EFFICACY OF RAPID DIAGNOSTIC TESTS FOR MALARIA IN CHILDREN OF RURAL GHANA

Jonathon Reynolds, Natalie Griswold (Dr. Ty Dickerson)

Department of Pediatrics

Background: In 2015, 88% of new cases and 90% of deaths due to malaria were in the WHO African Region, mostly among children[1]. Historically, making a definitive diagnosis of malaria required microscopic examination of a carefully prepared blood sample by a skilled laboratorian. Malaria rapid diagnostic tests (RDTs) have become available to the public for diagnosis of malaria in rural Ghana and require no laboratory infrastructure, allowing them to be effectively deployed in rural settings, including private retail drug shops[3]. Inaccurate RDT's can result in the misdiagnosis of malaria, leading to overtreatment or undertreatment, wasted resources and drug resistance[1,2]. We sought to determine how locally available RDTs perform compared to standard microscopy for the diagnosis of malaria parasitemia in children in the Barekese sub-District in the Ashanti Region of Ghana, West Africa.

Methods: During this community based, cross sectional study, caregivers of children aged 6 months to 5 years in six communities in the Barekese sub-District were invited to participate after obtaining parental consent. Samples of capillary blood were collected for locally available histidine-rich protein II (HRP2)-based RDTs[4] and preparation of blood smears for microscopy. Microscope slides with thick and thin smears were air dried prior to Giemsa staining and microscopic examination for malaria parasites by local medical lab scientists. RDT results were read and recorded on-site. All children who were RDT positive were treated with a course of artemisinin-based combination therapy (ACT) under the direction of a local pediatrician.

Results: 293 participants enrolled in the study. By RDT, 112 tested positive, 180 tested negative, and 1 test was inconclusive. Compared to the blood smear, the sensitivity and specificity of the RDT were 96% and 74% respectively. The positive and negative predictive values were 43% and 99% respectively. Of 64 children with positive RDT but negative microscopy, 49 reported having taken medication for malaria within the prior 14 days.

Conclusion: Consistent with other studies[5,6,7], this research suggests that the HRP2-based malaria RDT's such as those available in the Barekese sub-District of Ghana display high sensitivity and negative predictive value and thus are very useful for ruling out the diagnosis of malaria in children aged 6-60 months of age. Because of persistence of the HRP2 antigen in children effectively treated with a recent course of

antimalarial therapy, RDT is not useful for detecting treatment failures[6]. Alternate diagnoses rather than malaria should be carefully considered in all symptomatic children who are RDT negative[7].

References:

1. World Health Organization. Malaria. www.who.int/mdeiacentre/factsheets/fs094/en/
2. Chandler C., et all. How can malaria rapid diagnostic tests achieve their potential? A qualitative study of a trial at health facilities in Ghana. Malaria Journal, 2010; 9:95.
3. Ansah EK, et al. The impact of providing rapid diagnostic malaria tests on fever management in the private retail sector in Ghana: a cluster randomized trial. BMJ 2015 Mar 4; 350:h1019. Doi:10.1136/bmj.h1019.
4. First Response Malaria Antigen P. falciparum (HRP2) Detection Rapid Card Test. Premier Medical Corp. Limited, Gujarat, India.
5. Kyabayinze DJ, et al. Operational accuracy and comparative persistent antigenicity of HRP2 rapid diagnostic tests for plasmodium falciparum malaria in a hyperendemic region of Uganda. Malaria Journal 2008;7:221.
6. Abba K, et al. Rapid diagnostic tests for diagnosing malaria. Cochrane Library 6 July 2011.
7. Odoga, J, et al. Rapid diagnostic tests versus clinical diagnosis for managing fever in settings where malaria is common. Cochrane Library 17 Apr 2014.