popular mRDT brands in Nigeria - SD Bioline Malaria Ag P.f. In our study, a total of 110 hospital patients were tested using this brand. Out of these numbers, giemsa stained thick blood smear identified 83 (75.5%) positive while SD Bioline Malaria Ag P.f identified only 26 (23.6%) positive with sensitivity of 27.7%, accuracy of 42.7%, PPV 88.5% and NPV 28.6%. From these findings, one would observe that there are many malaria infected patients that the SD Bioline Malaria Ag P.f failed to identify. Yet among these numbers, there are also those that SD Bioline Malaria Ag P.f wrongly identified as positive i.e, false positive 3 (2.7%) and those that were actually positive but could not be detected by SD Bioline Malaria Ag P.f i.e, false negative 60 (54.5). The accuracy of SD Bioline Malaria Ag P.f from the study therefore stood at 42.7% which is not favourable as a diagnostic tool of choice especially for a menace like malaria. It is therefore not doubtful that discrepancies like these are responsible for slow progress in malaria elimination interventions apart from emergency of resistant strains of the parasite and its vector.

Conclusions

Diagnosing *Plasmodial* disease – malaria, has not been as successful as desired especially in settings such as where this study was undertaken. As deadly as the disease is, it has no definite diagnostic method which is devoid of one shortcoming or another. The world waits for that method which apart from being accurate is also quantitative and specific. Of all the available methods, microscopy is the most reliable; but it is fraught with so many shortcomings which include not being rapid, reduced sensitivity at low parasitaemia, affected by poor optical resolution of the microscope and the microscopist, shortage of adequately trained malaria microscopists and poor quality staining reagents. The malaria real time qualitative polymerase chain reaction (Rt qPCR) also has its own shortcomings that limit its application.

Findings from this study indicate that the mRDT examined is not measuring up to expectation despite its popularity. No wonder the disease burden is rising in spite of efforts already put place. For instance, the world health organization (WHO) reported in 2016 that 91 countries reported a total of 216 million cases of malaria, an increase of 5 million cases over the previous year. The global tally of death reached 445,000 deaths, about the same number reported in 2015. WHO Africa region continues to account for about 90% of malaria cases and deaths worldwide. Fifteen countries all but one in sub-Saharan Africa – carry 80% of the malaria burden, (WHO world malaria report, (2017)). The same report indicated that 15 countries but one in sub Saharan Africa carrying 80% of the malaria burden. This staggering statistics is coming at the heels of the introduction and use of mRDT. Something must therefore be wrong with the system that of all coordinated effort already put in place overtime virtually no progress is being made.

In this study, the RDT of choice in PSSH and in most other facilities in Nigeria was being investigated; it was observed from the study that the RDT is actually not helping out. Little wonder most renowned health facilities in Plateau State such as Jos University Teaching Hospital, Bingham University Teaching Hospital and Our Lady of Apostles Hospital have long jettisoned the use of RDTs for malaria testing. PSSH where it is still being used in the

state is only in the children outpatient department; where they use it before initiating emergency treatment of children with febrile illnesses when malaria is suspected to be the cause. It is noteworthy here that clinicians often do not rely on the results from these malaria RDTs when they look doubtful following clinical findings.

Recommendations

The World Health Organization (WHO) recommended RDT standards include a sensitivity of 95% for the detection of 100 /µl parasites and 95% specificity. It is obvious that the model evaluated fell below expected standard. In the study, the diagnostic performance of SD Bioline Malaria Ag P.f was poor with classification accuracy of 42.7% and recall (sensitivity) of 27.7% (tables 4 and 5).

With the accuracy of 42.7% and sensitivity of 27.7, our model is clearly underperforming and therefore, should no longer be recommended until issues of quality are adequately addressed about it. This is important as none of the past studies in Nigeria had attained up to 95% WHO recommendation for sensitivity. Discontinuation of the use of the malaria RDTs in Nigeria is important as nobody would like to be a victim of wrong diagnosis. The consequence of wrong diagnosis can lead to wrong treatment decision, distorted epidemiologic record and poor clinical outcome. Considering the information so far gathered from this study, the following recommendations should be considered for the use of malaria rapid diagnostic tests:

1. Malaria rapid diagnostic tests should be discontinued forthwith;
2. Research should be conducted to ascertain factors responsible for poor performance of the RDT kits used in Nigeria so as to come up with solutions that will improve the accuracy, robustness, goodness of rules and scalability of the products.
3. Malaria specialist centers manned by adequately trained malaria microscopists and funded properly with adequate instruments, where residents can obtain free quality malaria diagnosis should be established in every electoral ward or attached to all the primary health centers throughout the country to encourage early detection and treatment for total elimination of the parasite. This is because an uninfected mosquito does not transmit malaria parasite. Government and development partners should endevour to provide every necessary logistics for effective functioning of the centers; and
4. Research should be sponsored for the development of more reliable qualitative malaria rapid test kits based on clime peculiarities to enhance early and accurate diagnosis and treatment.

Limitations of the Study

The study witnessed quite a few limitations ranging from taking up measured volume of blood samples from restive children to poor capillary migration of recommended volume of buffer up to the result window. When this happens we will have no option than to add buffer and in some cases add more sample to the test which alter manufacturer's recommendation and these do impact the outcome of the study.

Contribution to Knowledge

The problem that prompted this study was the problem of inconsistent result by malaria rapid diagnostic test kits used in Nigeria. The problem with the mRDTs is something that involves the participation of several stakeholders to solve. This study has therefore contributed to knowledge by providing relevant information and guidance to individuals, health care service providers, test kit manufactures as well as health corporate organizations on the need to be alive to a prominent factor militating against winning the effort to eliminate malaria.

Suggestions for Further Studies

In order to advance the course of effective diagnosis and treatment of mostly febrile illnesses of protozoan blood parasites, I suggest further studies in the following areas:

1. Scientific study of studies of the effects of malaria misdiagnosis on the treatment decision, epidemiologic records, or clinical outcomes.
2. Molecular basis for reactive widal tests in the absence of *Salmonella* antibody.
3. A Broad spectrum diagnostic solution for parasitic blood diseases.

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