AN EASY WAY TO IMPLEMENT RAPID DIAGNOSTIC TESTS FOR VECTOR-BORNE DISEASES AND OTHER INFECTIOUS DISEASES

AN EVIDENCE BRIEF FOR MINISTRIES OF HEALTH, NATIONAL INSTITUTES OF HEALTH, PROGRAM MANAGERS AND IMPLEMENTERS


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ABSTRACT

The diagnosis of infectious diseases is difficult without appropriate testing. Presumptive treatment may put the patient in danger and, prompt the emergence of drug resistance, and the spread of these diseases. Laboratory tests are usually expensive, requiring highly trained personnel, and specialized settings. This systematic search found that simple rapid diagnostic tests (RDTs) are available for different vector-borne diseases (VBDs) and other poverty related infectious diseases, but their usefulness varies according to context. Therefore, before implementing RDTs, a pragmatic evaluation of performance, costs, acceptability, feasibility, and sustainability according to representative contexts is recommended to avoid costly mistakes. Once RDTs have been implemented, monitoring their impact, correct use, quality, and long-term sustainability is necessary.

HIGHLIGHTS

- → **RDTs are implemented in different contexts.**
- → **Performance and impact of RDTs are highly variable depending on context.**
- → **RDTs should be assessed in your context before implementing.**
- → **RDT implementation faces challenges ranging from cultural to administrative concerns.**
- → **Once an RDT has been implemented, continuous assessment of quality, impact, costs, adoption, and sustainability is necessary.**

THE RESEARCH PROCESS

The aim of this research was to summarizse the type of evidence and research findings related to field validation and implementation in urban areas of RDTs for VBDs and other infectious diseases. We conducted a systematic search and found that most of the evidence on the usefulness of RDTs pertains to malaria and tuberculosis and applies less to the neglected tropical diseases. RDT performance is highly variable depending on the context, and implementation faces challenges ranging from cultural to administrative aspects.

RESULTS

A total of 180 documents were included in our study. More than half of the studies were carried out in Africa (n=99), followed by Asia (n=42), the Americas (n=34), and Europe (n=3). The majority of studies investigated malaria (n=100) and tuberculosis (n=47). Fewer studies were identified for visceral leishmaniasis (n=10); filariasis and leptospirosis (each n=5); enteric fever and schistosomiasis (each n=3); dengue and leprosy (each n=2); and Chagas disease, human African trypanosomiasis, and cholera (each n=1).

FIELD PERFORMANCE

There are commercial and non-commercial RDTs. Performance of these RDTs was evaluated in 113 studies. Sensitivity was highly variable, and overall specificities were high (>80%), except for schistosomiasis and cholera (Table 1).

Table 1. Summary of performance results in included studies by disease.

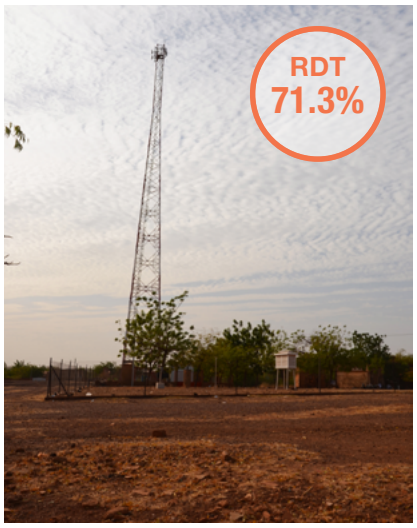
DISEASE	SENSITIVITY People with disease that showed a positive RDT	SPECIFICITY People without disease that showed a negative RDT
Malaria	30 – 100%	Near 100%
Tuberculosis	28.2 – 100%	> 93%
Visceral Leishmaniasis	72.4 – 87.6%	86 – 98%
Leptospirosis	33 – 93.3%	25 – 95%
Filariasis	87 – 94%	84 – 100%
Enteric fever	27.3 – 69%	> 88%
Schistosomiais	59 – 97%	47 – 91%
Dengue*	> 90%	14.3 – 74%
Chagas disease	>96%	> 97%
Cholera	91.7%	72.9%

Studies about African trypanosomiasis and leprosy do not report sensitivity or specificity.
*This dengue study was done during a DENV2 epidemic.

Reasons for variation in RDT performance were reported for malaria, tuberculosis, and visceral leishmaniasis. These included the study site; geographic area; reference test used as a standard for comparison; and age, pregnancy status, and HIV status of the patients, among others. (Figure 1)

Figure 1. Example of variation in malaria RDT specificity, according to season

Before rainy season.



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During rainy season.

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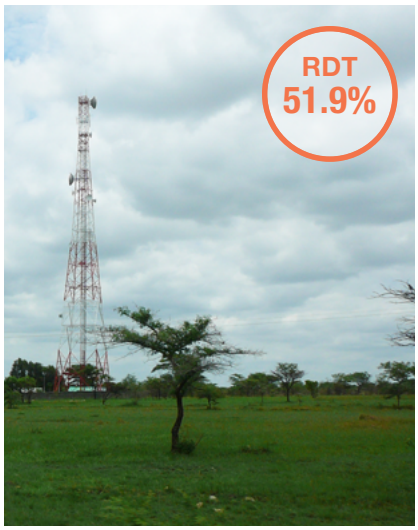
After rainy season.



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Implementation outcomes

Fewer studies assessed implementation outcomes than accuracy (Table 2); most of these studies are in malaria and tuberculosis; and, fewer are in visceral leishmaniasis, leprosy, and filariasis.

Table 2. Implementation outcomes assessed in RDTs by disease

OUTCOME	MALARIA	TUBERCULOSIS	VISCERAL LEISHMANIASIS	FILARIASIS	LEPROSY
Acceptability Perception that RDTs are agreeable or satisfactory	14	2	1	1	1
Adoption Uptake of RDTs in practice	12	2			
Appropriateness Perceived fit of RDT for a given context	6			1	
Feasibility The extent to which RDTs can be successfully used according to available resources	3	1			
Sustainability The extent to which RDTs can be successfully maintain overtime	2				
Cost Economic effort of the implementation strategy	10	3	1		

*Implementation outcomes for leptospirosis, schistosomiasis, Chagas disease, enteric fever, human African trypanosomiasis, and cholera were not reported.

Acceptability is the most reported implementation outcome of RDTs. It is key for a successful intervention to take into account the community and provider's beliefs, trust in the accuracy of the test, and the burden of work to providers.

Feasibility and sustainability have been assessed in some studies on malaria diagnostic tests, highlighting that adequate supply chains and sustainable training and quality assurance, among other factors, are essential for RDT implementation.

Impact
Rapid diagnostic tests for VBDs and other diseases of poverty are being used in the urban context with demonstrated impact on case detection, rational use of drugs, and even decreased mortality.

CONCLUSION

There are several rapid diagnostic tests for VBD and poverty related infectious diseases. There is not enough evidence to recommend one RDT over others. Decision-makers must consider the available options in their area, costs, and potential sources of variation in the field performance of diagnostic tests to decide whether to implement them in their own context. The pragmatic assessment of field performance and key implementation outcomes before, during, and after deploying an RDT is required to guarantee successful health policies.

RECOMMENDED SOURCES

The full study report is available at: https://idpjournal.biomedcentral.com/articles/10.1186/s40249-018-0474-8

RECOMMENDATIONS

Based on the results of our review, for the successful implementation of an RDT, we recommend:

1st **Determine the target disease and population, health system and epidemiological characteristics of your area, and the results that you expect to achieve with the implementation of the RDT.**

2nd **Check the availability, costs, and prior results of RDTs in your area.**

3rd **Conduct quick operational research to compare different RDT options. If needed, verify that RDTs work under routine conditions and are accepted by providers and patients; also confirm that it is feasible to implement the RDT in representative contexts before roll out.**

4th **Once you have decided to implement an RDT, ensure there is a supply chain and a sustainable strategy to train personnel.**

5th **Once the RDT has been implemented, monitor its impact, cost-effectiveness, correct use, quality, and long term sustainability.**

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