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HEALTH REPORTER: focus on diagnosis of malaria in resource-poor settings 9 January 2007

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This is our monthly email bulletin, bringing together research to inform policy debates on health in developing countries.

The Health Reporter aims to provide readers with a more in-depth look at a particular area of health policy. This month's theme is **diagnosis of malaria in resource-poor settings**. The bulletin also features summaries of new documents and other additions to the [Health Resource Guide](#)

Health Reporter archive - an archive is now available on the Health Resource Guide. See previous issues of the Health Reporter at www.eldis.org/health/archive.htm

All documents listed below are available free on the web. If you are unable to access any of these materials online and would like to receive a copy of a document as an email attachment, please contact r.wolfe@ids.ac.uk

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Feature: diagnosis of malaria in resource-poor settings

Diagnosis of malaria must be prompt as even a few hours delay in treatment can mean the difference between life and death. For many years, the best way of diagnosing malaria has been microscopy to directly look at parasites in a blood film. This requires a laboratory set-up with a good microscope, reagents (substances added to a blood sample to detect malaria parasites), slides and a trained microscopist (person who is trained to use a microscope) . However, in many malaria-endemic countries, most of the smaller health facilities do not have laboratories and so malaria is commonly diagnosed on clinical grounds alone. As a result, many people receive drugs unnecessarily as almost all fever cases are treated for malaria. In recent years, in response to growing resistance by the parasite to the existing drugs - chloroquine and sulphadoxine-pyrimethamine, the majority of malaria endemic countries (those countries prone to malaria) have switched their national malaria drug policy to a strategy called artemisinin-based combination therapy (ACT). This strategy is significantly more expensive than the single drug therapy and so accurate diagnosis of malaria has become much more important.

Another relatively new tool for malaria diagnosis is the rapid diagnostic test (RDT) which detects markers in the blood that indicate a malaria infection. These RDTs can be performed on a fingerprick of blood, with very little training and give a result in about 15 minutes. Thus they are suitable for use where there is no laboratory such as smaller health centres and even at community level. The RDTs can be roughly divided into two groups: those that detect falciparum malaria only (a type of malaria that causes the often fatal cerebral malaria) and those that detect all four malaria species. Although the RDTs currently available have levels of accuracy comparable to routine microscopy, they can still give false results if not performed correctly. A very important factor when selecting a suitable RDT is its heat stability as it will often be used in situations where there is little or no refrigeration. It is also important to be aware that RDTs do not give as much information as microscopy because they do not indicate what stages of the parasite are present in the blood.

Regardless of whether microscopy or RDT is used for malaria diagnosis it is very important to have systems in place to ensure the diagnosis is of a high standard. This is very important as many clinicians still treat the patient based on clinical symptoms, even if an RDT or microscopic test is negative. This is often because they have little confidence in the standard of available tests used. If diagnoses continue to be based simply on clinical symptoms, it is very unlikely that the use of microscopy or RDTs will provide any benefit. Moreover, use of these tests will cease to be cost-effective tools and will increase the overall cost of treatment.

As many malaria-endemic countries revise their malaria strategy and switch to ACT they also need to consider how to improve the diagnostics. Both microscopy and RDTs can be useful tools but each country needs to develop and support its own policy depending on malaria endemicity, the target population(s), the resources available and the capacity of the health system.

Many thanks to Helen Counihan of the Malaria Consortium for writing this introduction and advising on key readings.

For more information see:

- Malaria Consortium
www.malariaconsortium.org/
- Malaria section on health resource guide
www.eldis.org/health/malaria/index.htm
- World Health Organization special initiative: malaria rapid diagnostic tests
www.wpro.who.int/sites/rdt/home.htm

Recommended readings on diagnosis of malaria in resource poor settings

The use of rapid malaria diagnostic tests, second edition

Authors: WHO

Produced by: World Health Organization (WHO) (2006)

This document, published by the World Health Organization, explains what rapid malaria diagnostic tests (RDTs) are, when they can be useful, how they can be used in malaria management, and how they can be purchased, transported, stored and quality-assured. Malaria RDTs are simple devices which change colour in the presence of substances produced by malaria parasites. They offer the potential to provide accurate diagnosis to all at-risk populations for the first time, reaching those unable to access good microscope testing services. Other potential ways of using them include self-diagnosis by trained individuals or groups, and for malaria prevalence surveys.

The document notes that misdiagnosis of malaria results in a significant number of illnesses and deaths. It argues that rapid, accurate and accessible detection of malaria parasites has an important role to play in addressing this, and in promoting more rational use of increasingly costly drugs, in areas where malaria is widespread. Recommendations include arranging transportation of RDTs that avoids exposing them to high temperatures (which reduce their effectiveness); and organising national quality assurance programmes for RDTs. The document also gives advice on how to choose an appropriate RDT, and how to integrate RDTs into health systems.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23106>

Informal consultation on quality control of malaria microscopy

Authors: WHO

Produced by: World Health Organization (WHO) (2006)

This document, published by the World Health Organization, describes the outcomes of a consultation on malaria microscopy -- a test for malaria in which the patient's blood sample is examined under a microscope. Aims of the consultation included to review recent experiences of assessment schemes for malaria microscopy. It also aimed to review "slide validation" schemes -- in which microscopy experts re-check test results in order to monitor the performance of the technicians who originally carried them out. Finally, the consultation aimed to review the requirements for malaria microscopy training materials.

The document reports that, to be competent in malaria microscopy, technicians must have adequate skills in preparing, staining, reading and interpreting blood films. Overall performance is influenced not only by the technician's competence but also by other factors, including working conditions, the number of slides that need to be read, and equipment. Technicians' competency needs to be reviewed and accredited, and the document sets out principles on which this assessment should be based.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23118>

Evaluation of rapid diagnostic tests: malaria

Authors: Bell, D.; Peeling, R.W.

Produced by: Nature Reviews Microbiology (2007)

This paper, published in Nature Reviews Microbiology, provides guidelines for evaluating the effectiveness of rapid diagnostic tests (RDTs) in diagnosing malaria. The paper describes the different types of malaria RDTs and the importance of evaluating them. The paper sets out minimum standards for trials of malaria RDTs. It argues that the trial design and interpretation of results must take into account: the likely conditions of intended use; the limitations of comparative standards; and the specific characteristics of malaria.

The paper also examines the factors that influence the results of malaria diagnosis based on RDTs. These include: transport and storage of RDTs; training and choice of technicians; recent treatment; laboratory facilities and testing site; and the presence of diseases other than malaria. Finally, the paper discusses special considerations for laboratory-based trials. When samples are no longer being tested in the environment in which they are taken, the possible effects of changes in samples during storage on the performance on the tests must be understood. [adapted from author]

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23162>

The contribution of microscopy to targeting antimalarial treatment in a low transmission area of Tanzania

Authors: Reyburn, H.; Ruanda, J.; Mwerinde, O.; Drakeley, C.
(2006)

This study, published in the Malaria Journal, explores why malaria slides (samples of blood which are examined under a microscope for malaria) are requested and how their results guide treatment decisions in an area of low transmission of malaria in Tanzania. The paper finds that health workers treated many children presumptively when they presented at a clinic with a fever rather than request a blood slide. Even when a blood slide is requested, and the test result negative, almost half of the patients were still treated with an antimalarial.

The paper concludes that malaria slides in clinics may fulfil a social or ritual function, rather than being used to diagnose malaria. If the clinical suspicion of malaria is strong, then this might override the negative slide result. Researchers found that a slide request was more likely if patients had travelled further suggesting patient motivation to attend a facility where microscopy was available. There was no association between slide request and socio-economic status suggesting that the cost of the slide does not play a major role. The authors recommend that there is an urgent need to improve laboratory standards so that testing is more accurate and health workers are more willing to be guided by negative slide results.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23198>

Cost-effectiveness of malaria diagnosis in Sub-Saharan Africa: the role of rapid diagnostic tests in rural settings with high Plasmodium falciparum transmission

Authors: Shillcutt, S.D.; Morel, C.M.; Coleman, P.G.; et al
Produced by: World Health Organization (WHO) (2006)

This World Health Organization report assesses the cost effectiveness of three strategies used to diagnose malaria. These strategies are: rapid diagnostic tests (RDTs) or "dipsticks" which provide evidence of the presence of malaria parasites in the blood; presumptive treatment (PT) - where patients who suffer from a fever are presumed to have malaria and treated accordingly; and field standard microscopy - where a drop of blood is examined under a microscope to look for malaria parasites. The report finds that in areas with high malaria prevalence, PT is cost saving because the costs of diagnosis are avoided. RDTs are cost effective compared to PT when malaria prevalence is lower.

The paper concludes that RDTs are likely to be highly cost-effective compared to microscopy and presumptive treatment across most of Africa in an era of more expensive medicines to treat malaria. This is due to improved targeting of antibiotics to those people who do not have malaria and better targeting of antimalarials. The authors recommend that efforts to evaluate operational RDT use and test interventions to improve clinical adherence to treatment protocols should be a priority.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23157>

Reducing the burden of childhood malaria in Africa: the role of improved diagnostics

Authors: Rafael, M.E.; Taylor, T.; Magill, A.; et al
Produced by: Nature [journal] (2006)

This paper examines the potential impact of improved malaria diagnostic tests on children up to five years old in sub-Saharan Africa. Presently, most malaria illnesses are diagnosed on clinical grounds resulting in over treatment. This is harmful because it delays diagnoses of other illnesses, contributes to the development of drug resistance and results in a waste of scarce resources. The study compares the harm resulting from over treatment with the benefits of using diagnostics. The paper finds that diagnostic tests, coupled with effective treatment, can significantly reduce malaria related deaths. However, tests requiring better infrastructure than is currently available in sub-Saharan Africa would have limited impact.

The paper concludes that the introduction of widely available and improved diagnostic tests would save lives both directly through improved case detection and indirectly through conservation of resources, slowed development of drug resistance and improved diagnoses of other illnesses. The authors recommend that diagnostic test should not rely on electricity and water; they should produce results in less than 5 minutes; rely on finger prick blood, urine or saliva; and be simple to use for health care workers with minimal training. In the long term, efforts should focus on making tests more widely available by reducing infrastructure requirements.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23340>

Other recommended readings

Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries

Authors: Adam, T.; Lim, S.S.; Mehta, S.; et al

Produced by: British Medical Journal (BMJ) (2005)

This paper examines the costs and benefits of interventions for maternal and newborn health in developing countries. The analysis includes 21 interventions which target the health related Millennium Development Goals (MDGs), and the effects of these interventions are estimated through their impact on incidence, remission and case fatality of maternal and neonatal conditions. The paper finds that the most effective mix of interventions was a community based newborn care package (offering support for breastfeeding mothers and low birthweight babies), followed by antenatal care (including tetanus injections, screening for pre-eclampsia, and treatment of syphilis). The presence of a skilled attendant at birth is also a relatively cost-effective intervention for maternal and newborn health.

The paper concludes that preventive interventions at the community level for newborn babies and at the primary care level for mothers and newborn babies are extremely cost effective but current coverage is insufficient. Most hospital based interventions are also highly cost effective and without universal access to these the MDGs for maternal and child health will not be met. Scaling up all the included interventions to 95 per cent coverage would halve neonatal and maternal deaths. [adapted from author]

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23156>

Child health inequities in developing countries

Authors: Fotso, J.-C.

Produced by: International Journal for Equity in Health (2006)

This paper, in the International Journal for Equity in Health, compares the magnitude of inequities in child malnutrition across urban and rural areas in sub-Saharan Africa (SSA), and investigates the extent to which disparities within urban areas are accounted for by the characteristics of communities, households and individuals. The paper finds that across countries in SSA, there are inequalities between socioeconomic groups in the likelihood of children having low height for their age -- an indicator of malnutrition. Though these inequalities exist in both urban and rural areas, they are larger in urban areas. The levels of education of a child's parents, and the socioeconomic status of the community, account for some of these inequalities, but household wealth is the most important factor.

The paper concludes that there are enormous disparities between the poor and the non-poor in urban areas of SSA. The authors recommend that specific policies geared at preferentially improving the health and nutrition of the urban poor should be implemented. To successfully monitor the gaps between urban poor and non-poor, existing data collection programmes such as the Demographic and Health Survey and other nationally representative surveys should be re-designed to capture the changing patterns of the spatial distribution of population. [adapted from author]

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23341>

A community-based health education programme for bio-environmental control of malaria through folk theatre (Kalajatha) in rural India

Authors: Ghosh, S.K.; Patil, R.R.; Tiwari, S.; Dash, A.P.

Produced by: Malaria Journal, BioMed Central (2006)

This article, published in the Malaria Journal, examines the effectiveness of Kalajatha events as a medium for educating rural communities about malaria control and prevention strategies. Kalajatha refers to a traditional form of folk theatre which delivers key messages in local dialects and cultural settings. Using data from a programme in south India, the article finds that the

respondents who were exposed to the Kalajatha events gained new knowledge about malaria, its symptoms, transmission and control methodologies. They could easily associate clean water with mosquitoes breeding, and they actively participated in releasing larva-eating fish which resulted in a reduction in malaria cases. However, behavioural changes especially in maintenance of general hygiene were not observed.

The article concludes that folk theatre is a very effective medium in promoting health education and possibly behavioural changes to the rural communities. Whilst immediate behaviour changes were not observed, the first step towards achieving behaviour change was achieved by providing correct and scientific information on malaria control and prevention. Since Kalajatha events are a medium with which the rural community identify well, they may also be useful for delivering other health messages, such as for the prevention of HIV.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23342>

Does a competitive voucher program for adolescents improve the quality of reproductive health care?: a simulated patient study in Nicaragua

Authors: Meuwissen, L.E.; Gorter, A.C.; Kester, A.D.; Knottnerus, J.A.

Produced by: BMC Public Health (2006)

This study, published in BMC Public Health, evaluates the impact and sustainability of a competitive voucher programme on the quality of sexual and reproductive health (SRH) care for poor and underserved female adolescents. Vouchers were distributed to adolescents in disadvantaged areas that gave free-of-charge access to SRH care in four public, ten non-governmental and five private clinics. The paper finds that some aspects of service quality improved during the voucher programme: more of the patients left with a contraceptive method during the programme than before it began; and shared decision-making on contraceptive method as well as condom promotion significantly increased. Female doctors had best scores before, during and after the intervention. The improvements were more pronounced among male doctors and doctors older than 40, though these improvements were not sustained after the programme ended.

The paper concludes that adolescents often face provider-related obstacles when requesting contraception. The care provided during the voucher programme improved for some important outcomes. The improvements were more pronounced among providers with the weakest initial performance. [adapted from author]

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23159>

Behaviour change in perinatal care practices among rural women exposed to a women's group intervention in Nepal

Authors: Wade, A.; Osrin, D.; Shrestha, B.P.; et al

Produced by: BMC Pregnancy and Childbirth (2006)

This article, in BMC Pregnancy and Childbirth, examines the behaviour changes in pregnancy, childbirth and newborn care of women in rural Nepal who attend participatory women's groups which focus on improving care before, during and after childbirth. The trial included 5400 women and examined changes in the incidence of four positive outcomes: attendance of antenatal care; cleanliness of boiled blade to cut the cord; appropriate dressing of the cord; and not discarding of colostrums (the first milk produced by the breasts that provides essential nutrients and infection-fighting antibodies for infants). The paper finds that women who attended groups were more likely to show a positive change than non-group members with regard to antenatal care utilisation and not discarding of colostrums.

The authors conclude that women's groups promote significant behaviour change in pregnancy, childbirth and newborn care amongst women not previously following good practice, and these changes that can be attributed to interventions were not restricted to specific demographic subgroups. The presence of groups in an area also has a wider impact than merely on the women who attend -- the activities and existence of the group stimulate wider behaviour change in their communities.

Available online at: <http://www.eldis.org/cf/rdr/rdr.cfm?doc=DOC23155>

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- Health Systems Resource Guide - www.eldis.org/healthsystems
- HIV and AIDS Resource Guide - www.eldis.org/hiv aids

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