians sampled across all the three diseases studied. Only 1.9% of clinicians did not treat malaria presumptively with only

13% and 16.7% reporting having never treated sepsis without blood culture and TB without ZN for AAFB respectively (Table 2).

**Table 2: Clinicians view on the use presumptive diagnosis**

Illness	Never	Sometimes/ Frequent	Always
Malaria	1(1.9%)	51(94.5%)	2 (3.7%)
Sepsis	7(13%)	36 (66.7%)	11(20%)
Tuberculosis	9 (16.7%)	43(79.6%)	2(3.7%)

Although 72.2% and 83.4 % of clinicians interviewed believe that laboratory results are reliable and accurate respectively, only 50% of them believe that the results influence their decision (Table 3).

**Table 3: Relationship between accuracy and reliability and utilization of lab services**

Clinicians response	Reliable	Accurate	Influences decision making
Yes	39 (72.2%)	45 (83.3%)	27 (50%)
No	15 (27.8%)	9 (16.7%)	27 (50%)

Eight five percent of clinicians did not feel that time was a hindrance to utilization of laboratory services. Unavailability of sample collection materials (needles, syringes etc) was a hindrance frequently/almost always to only 3.7% of clinicians with 16.7% (9) feeling the cost of services was a barrier. Four (7.4%) of the clinicians sampled felt that some patient were too young to be tested.

## DISCUSSION

When a child presents with fever, the decision on the diagnostic and treatment regimen is determined after a thorough clinical evaluation and conducting of appropriate laboratory tests. For accurate diagnosis, efficient laboratory testing is vital for the identification and subsequent treatment of patients with life threatening diseases such as malaria, TB and sepsis. Absence of effective laboratory services can lead to misdiagnosis and mismanagement of patients (11). This has a lot of disadvantages including increased cost, development of drug resistance and increased mortality as other likely conditions are missed or diagnosed late (5,12).

The laboratory tests evaluated, except for blood cultures, were largely available at the hospital as self reported by the clinicians. The reasons for presumptive treatment therefore in our set up may not be due to unavailability of services. Similarly Barat et.al in Zambia showed that availability of malaria test did not affect the rate of presumptive treatment (13). As for tuberculosis test, ZN for AAFB test may not be useful in most cases as the younger children are not able produce sputum. Obtaining specimens through gastric lavage and bronchoalveolar lavage is not always a viable option (14).

Most clinicians in our facility believe that the laboratory results were accurate and reliable. This is in contrast to other studies as Derua YA, showed a 41% reliability of microscopy for malaria diagnosis by clinicians (15,16). However the results did not influence their clinical decision in this study. Similar results were reported in Ghana in a study involving 80 clinicians (6). This is in contrast to what is reported in other studies. We can therefore postulate from these comparable

studies in two different parts of Africa that mind sets as shown by Chandler et.al in Tanzania may be pivotal in explaining why clinicians would have test results, trust them but not use them in treating a patient (17).

It is has long been thought that clinicians do not use laboratory services because they are unavailable. This notion need to be revisited as only 3.7% of clinicians cited unavailability of resources (eg. sample containers) as the factor that hinders their utilization the laboratory services. Similar findings were reported by Polage et.al in Ghana 5 years before our study (6, 8-10).

### **CONCLUSION**

It is clear that clinicians treat their patients based on presumptive diagnosis despite laboratory services being available, reliable and accurate.

### **RECOMMENDATION**

To understand this paradox, further studies are required. This will go a long way in enhancing and promoting the utilization of laboratory services as a critical component of medical care.

### **ACKNOWLEDGEMENT**

We wish to acknowledge Cathy A. Petti, MD who was involved in conceiving the idea of conducting this study in our set up.

### **REFERENCES**

1. Guerra CA, Gikandi PW, Tatem AJ, Noor AM, Smith DL, et al. The limits and intensity of *Plasmodium falciparum* transmission; implications for malaria control and elimination worldwide. *Plos med* 2008 5;e38. doi:10.1371/ journal.p.med .0050038.
2. World Health Organization: Guidelines for the treatment of malaria – 2nd edition. *Geneva, 2010*.
3. Berkley JA, Lowe BS, Mwangi I, Williams T, Bauni E, Mwarumba S, et al. Bacteremia among children admitted to a rural hospital in Kenya. *N Engl J Med* 2005;352(1):39-47.
4. Evans JA, Adusei A, Timmann C, May J, Mack D, Agbenyega T, et al. High mortality of infant bacteraemia clinically indistinguishable from severe malaria. *Qjm* 2004;97(9):591-7.
5. Reyburn H, Mbatia R, Drakeley C, Carneiro I, Mwakasungula E, Mwerinde O, et al. Overdiagnosis of malaria in patients with severe febrile illness in Tanzania: a prospective study. *Bmj* 2004;329:1212.
6. Polage CR, Bedu-Addo G, Owusu-Ofori A, Frimpong E, Lloyd W, Zurcher E, et al. Laboratory use in Ghana: physician perception and practice. *Am J Trop Med Hyg* 2006;75(3):526-31.
7. Gwer S, Newton CRJC, Berkley JA. Over-Diagnosis and Co-Morbidity of Severe Malaria in African Children: A Guide for Clinicians. *Am. J. Trop. Med. Hyg.*, 2007;77(Suppl 6): 6–13
8. Strengthening microbiologic laboratory systems to support infectious disease prevention and control programs in under-resourced countries, final meeting report. . Washington, D.C.: American Society for Microbiology; 2005.

9. International laboratory related-resource and activity directory. . In. Department of Health and Human Services, Centers for Disease Control and Prevention. Available at:<http://www.phppo.cdc.gov/dls/ila/default.aspx>. ; 2007.
10. Petti CA, Polage CR, Quinn TC, Ronald AR, Sande MA. Laboratory medicine in Africa: a barrier to effective health care. *Clin Infect Dis* 2006;42(3):377-82.
11. Craig, JC, Williams, GJ, Jones, M, Codarini, M, Macaskill, P, Hayen, A, et.al The accuracy of clinical symptoms and signs for the diagnosis of serious bacterial infection in young febrile children: Prospective cohort study of 15 781 febrile illnesses. *BMJ*, 2010 ;340 doi:10.1136/bmj.c1594
12. Barat L, Chipipa J, Kolczak M, Sukwa T. Does the availability of blood slide microscopy for malaria at health centers improve the management of persons with fever in Zambia? *Am J Trop Med Hyg* 1999; 60: 1024–1030.
13. Chinkhumba J, Skarbinski J, Chilima B, Campbell C, Ewing V, San Joaquin M, et.al Comparative field performance and adherence to test results of four malaria rapid diagnostic tests among febrile patients more than five years of age in Blantyre, Malawi. 

1	
---	--

*Malar J.* 2010 Jul 20; 9:209.
14. Derua YA, Ishengoma DRS, Rwegoshora RT, Tenu F, Massaga JJ, Mboera LEG et.al *Users' and health service providers' perception on quality of laboratory malaria diagnosis in Tanzania.* *Malar J.* 2011; 10: 78.
15. Chandler CI, Jones C, Boniface G, Juma K, Reyburn H, Whitty CJ. Guidelines and mindlines: why do clinical staff over-diagnose malaria in Tanzania? A qualitative study. *Malar J.* 2008; 7: 53.

16. World Health Organization: Global plan for artemisinin resistance containment (GPARC). *Geneva, 2011.*
17. Stockdale AJ, Duke T, Graham S, Kelly J. Evidence behind the WHO guidelines: hospital care for children: what is the diagnostic accuracy of gastric aspiration for the diagnosis of tuberculosis in children? *J Trop Pediatr.* 2010 Oct; **56(5):291-8.**