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ORIGINAL ARTICLE

Misdiagnosing of malaria as RTI decreased after introduction of RDTs in rural areas of Kenya

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Abstract

BACKGROUND: Clinical presentation of malaria is highly variable and can be mistaken for number of other diseases, including respiratory tract diseases, which are associated with significant morbidity and mortality. However, presumptive management of fever as malaria can result in significant overdiagnosis, even in high-risk areas. Quality microscopy services for the diagnosis of malaria are not widely available in rural areas of Sub-Saharan Africa as well as in substandard conditions of low-income settings and the accuracy of microscopy is usually poor.
MATERIAL AND METHODS: The aim of the study was to determine how introduction of RDTs influenced diagnostics of malaria in high risk area of Eldoret, Kenya. Documentation of every patient was screened for data of current disease and diagnostic tools used. In patients with suspected malaria, either microscopy, or RDT or both were done to confirm the diagnosis.
RESULTS: Initially, incidence of malaria was very high, about 50-70% of all visits in OPD due to any infectious condition. In 2010, when rapid diagnostic tests became available in Eldoret, decrease in incidence of malaria from 49% (2010) to 29% (2011) and further to 5.3% (2016) was noted. At the same time, increased incidence of upper and especially lower respiratory tract infections was noted.
CONCLUSION: Results suggest that upper and lower respiratory tract infections were formerly diagnosed and treated as malaria. Other contributing factors, such as improvement of infrastructure and malaria preventive and treatment programs also play a role in decreasing malaria incidence in rural areas of Kenya, however, RDTs play a key role in proper diagnostics of malaria.

INTRODUCTION

Sub-Saharan Africa carries a disproportionately high share of the global malaria burden. In 2015, the region was home to 88% of malaria cases and 90% of deaths due to malaria. Most of these deaths are caused by several factors including poor infrastructure, low household income and poor diagnostics (WHO 2015). Unfortunately, also the clinical presentation of malaria is highly variable and can be mistaken for a number of other diseases, including low respiratory tract diseases, such as pneumonia, which are associated with significant morbidity and mortality. Health workers without proper training and access to tools for microscopic diagnosis often manage most

or all fever cases as malaria, which is understandable, however, presumptive management of fever as malaria results in significant overdiagnosis and overtreatment, even in high-risk areas (Perkins & Bell 2008; Mamova *et al.* 2015). Microscopy service for the diagnosis of malaria is not widely available in rural areas of Sub-Saharan Africa, where most of urgent care takes place (Mamova & Cmorej 2016). In such places, infrastructure for successful microscopic diagnostics of malaria is difficult to achieve, mainly due to costs for trained and motivated staff, well-maintained equipment, and effective quality assurance system (Kain *et al.* 1998). In substandard conditions of low-income settings, the accuracy of microscopy is usually poor. Microscopy in these areas when compared with expert microscopy can achieve sensitivity of only 69% and specificity of 62% (Kilian *et al.* 2000).

The development of diagnostic tests that can detect malaria parasite antigens in a blood sample taken from fingerprick only, was a major advance. Rapid diagnostic tests (RDTs) are based on the ability of monoclonal antibodies to bind to parasite antigens in lysed blood and immobilize them along a defined line on nitrocellulose for detection with a colored label. Commercial RDTs target one or more of Plasmodium protein targets: histidine rich protein 2 (HRP2), parasite lactate dehydrogenase (pLDH), or aldolase. HRP2 is present in *Plasmodium falciparum* only, whereas pLDH and aldolase, are present in all four major species. RDTs have the big advantage of requiring less training and infrastructure, therefore they are suitable for remote settings, do not require human factor and for interpretation (Kilian *et al.* 2000; Chiodini *et al.* 2007).

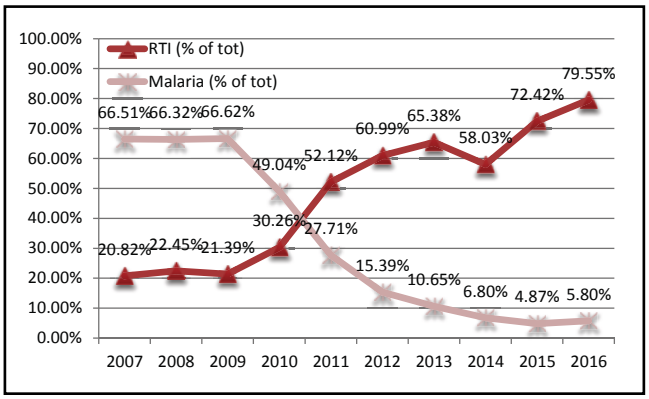

Fig. 1. Increasing RTI and decreasing malaria after introducing RDTs in Eldoret.

PATIENTS AND METHODS

St. Ladislav Bathyani Clinic provides services for population of 300,000 citizens of Eldoret and adjacent rural regions of Kenya. The town is situated around 100 km from Lake Victoria, which makes it high risk area for malaria. An observational retrospective study of malaria incidences was done in years 2007–2016. In total, 94,893 adult patients visited OPD in last 9 years due to any infectious condition. Patients with chronic cardiovascular diseases, diabetes and other chronic diseases were not included in the analysis; children were not included as well. Documentation of every patient was screened for data of current disease and diagnostic tools used. In patients with suspected malaria, either microscopy, or RDT or both were done to confirm the diagnosis. RDTs were available at the clinic since 2010; patients visiting the clinic from 2007 to 2010 had only microscopy for confirmation.

RESULTS AND DISCUSSION

Initially, malaria rates were very high, about 50 to 70% of all visits. In 2010, when rapid diagnostic tests became available in Eldoret, decrease in incidence of malaria from 49% (2010) to 29% (2011) and further to 5.3% (2016) is noted (Figure 1, Table 2). At the same time, increased incidence of upper and especially lower respiratory tract infections was noted, with strong negative correlation according to Pearson's analysis (–0.83,

Tab. 1. OPD visits in last 9 years in Eldoret and spectrum of diagnoses.

year /diagnose	UTI	HIV	STD	Malaria	RTI	Diarrhea	TOT
2007	101 (0.7%)	182 (1.2%)	601 (4%)	9,910 (67%)	3,102 (21%)	711 (4.9%)	14,901
2008	95 (0.6%)	151 (1.2%)	556 (4.3%)	8,855 (67%)	2,998 (22%)	699 (5.4%)	13,352
2009	90 (0.7%)	110 (0.8%)	505 (4.8%)	7,768 (69%)	2,494 (20%)	692 (6.3%)	11,660
2010	33 (0.3%)	163 (1.6%)	421 (4.1%)	5,006 (49%)	3,089 (29%)	1,507 (15.1%)	10,207
2011	75 (1.1%)	76 (1.1%)	176 (2.6%)	1,919 (26%)	3,609 (51%)	1,071 (17.8%)	6,925
2012	75 (0.8%)	64 (0.6%)	251 (2.9%)	1,335 (24%)	5,291 (61%)	1,665 (8.6%)	8,675
2013	47 (0.6%)	53 (0.8%)	148 (2.2%)	705 (11%)	4,327 (63%)	1,338 (19%)	6,618
2014	46 (0.6%)	59 (0.7%)	56 (0.8%)	558 (6,5%)	4,760 (58%)	2,738 (33%)	8,202
2015	81 (0.9%)	66 (1.1%)	9 (0.1%)	399 (4.9%)	5,936 (73%)	1,704 (20%)	8,197
2016	29 (0.5%)	65 (1.1%)	3 (0.05%)	357 (5.3%)	4,897 (79%)	1,163 (13.9%)	6,156

Tab. 2. Proportions of Malaria and RTI to total OPD visits.

	total no. of patients	RTI	RTI (% of tot)	Malaria	Malaria (% of tot)
2007	14,901	3,102	20.82%	9,910	66.51%
2008	13,352	2,998	22.45%	8,855	66.32%
2009	11,660	2,494	21.39%	7,768	66.62%
2010	10,207	3,089	30.26%	5,006	49.04%
2011	6,925	3,609	52.12%	1,919	27.71%
2012	8,675	5,291	60.99%	1,335	15.39%
2013	6,618	4,327	65.38%	705	10.65%
2014	8,202	4,760	58.03%	558	6.80%
2015	8,197	5,936	72.42%	399	4.87%
2016	6,156	4,897	79.55%	357	5.80%

$p<0.003$). Results suggest that previously, upper and lower respiratory tract infections were diagnosed and treated as malaria. As for the incidence of other infectious conditions, it remained unchanged (Table 1).

CONCLUSIONS

Most of the febrile episodes in Sub-Saharan Africa are automatically treated as malaria, especially when only microscopic diagnosis is available in the region. With the introduction of RDT, with generally 95% specificity and 98% sensitivity, the number of malaria cases decreased by 50–70% in the region. This number is wide success and has also other contributing factors, such as improvement of infrastructure and malaria preventive and treatment programs. With RDTs, a lot of first line treatment drugs were saved, which also contributes to lower resistance levels in the future and lowering of the burden on the laboratory staff. RDTs are good alternative to smears in remote settings, where there are insufficient numbers of trained laboratory staff. Sustained malaria control will depend on the global capacity to accurately detect malaria and map its distribution. Specific detection of malaria parasites with high quality rapid diagnostic tests is now available even at the village level.

REFERENCES

1 Chiodini PL, Bowers K, Jorgensen P, Barnwell JW, Grady KK, Luchavez J, Moody AH, Cenizal A, Bell D (2007). The heat stability of *Plasmodium* lactate dehydrogenase-based and histidine-rich protein 2-based malaria rapid diagnostic tests. Trans R Soc Trop Med Hyg. **101**(4): 331–337.

2 Kain KC, Harrington MA, Tennyson S, Keystone JS (1998). Imported malaria: prospective analysis of problems in diagnosis and management. Clin Infect Dis. **27**(1): 142–149.

3 Kilian AH, Metzger WG, Mutschelknauss EJ, Kabagambe G, Langi P, Korte R, von Sonnenburg F (2000). Reliability of malaria microscopy in epidemiological studies: results of quality control. Trop Med Int Health. **5**: 3–8.

4 Mamova A, Cmorej PCH (2016). Public health and health care administration issues in migrants and internally displaced people during war conflicts. Int Health Journal. **2**: 4–5.

5 Mamova A, Dobrodenkova S, Sladeckova V, *et al.* (2015). Severe malaria including cerebral malaria among 3707 admissions in South Sudanese hospital for internally displaced population after tribal conflicts in 2012–2013. Clinical Social Work and Health Intervention. **V**(2): 65–66.

6 Perkins MD, Bell DR (2008). Working without a blindfold: the critical role of diagnostics in malaria control. Malaria Journal. **7**(Suppl 1): S5 .

7 WHO Malaria Report (2015). Geneve: WHO, 2016.