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The Introduction of Rapid Diagnostic Test for Malaria in Mozambique: Local Appropriation and Complementary Therapeutics

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Abstract

In 2008 Mozambique's Ministry of Health (MoH), with the technical and financial support of transnational and international organisations such as United Nations (UN) agencies, USAID (United States Agency for International Development) and INGOs (International Non-Governmental Organisations), amongst others, introduced the Rapid Diagnostic Test (RDT) for malaria to be implemented across the country. This new biomedical technology impacted not just clinical practice, where health workers had to draw blood to be able to diagnose malaria (parasitological confirmation), but interacted with local worldviews and therapeutic practices in ways that needed to be incorporated into therapeutic interventions, notwithstanding patients' overall acceptance of the reliability of RDTs.

Research Highlights

- The introduction of this new biomedical technology was locally appropriated and incorporated into local worldviews, such that pluralist and complementary therapeutic interventions needed to be performed in order to achieve biomedical therapeutic success.
- Rapid Diagnostic Tests become a social object around which new knowledge and practices come to reshape existing knowledge and meanings.

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- The introduction of any biomedical technology should be informed by contextual understandings of the social construction of disease and experiences of health and illness.

Introduction

Several ethnomedical systems can be found in Mozambique, although differences are observed between rural and urban contexts, north and south, and within each healthcare provider. This multiplicity of healing practices and medical knowledge is shaped in a context of rapid circulation of goods, and increasing social mobility and change. Instead of regularities and a certain order, interferences and interfaces between ethnomedical systems are found that correlate with modern social dynamics. In this regard, healthcare providers play a critical role in shaping and adapting therapeutic practices and knowledge.

This article aims to analyse the kinds of lay knowledge and practices that have arisen since the introduction of biomedical technology used for malaria diagnoses, specifically the Rapid Diagnostic Test (RDT), in a rural district in south Mozambique. This study is part of wider research regarding healthcare providers' relationships to malaria-control activities, and is based on fieldwork carried out in the Chókwè district, as well as Maputo, the capital of Mozambique, over a period of four years.

This article will next outline the study methodology, and then offer contextual information around healing landscapes and healthcare providers in Mozambique. The case study will then be introduced and articulated with reference to two main concepts: appropriation and technology. The final section offers a discussion and concluding remarks.

Methodology

This study is the result of four years of research undertaken in Mozambique (from March 2008 to July 2012), mainly in the Chókwè district, Xai-Xai city (where the Provincial Health Directorate is located) and Maputo, the country's capital.

The Chókwè district was selected for this case study for three reasons: its high rate of malaria morbidity and mortality (in 2006 and 2007 the Chókwè district was second only to the Xai-Xai district in malaria prevalence); the existence of malaria control interventions implemented by the National Malaria Control Program (NMCP) and national and international non-governmental organisations (NGOs); and, finally, because of the researcher's familiarity with the district. For this

task, a non-probabilistic sampling was designed, in which traditional healers and religious leaders were chosen intentionally, when distinctive signs of their presence had been observed (drums, drying plants and specific fabrics, as well as religious artifacts). In the absence of these traits, a snowball technique was used based on their peers. Interview respondents, male and female, were intentionally selected from different neighbourhoods within the same village. Taking into consideration the limited number of health centres (17 health centres, one rural and one Day Hospital), healthcare practitioners from all health centres were both intentionally and randomly selected for semi-structured interviews. No fieldwork was carried out during medical consultations. A total of 44 traditional healers, 42 religious leaders, 19 health professionals and 87 ordinary men and women were contacted and interviewed during the ethnographic fieldwork. Fifteen focus groups were conducted with women as the target group, and recruitment for this was totally managed by local leaders. No incentives were provided to respondents for their participation.

With the exception of interviews with health workers, which took place in the Portuguese language, most of the remaining interviews were held in the local language (*Changane*) with the assistance of a simultaneous interpreter. During the researcher's stay in Mozambique, the interviews were translated and transcribed into Portuguese and, finally, revised by both the researcher and interpreter.

The semi-structured interviews and focus groups were conducted in the four administrative divisions (Lionde, Macarretane, Xilembene and Chókwè city) that comprise the Chókwè district and its respective locations (Macarretane, Matuba, Maxinho, Xilembene, Chiduacine, Lionde, Conhane, Malau and Chókwè city). Twenty eight sites were randomly selected, after establishing the criteria of visiting the same number of villages with without health facilities. In Chókwè city the criteria of urban or rural neighbourhoods was also considered, taking in the existence of four established health facilities—the rural hospital, the day hospital, and two health centres.

This research fulfilled all ethical obligations, and was authorised by the Bioethics National Committee for Health (IRB00002657), and supported by the Provincial Health Directorate and District Services for Health, Women and Social Action in the Chókwè district. The purposes of the research and data recording (audio or written) were explained to all participants, who were also given guarantees of anonymity and confidentiality. All participants indicated their agreement by signing informed consent forms.

Healing Landscapes: An Overview

Since there is a need to receive healthcare, to "tame uncertainty" (Granjo, 2009a, pp. 251-252)—whether at the personal or collective level—traditional healers (*tinyanga*) have consistently played a role of major importance in Mozambican society, although this role has changed throughout time.

Mozambican society considers life as the sum of the relationships between living members, and between living members and their ancestors. "Those who die do not cease their existence, but at the same time are not transferred to a separate and unknown world" (Granjo, 2009b, pp. 569-570). Although progressive contact with biomedicine and its agents has increased awareness of the natural causes of illnesses (Sindiga, 1995b, p. 66)—designated locally as "hospital illnesses" ("doença do hospital")—local interpretations of misfortune tend to reject naturalist causes in the events of illness, death, accident or infertility.

The balance between the three dimensions of nature, peers and ancestry must be maintained by recourse to ceremonies, social taboos, codes of conduct and obligations between kinship members (including ancestry), among other mechanisms social regulation. If the harmony of these relationships is disrupted (as expressed through the occurrence of an illness or fatality), it calls forth a retrospective (diagnostic) analysis of the relationships between these three spheres on the part of household members and/or kin. The interpretations arising from this analysis are used to isolate illness etiology and identify health-seeking strategies.

Throughout the fieldwork, three categories of classification emerged which express local representations of illness: "hospital illness", "traditional illness" and witchcraft (*kuloia*). This subdivision is not exclusive to Mozambican society and can be found in the work of other researchers (Foster, 1976; Sindiga, 1995). These categories overlap and inform each other and, for this reason, any study looking into malarial illness, and its associated knowledge and practices, needs to consider the wider health providers' landscape, including itinerant medicine sellers and the informal and retail sectors which operate outside of the biomedical system.

Local Appropriations of Biomedical Technology: Malaria Rapid Diagnostic Tests

Malaria is endemic throughout Mozambique in areas where the climate favours its transmission throughout the year, with transmission

peaking after the rainy season (from December to April). *Plasmodium falciparum* is the most prevalent parasite, accounting for approximately 90 per cent of all malaria infections, while *P. malariae* and *P. ovale* are, respectively, responsible for 9.1 per cent and 0.9 per cent of all infections (Mabunda, Casimiro, Quinto & Alonso, 2008).

In 2008 the malaria RDT was introduced by the MoH in Mozambique, following international policy with regard to malaria control programs. This article will now examine the RDT as a technology; as a body of knowledge and actions, composed of several procedures (rules) and designed to achieve a specific practical purpose. A 'technology' can be understood as being composed of a tangible product (materialised elements) and a set of knowledge, information, languages, procedures, rules and meanings, which are mobilised in order to support the use of the tangible product. In the case of the RDT, the material elements are described by the manufacturer in the product specifications. The procedures depend upon the instructions given by the manufacturer on the package, and job aids used during training, post-training follow-up and monitoring, but, importantly, ultimately relies on user practice which often varies from any formal instructions (Asiimwe et al., 2012).

Biomedical knowledge, emerging from the paradigm of scientific progress, is considered a dominant ideology that emerges from scientific and biomedical research undertaken in developed countries, and which subsequently generates biomedical technology. The integration of technology into biomedical healthcare practice reinforces the idea that biomedicine tracks, *per se*, progress, economic growth and wellbeing, while dismissing the institutional and structural context that promotes it and objectifying the clinical encounter. According to Brijnath and Manderson (2011), technology gives concreteness to the medical diagnosis, which otherwise could be contested (Brijnath & Manderson, 2011, p. 515). The materialisation of biomedicine (Hadolt, Hörbst & Müller-Rockstrohn, 2012, p. 180) through technology becomes a symbol of indisputable knowledge that confers confidence in and authority upon biomedical practices and, by association, health workers (Ansah, Reynolds, Akanpigbiam, Whitty & Chandler, 2013; Asiimwe et al., 2012; Baiden et al., 2012; Mubi et al., 2013; Mukanga et al., 2012; Williams et al., 2008).

However the RDT, used to confirm or exclude the presence of malaria, is not technically 100 per cent accurate (Abeku et al., 2008). Its limitations include false-positive and false-negative results (Ishengoma et al., 2011), reduced sensitivity for low parasite densities, unpredictable

sensitivity with humidity and heat, and positive results four weeks after treatment (which problematises reinfection diagnoses). In resource-limited settings with a fragile health system characterised by antimalarial and test kit shortages, and inadequate training, supervision and storage, any doubt regarding tests results are unable to be followed up by recourse to another medical tool, such as another RDT or by laboratory microscopic examination, or timely technical support. In the Chókwè district the doctor: population *ratio* is 1: 24069, and other medical workers: population *ratio* is 1:1318 inhabitants (MoH/Human Resources Directorate [MISAU], 2012, p. 67).

The authority, materiality and objectification technology offers biomedicine—centered in the human body and its biochemical processes—obscures the meanings and interpretations arising from the relationships societies and individuals establish with that technology (Brijnath & Manderson, 2011, p. 515). Quoting Arjun Appadurai (2000):

...the social history of things and their cultural biography are not entirely separate matters, for it is the social history of things, over large periods of time and at large social levels that constrain the form, meaning and structure of more short-term, specific and intimate trajectories (p. 16).

The local appropriation of biomedical technology challenges formal terminologies and its study shows how local definitions and meanings shape medical linguistic “correctness” (Granado, Manderson, Obrist & Tanner, 2011), and establish new significances based on social roles and contexts (Kotwal, 2005; Müller-Rockstroh, 2007; Prue et al., 2003). When a new technology is introduced, a clash between previous knowledge, expectations and unknown consequences arises and ultimately leads to new meanings and practices that traverse the entire society, that is, medical practitioners, researchers, patients and their families. The diversity of outcomes arising from contextual specificities—despite the application of general, international frameworks defined by core health actors, such as the WHO, United Nations agencies and major funding organisations—gives rise to the need for suitable, realistic and tangible strategies to deliver quality health care in different cultural contexts. Standard Operating Procedures (SOP) and the “SMS for life” program are good examples of adaptations and local strategies that have been used, in this case, to strengthen the Tanzanian healthcare system (Masanja, Bethune & Jacobs, 2011).

According to Hahn (2004), following Silverstone (1992 cited in Hahn 2004), the concept of appropriation comprises four dimensions:

material appropriation, objectification, incorporation and transformation. Material appropriation refers to material access to the object; the "familiarity" with a single product (Hahn 2004, p. 218). Objectification implies a contextualisation of the good, its detailed description and categorisation in the "universe of things" (Hahn 2004, p. 219). Incorporation relates to the interaction between products and the perceptions of actors (Hahn 2004, p. 220) and, finally, transformation indicates that an object has been transformed according to societal norms and restrictions, with all the consequences that attend this process (Hahn 2004, p. 220). The appropriation of global commodities is unpredictable, continuous, unable to be generalised to other contexts or actors, and may occur in a total or partial way, by exclusion of one of the four dimensions mentioned (Hahn 2004, pp. 221-225). According to the data produced by this study, an emphasis upon local definitions of technology use emphasises the local agency of actors and social groups.

Technology as Policy

According to international biomedical discourse, the use of the RDT met a need, based on research evidence, to avoid mis- and over-diagnosis of malaria (Ansah et al., 2013; Chandler, Whitty & Ansah, 2010; D'Acremont et al., 2011; Williams et al., 2008), which is one of the origins of parasite resistance to (less expensive) drugs, such as chloroquine and quinine, which has led, in turn, to the need for more expensive combination therapies (World Health Organization [WHO], 2006, p. 1). Furthermore, the expansion of RDT would enable research into malaria outbreaks and the implementation of surveys, as well as diagnosis 'out of hours' in hospitals and self-diagnosis by travellers (WHO, 2003, p. 8).

In 2008 the malaria RDT was introduced widely in Mozambique (2,800,000 were distributed), although the majority of healthcare professionals did not receive training for its use until 2009 (as part of new malaria treatment guidelines). At that time, 8519 health workers received training, whereas only 1028 were trained in 2008 (MISAU, 2010, p. 8).

The concept of technology-as-policy gains substance when we consider the decision-making process regarding the introduction of biomedical technology, which integrates international policy, actors, and economic and political factors (Müller-Rockstrohn, 2007, p. 211). The World Health Organization in this context takes on a unique role in defining recommendations, mobilising stakeholders (NGOs, researchers, foundations, governments and industry, amongst others) and providing

funding. Although the MoH is the institution that formally decides upon the best malaria control strategy to adopt (according to funds available, opportunity costs, and based on WHO recommendations, recent results from pilot-projects, and research implemented by INGOs, NGOs and the National Malaria Control Program at the provincial and district levels), financial limitations can severely limit the MoH's options regarding policy decisions. Financial limitations and staff shortages also have implications for monitoring and evaluation (including quality assurance) activities, even though all WHO guidelines and norms may be formally adopted.

Biomedical malaria discourse at the national level is presented in strategic documents that attempt to integrate different recommendations and research evidence regarding the disease's epidemiological profile. The third objective outlined in the Malaria Strategic Plan 2012-2016, clearly considers various levels of intervention, ranging from procurement to local delivery to Health Units to local health volunteers. Although the continued training of volunteers and health practitioners in the use of RDTs was included in the Strategic Plan, no references were found to any proposed campaigns to educate the general population, or to any other event or medium through which to present details of the new biomedical technology to patients. As a result, many of the local interpretations that emerged around the technology were untempered by biomedical knowledge regarding the RDTs.

As mentioned, the RDT was introduced in 2008, and in the period prior to its introduction malaria diagnoses were entirely clinical and based on symptoms and signs such as: fever, headaches, vomiting, diarrhoea and joint pain. According to the Integrated Management of Childhood Illness (IMCI) guidelines, adopted by the MoH in the period preceding the introduction of the RDT, the appearance of these symptoms should be followed by a presumptive malaria diagnosis. In the few health units with laboratories, usually located in district headquarters, diagnoses were supported by a microscopic examination of slides conducted in a laboratory.

When RDTs were introduced into every healthcare facility, it became mandatory that a malaria diagnosis be positively confirmed through blood samples (the RDT or laboratory test). If neither of these were available, no clinical diagnosis could be made.

Patients' Perspectives

The introduction of this new biomedical technology led to several unexpected effects with regard to the knowledge and practices of

patients and healthcare providers. Nowadays malaria is considered an 'ordinary' hospital illness, and has been so for some of the respondents since the colonial period and for others since the great floods of 2000. Massive education campaigns, focusing on water and sanitation, primary healthcare and childhood illnesses, have reinforced the spread of information about malaria, including its symptoms, signs and causes, as well as recommended health-seeking behaviours and home-based treatments. Although the meanings given to malaria symptoms and signs can be attributed to other etiologies (witchcraft and 'traditional illnesses') generally, and according to this study, malaria is considered a "hospital illness" and patients and their relatives are used to recognising the disease and seeking treatment in health centres, dispensaries, pharmacies or through community health volunteers. Since 2000, malaria has become a part of life and is a disease that can be considered 'under control.' Descriptions of symptoms and signs are usually followed by exclamations such as 'I know this is malaria!' or 'this can only be malaria!'

According to the data from this study, RDTs were consensually accepted by participants as being completely reliable and, in some cases, the use of the tests led to a rejection of traditional healers, on the grounds that they do not use reliable methods or tools for diagnoses:

...the problem is that healers cannot say no. They always heal. They don't have a test to know the illness the person has or feels. They just give you roots, and the person wastes his time and loses his life. At the hospital they do the test (#166, male, 20yo, Matuba).

Outpatients know the process: first you buy a ticket for the consultation; then your weight is measured; when you enter the consultation room the nurse asks what symptoms you feel; a test/analysis is performed; and finally you go to the pharmacy with a prescription and buy the medicine.

Although the majority of testimonies expressed general acceptance of use of the RDT and its results, some participants expressed different perspectives and questioned the results of the clinical encounter. The RDT results challenged the patient's medical knowledge and brought into question their (presumed) control over their family's health. For a patient who saw her/his suspected malaria invalidated by a RDT (or a false negative result), the presence of an evil spirit in her/his body (possession of a spirit) became the only possible reason for the change of diagnosis. For this reason, and in order to control the process and

achieve wellbeing, it is critical to also act in the spiritual realms in order to achieve a correct diagnosis.

Interview participants referred several times to the need to seek a religious leader (mainly from the Zion churches) or a *nyanga* to free themselves of evil spirits before entering healthcare facilities. Undertaking these practices would 'clean' and 'purify' attendees of evil forces, and thus create the optimal conditions for a reliable and correct diagnosis. Statements along these lines were also heard in informal conversations with individuals in charge of district services, which calls into question the assumption that such views are a consequence of limited education or the isolation of villagers.

Sometimes people go and do the blood test, which is negative. And they say to go to the healer and receive a bath - bathing in chicken's blood mixed with plants that you rub all over your body. If it is a man you slaughter a chicken, if it is a women, you slaughter a rooster. Then you return the hospital to find out if you are sick.(#39, Traditional healer, female, 65yo, Chiaquelane)

What we do when somebody gets sick... we are warn everybody and we pray, and then we send her to the hospital. These prayers are made by the pastor, as well as by the believers of the church.(#65, female 52yo, Zuza)

Before a person goes to the hospital, I roll the stones and see if the person has a bad spirit in his/her body. First I do a bath mixture with some roots and then I take the person to the hospital.(#61, traditional healer, female, >50yo, Zuza)

They have been saying that some people are experiencing this and they went to the hospital, (...) did an x-ray but the doctors said they didn't see anything, everything was clean. So those things are related to witchcraft, because the doctors don't see things related to witchcraft. You don't find them at the hospital. They cannot see because it's a spirit thing.(#128, traditional healer, male, 35yo, Chókwè city)
You can go to the nyanga and he says that you are feeling this and that, but the hospital did not see anything. This is something that was made for you, by the nyanga. The medical staff in the hospital did not see anything because it

was something that was made. (#127, religious leader, male, 61yo, Chókwè city)

Here the data suggests that the influence and impact of the idea that witchcraft and evil forces operate in individuals' lives and affect wellbeing is not overturned by the introduction of biomedical technology or new scientific knowledge.

Discussion

Although RDTs are only physically available to health professionals, they are 'ordinary objects' to all those who attend the health centres. Patients and their relatives, seeking biomedical care, fully appropriate this new technology within their existing therapeutic knowledge. Witchcraft or 'traditional illnesses' are lay rationales or justifications and it remains the responsibility of outpatients to avoid their interference in biomedical diagnoses. In this sense, RDTs are not independent objects despite patients' confidence in them.

In the flow of objects and medical knowledge, when Chókwè society takes ownership of this diagnostic technique and integrates it into the local worldview, it creates a new mode of ordering knowledge and practices (Law, 1994, cited in Müller-Rockstroh, 2007, p. 10). It is in the interface between new biomedical knowledge and local knowledge that new meanings and interpretations of reality arise. If the outpatient and his/her relatives seek a complementary and pluralistic approach, this enables the biomedical practitioner to 'see' and identify the illness without the interference of a 'spiritual filter'. According to this research, any actions and events that were not expected by the informants yet started to occur in a regular way (such as false-negative test results), were often interpreted through the local worldview as being occasioned by independent forces, such as ancestors or evil spirits.

Conclusions

The narratives and meanings around global commodities need to be contextualised and understood in terms of their integration/appropriation into local worldviews and definitions (Hahn, 2004, p. 216). The social object RDT—an integration of the macro (global good) and local levels—is created through a dialectical relationship between prior knowledge and practices confronted by processes of change represented and interpreted by patients and their families. Local knowledge, practices and expectations are challenged and (re)ordered in this process of appropriation.

The Rapid Diagnostic Test—initially presented as a biomedical technology based on science that simplifies and improves the accuracy of diagnoses—thus becomes a social object around which new knowledge and practices reshape previous knowledge, meanings and relationships with biomedical services, and "influence the practices of social actors" (Edwards & Lewis, 1979).

This social object cannot be analysed as a static and singular product because social actors attach different meanings to it. These meanings emerge from: the clinical encounter; the local worldview and social relations; and the international policies and recommendations adopted by the Ministry of Health.

The uncertainty surrounding some test results meant that malaria—considered a 'hospital disease'—started to be perceived as an illness where spiritual features could interfere with diagnosis technology. In the flow of medical material changes and meanings, the pluralist and complementary therapeutics adopted by patients became the guarantee of successful biomedical treatment in malaria cases.

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