

Malaria Focused Ethnographic Study of Community Perceptions and Practices in Rigoma Division, Nyamira District, Kenya

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Abstract

Epidemic malaria is a common health problem in Rigoma division resulting in enormous human and economic loss. This paper investigates community perceptions and practice of malaria in Rigoma division, Nyamira district. It focuses on community perceptions and response to epidemic malaria, using case histories. Focus group discussions, free listing and direct observation were also used to collect data. The 55 case histories (54.5% female and 45.5% male) indicate that the people have knowledge of malaria aetiology, treatment and prevention. However, this level of understanding is not translated into proper control and prevention of malaria in the area. It is recommended that a public health education program be initiated in the division to bridge existing knowledge gaps.

Key words: Lay people, malaria epidemics, perceptions, Gusii, Kenya
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Introduction

Malaria remains a major public health problem especially in Africa where 90% of the global incidences occur. There are between 300 - 500 million malaria episodes globally, affecting up to one in ten of the world's population each year. Indeed, malaria is a major cause of poverty and inequality in the world affecting primarily the poor. It exacerbates inequalities in health and impedes development. Malaria accounts for nine percent of Africa's disease burden and is responsible for 1 in 4 of deaths below the age of 5 years (WHO 1998). In Kenya malaria is a priority disease. It remains a leading cause of morbidity and mortality, especially in young children and pregnant women. It accounts for 30% of outpatient

attendances and 19% of admissions to health facilities nationally (Rep. of Kenya 2006).

The level of endemicity of malaria in Kenya varies from region to region and there is a big diversity in the risk of malaria infection largely driven by temperature (including the effects of altitude). Based on malaria risk, districts in Kenya are broadly categorized into one of five classes of malaria ecology, namely: Lakeside endemic; coastal endemic; highland; arid, seasonal; and low malaria risk areas (Rep. of Kenya 2006). This study is situated in a malaria epidemic district. Malaria epidemics usually occur at high altitude and in populations with low immunity. The highland altitude epidemics (commonly referred to "Highland malaria") occur in areas with altitude that range from 1700m to 2500m above sea level. In Kenya these are areas found in the highlands east and west of the Rift Valley. The epidemics normally occur from May to August following the

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long rains. However, during the 1997/98 El Nino rains, the epidemics occurred from January through March 1998. This was after unusual heavy rains (October to December 1997) caused by the El Nino weather conditions (Githeko and Ndegwa 2001). The outbreak of these epidemics usually lasts one to three months with high mortality in all age groups (Some 1994). To compound this problem, outbreaks generally get the health care sector unprepared thus limiting a rapid and effective response to the diagnosis and treatment needs of those affected. In the recent past, epidemic malaria has been increasing in frequency and severity among densely populated and economically important areas of the Kenya western highlands (Rep. of Kenya 1998).

This study was therefore designed to investigate lay people's malaria lived experiences in Rigoma division, Nyamira district. Nyamira district is classified by the Ministry of Health of Kenya as one of the 14 districts worst hit by malaria epidemics. The local population have until recently (1980s) reported only a few cases of malaria each year. As result of limited exposure, the people have little or no immunity against malaria infection. This has increasingly exposed them to serious cases of epidemic malaria (Nyamongo 2002). The problem of epidemic malaria in Rigoma is made worse by a general lack of well equipped health facilities and poor infrastructure, which hinder quick access to health facilities. Besides, health facilities are few and unevenly spread making them inaccessible to most Rigoma residents (Republic of Kenya 2001a).

This study therefore, is premised on the fact that, given the high level of vulnerability among the local populations due to their low immunity, knowledge about the community's ethnomedical perceptions and practices should provide useful information that can be used to design appropriate intervention strategies for the area in particular and other epidemic rural

settings in the country in general.

Methodology

Study area and population. The research was carried out in Rigoma division of Nyamira district. The division is one of the 5 administrative divisions that constitute Nyamira district. The district lies between latitudes 0 30" and 0 45" South and longitudes 34 45" and 35 00" East in the South-western Kenya region. It receives an average annual rainfall of 2100mm. There are two rain seasons in the district of which the long rains occur between March and June and the short rains from October to December. The monthly temperature varies between 24.7°C and 27.1°C. In 1999 Rigoma division had a population of 96,140 people (Republic of Kenya 2001b). The division is also characterized by a hilly terrain. Despite the fact that the area is dissected by a hilly terrain, there is also low lying land (*ebirubo*), which is usually prone to flooding and collecting of water marshes especially during the rainy seasons. These climatic and ecological conditions greatly favour the survival of mosquitoes especially during rainy seasons, periods normally marked with malaria epidemics (Siso 2003). Administratively, the division is divided into 4 locations, which are further sub-divided into 12 sub-locations (Republic of Kenya 2001).

The main inhabitants of the division are Abagusii, a Bantu-speaking community. The majority of the local people are subsistence farmers, whose main source of livelihood depended on farm produce. The area has rich fertile soils that support the cultivation of both cash and food crops. The main food crops are maize, beans, finger millet and bananas; while the cash crops are tea, coffee and pyrethrum (Siso 2003).

Sampling procedure. The main sample in the study comprised of 55 informants, selected purposely from all the four locations. The informants were 19 - 60 years of age and

residing in the division. Specific focus was placed, however, on those who expressed a febrile illness three weeks prior to the study. Febrile illness was used as proxy for malaria. The choice for this category of people was anchored on the assumption that owing to their recent experience, they were better placed to offer reliable, adequate and valid information on various malaria-related issues. Sampling continued until theoretical saturation was reached – that is, until subsequent interviews did not yield new data.

Study design. The study was carried out during the months of January to March 2001, although key standard information and demographic variables were quantified. The study relied on qualitative data collection methods involving case histories, focus group discussions and direct observations. However, the core source of data for this study was derived from 55 case histories, who were interviewed in the local language, *Ekegusii*. The interviews were conducted using an interview guide that lasted for about an hour. The responses were recorded in a near verbatim form. The verbatim data was thematically recorded to indicate information on topics such as lay people's knowledge on malaria causation, malaria prevention, treatment, health response time and local perceptions. Case histories were suitable for this study as they elicited rich individualized accounts on the lay people's recent malaria-lived experiences. Additionally, 22 informants out the 55 case history informants were asked to give a free list of the most common illness in the division.

The data from case histories and free listing thus yielded both qualitative and quantitative data. Qualitative data captured the lived malaria experiences of the informants. The quantitative data were summarized into frequencies, percentages and other measures of central tendency. In order to get data that can be generalized to the whole study area data from case

histories were supplemented by the use of focus group discussions. The focus group discussions were particularly useful in crosschecking different perceptions and practices by the informants. A total of 4 focus group discussions were held - one each in the 4 locations in the division. The focus groups consisted 8-12 informants that included both men and women.

This study was guided by the code of ethics in conducting anthropological research. All informants provided consent for interview. All data were kept confidential and anonymous. The study results were disseminated in the community and to malaria control stakeholders in the area.

Results

Malaria terminology

The community reported two types of malaria in the area, namely: Brain malaria (cerebral malaria) locally known as *malaria y'obongo*; and normal malaria (uncomplicated malaria) locally known as *malaria ya kawaida*. Cerebral malaria, though uncommon in the area, was reported by the informants to be the most severe form of malaria in the area. The people believe that this type of malaria needs immediate medical attention, whenever one suspects infection. Further the informants believed that treatment for this form of malaria can only be done at formal health facilities and not with traditional health practitioners. This health seeking behaviour can be attributed to the reported trust by the community members that it is only in these health facilities that one can get appropriate treatment for malaria, since these facilities have trained health practitioners to deal with this lethal form of malaria.

The informants further reckoned that treatment should be done as soon as the symptoms are suspected so as to avoid the severe complications associated with this type of malaria. They reported that if the patient is not treated soon enough, s/he goes into a comma or become, mad. The study showed that the most

common signs associated with this type of malaria, include: the patient turning violent and getting unusually strong, makes unintelligible sounds, convulsions and lapsing into a comma.

Malaria problem in Rigoma

The results showed that malaria is a serious health problem in the area. Further study results indicated that all the 22 informants (100%) who

were asked to give a free list of illness that afflict people in the area, mentioned malaria as one of the most common in the area (Table 1). Other illnesses mentioned include common cold (90%), AIDS (86%), typhoid (81%), intestinal worms (52%) among others (Table 1).

Table1: A Free list of common illnesses in Rigoma Division

Disease	N=22	%	Salience
Malaria	21	100	0.960
Common cold	19	90	0.522
AIDS	18	86	0.472
Typhoid	17	81	0.318
Intestinal worms	11	52	0.187
Gonorrhoea	10	48	0.194
Diabetes	8	38	0.081
Pneumonia	8	38	0.178
Tetanus	7	33	0.083
Diarrhoea	7	33	0.216
TB	5	24	0.106
Backache	5	24	0.086
Skin diseases	5	24	0.111
Syphilis	4	19	0.048
Headache	3	14	0.071
Stomachache	3	14	0.070
Swollen limbs	3	14	0.033
Fever	2	10	0.064
Meningitis	2	10	0.029
Amoeba	2	10	0.036
Measles	2	10	0.050
Eye problems	2	10	0.024
Asthma	1	5	0.041
Epilepsy	1	5	0.000
Toothache	1	5	0.019
Cancer	1	5	0.022
Chest pains	1	5	0.000

The importance of malaria in the division was further strengthened by the fact that malaria was reported to have virtually affected every household. Indeed, over ninety-five percent (96.4%) of the case history informants said that at various times, malaria had affected all members of their families.

The situation of malaria in the area is aptly captured by one middle-aged woman, who said thus:

Int: How many members of your family have suffered malaria in recent past?

Informant 4: It has "visited" everybody in my family- I mean my children and husband.) Highland malaria spares nobody here my son (researcher). It is not like the malaria that used to attack people here in the past. This one comes like plague (*Omosando*)...

Malaria causation

People's knowledge of malaria causation was measured in terms of one's conception of the cause of malaria. Those who subscribed to the scientific explanation were considered knowledgeable, while those who subscribed to other forms of explanations were considered less knowledgeable. When the study informants were asked about malaria causality or/and transmission, all the case history informants associated malaria cause with mosquitoes.

Despite this apparent agreement with the biomedical paradigm - that mosquitoes are the sole agents of malaria causation, other informants felt there are other causes. The other reported causes include: cold weather (23.6%), pollen grains (18.2%), eating sugary foods (7.3%), bad smell from decaying matter (3.6%), unboiled water (7.3%) and dirtiness (1.8%). This belief in multi-causality of malaria is aptly captured by a thirty-one year old case history informant, who said thus when asked to tell the cause of malaria:

Informant: Malaria is caused in most

cases by mosquitoes. However, this may not be the only reason as it is also caused by cold weather conditions and bad smell from decaying matter as a result of heavy rains.

Int. (probe): please tell me how cold weather conditions and bad smell from decaying matter cause malaria?

Informant: normally after the long rains lots of things (plants and small animals) die and begin to decompose and hence produce bad smell. The smell coupled with cold weather conditions makes a person to contract malaria.

While the study found a relationship between cold weather and that of bad smell from decaying matter with the presence of mosquitoes the other reported cases have clearly a spurious relationship with malaria causation. This belief in multiple causes for malaria is indeed a challenge to any malaria prevention strategy that may be initiated in the area.

Perceived Malaria transmission period

Regarding lay people's perceptions of malaria transmission, the results showed that 90.9% of the informants reported that the period between April and August as the time the area experiences the highest malaria transmission rates. However, 40% of the informants while acknowledging this period as the worst regarding their health status further indicated that it is actually the months of July and August that the malaria menace reaches its peak. The other informants preferred not to mention months, but rather noted that malaria transmission in the area is highest after any heavy rainy season (Table 2).

The reported high infection rates during the peak period in the area (especially during the month of July) were commonly reported by both the case history and focused group discussion informants. Indeed this is clearly

brought out by a forty year old case history informant, who said thus:

July is the worst month of the year. It is the period we experience the climax of malaria infections that normally begin in April. This is the time one can see people with wheelbarrows ferrying malaria patients to local health posts. Virtually everybody is attacked from the disease during this period. For example, during the 1998 El Nino phenomenon everybody "tested" (contracted) malaria. It is commonly said here that if one completes the month of July alive, then chances are one will leave to see the new year.

Table2: Informants perceived malaria peak period

Perceived peak period	Freq.	%
April-July	28	50.9
July-August	22	40
After rains	4	7.3
Seasonal	1	1.8
Total	55	100

These comments underscore the grave malaria situation at this time of the year. The study also revealed that there were unusually high cases of malaria during the study months—January to March—a period that is usually characterized by a dry spell in the area. However, this was reported to be as a consequence of the out of season heavy rains that pounded the area during an earlier time (December 2000 and January 2001).

Malaria prevention and control

The study results showed that most informants (87.3%) believe that malaria is preventable and reported engaging in some kind of prevention at the time of the study. However, 12.7% of the informants, while believing that malaria is preventable, reported not to be keen on malaria prevention. This was attributed to the local

people's previous failed attempts to control malaria; thereby leading to loss of trust in this measure. This state of despair was clearly brought out by a forty five year old man, a case history informant and shared by a majority of the study informants, he said thus:

Prevention and control of malaria in this area has defeated us. How can you prevent malaria with all the mosquitoes during the rainy season?... We have tried every method from burning mosquito coils, cleaning our compounds, spraying with doom (insecticide)... But we simply have too many mosquitoes. Last month I bought a bed-net as the last resort, however these mosquitoes have become "clever", they now bite you when you are seated in the house, outside the house... Prevention here is a dream, may be the government should immunize people like the recent polio immunization campaign.

Additionally, the study results showed that there were minimum efforts towards malaria prevention in the study area. The prevailing opinion throughout the study area was that there is little that can be done by the local residents to prevent malaria. This is irrespective of the fact that a majority of the people had a clear knowledge of malaria prevention measures. This anti-malarial behaviour was attributed to three reasons; one, unpredictable and periodic nature of malaria outbreaks in the area, second, ignorance among some people and third, a tendency by the local people to put little emphasis on matters related to their health.

Treatment seeking behaviour

The study revealed that the local population has various sources for the treatment of malaria. They include: self-medication, the government health posts, private health practitioners (who include traditional healers). The majority of the informants (83.3%) in the study area resorted to self-medication as the first response to malaria

infection. 79.2% of the patients who first resort to self-medication use over-the-counter (OTC) drugs and 20.8% reported using traditional remedies for self-medication. In some cases both traditional remedies and biomedicines are combined. The most common OTC drugs used are analgesics, namely, Panadol™, Hedex™ and aspirin. To a lesser extent the study results indicated that the local people bought anti-malarial drugs like Fansidar™ from drug shops. The study findings further revealed that Fansidar™ is the most commonly used anti-malarial in the area. They also showed that 41.1% of the case history informants indicated that the drug is becoming less effective in malaria treatment.

The study findings further indicated that most traditional remedies were derived from local plants believed to have malaria-treating ingredients. These included: *omwarubaine* (*Neem tree, Azadirachta indica*) whose leaves (and/or bark) are boiled and the juice extract drunk; *omotagara* (*Solanecio manni*) whose leaves are boiled and juice drunk to stop vomiting; *omonyasese* (*Clerodendrum myri-coide*) whose leaves (and/or roots) are boiled and the juice extracts drunk and *omokera oge-simba* (*Justicia betonica*) whose leaves are boiled and juice thereof drunk.

Despite the fact that most people sought self-medication as first response to malaria infection, the study findings further showed that they at the same time had trust in the formal health system for effective malaria treatment. In fact, typically most patients do something at home as an initial response. But it appears that generally such treatment does not replace the decision to go to a health post for "expert treatment". Indeed most people in Rigoma regarded self-medication as a 'First Aid' as one waits for proper treatment at the hospital. This scenario was aptly captured at a Focus group discussion at Esani given below:

Int: You mean that even if you buy anti-malarial drugs, like the Fansidar™ tablets that you bought and took, you cannot get well?

Informant 2: No. What I am saying is that buying drugs be it anti-malarial drugs is not enough to treat malaria. Real malaria treatment must be done in hospital (*Nyagitari*). This is where we have trained personnel to treat malaria. Self-medication is merely meant to be First Aid...."

Int: Please tell me what you mean by First Aid?

Informant 5: (asks to continue from where respondent 2 left) the drugs we buy from the shops and Chemists help us to 'cool down' malaria signs like fever and headaches. This enables one to monitor the progress of the disease. This is especially the case when one does not have money to go to hospital. It gives you one opportunity to look for money.

Treatment time seeking

A range of responses were reported when case history informants were asked to tell the time they took to seek treatment upon detection of what was perceived as malaria. The study results indicated that most malaria patients in Rigoma generally took 1 to 3 days to seek for medical help whenever an episode of malaria infection is suspected. The results from the 55 case histories are summarized in the Table 3.

Table 3: Time taken by informants before seeking health care

Treatment time seeking	Freq.	%
1 day	24	43.6
2 days	12	21.8
3 days	9	16.4
Over 3 days	8	18.2
Total	55	100

These results further revealed that those who took 1 day to seek treatment included young children and those who had never had prior experience with malaria. This behaviour was attributed to the awareness by the local community that childhood malaria was lethal and therefore needed urgent medical attention.

Three reasons were reported as being responsible for the delay of some informants in seeking treatment for malaria (those who took over 3 days). These are: first, patients normally want to be sure whether a fever attack is malaria or not. Second, they lacked money to purchase drugs and therefore took time to look for the required money. Third, local government health facilities are closed during the weekends and since they are reported to be cheaper compared to their private facilities, most patients preferred to wait till Monday. Finally, some patients ignored the signs hoping that they will get well.

Discussion

This study analysed community malaria-lived experiences in Rigoma division, Nyamira district. The study findings suggest that malaria is a serious health problem in the area and that the area experiences malaria outbreaks during and after the rainy season. For instance, the data results showed that there were increased incidents for malaria in the months of April to July – a period when the area experiences the long rainy season. However, malaria outbreaks usually occur during and just following the rain season, which provide optimal conditions for mosquito breeding. The study results indicated that local people distinguished two types of malaria, namely, cerebral malaria (*malaria y'obongo*) and uncomplicated malaria termed locally as “normal malaria”.

Cerebral malaria is not common, but it is, however, considered by the local community as the most lethal form of malaria. Given its reported fatality, the local people reported that cerebral malaria patients needed quick and

adequate treatment, more particularly from trained health workers at formal health facilities and not from traditional healers, whom they regarded to be less qualified in providing adequate treatment for this form of malaria. They believed that if such a measure is not taken in time the patient might turn mad or go into a coma. Community based ethno-medical studies to describe local classifications of malaria have been undertaken in a number of sides in Africa (Agyepong 1992, Karanja *et al.* 1999 and Munguti 1998.). These studies have established that biomedical concepts about malaria are yet to be adopted universally and therefore other ideas of disease classification coexist in nearly every culture where local illness taxonomies have been studied.

The study further revealed that the people in the division were in agreement with the biomedical paradigm of the germ theory – on disease causation. However, despite this agreement others still felt that the mosquito vector is not the only cause of malaria and as such suggested other causes. These believe in multiple causality for malaria has been reported in other studies carried elsewhere in Africa (Agyepong 1992, Munguti 1998 and Khayundi 2000). This lay people's mentality will no doubt impact negatively on any malaria prevention strategy in these areas. These finding therefore underscores the importance of initiating anti-malarial campaign in the area to help bridge the existing knowledge gaps.

Most people in Rigoma (87.3%) used self-medication as the first response to a perceived episode of malaria. The initial treatment of malaria at home and without consulting health professionals has been established (e.g. Snow *et al.* 1992 and McCombie 1996). This finding underlines the vitality of not only making anti-malarial drugs available to patients but also training the people on appropriate use of these drugs. This is particularly important in a rural area like Rigoma division where health

care sources are not only inadequate but also having insufficient drugs for patients during malaria outbreaks. Despite the fact that the community resorted to self-medication as a first response to malaria infection, they at the same time believed that malaria is only adequately treated in formal health facilities. Indeed, in Rigoma division most people were reported to be dissatisfied with buying drugs in drug shops. They insisted on going to health facilities for malaria treatment. This means that the government's objective of educating people on the dangers of self-medication or going to unqualified practitioners has largely succeeded.

The people of Rigoma division too, took seriously a suspected attack by malaria; the study showed that over 60% of the people reported taking 1-2 days to seek medical aid whenever attacked by malaria. The swiftness in time response in seeking healthcare by the people of Rigoma division differs with other studies done among other communities in Africa (Ryan 1998, Mwenesi 1993 and McCombie 1996) – who usually took some time before seeking health care. However, these results corroborate another study done by Nyamongo (2002) among the community but in a different district. In both this study and that of Nyamongo (2002), two reasons stand to explain the seriousness with the way the local people deal with a suspected case of malaria. Malaria is a common disease in Gusiiland and which has devastating consequences. Its human cost is evident to residents in Gusii due to the high yearly fatality rate. During the malaria high season it is difficult to find a homestead without malaria patients. Thus malaria is common enough to raise concern and thus the willingness to tame the disease at the earliest opportunity possible.

The reported disillusionment by the people of Rigoma division in the utilization of known malaria prevention measures is a cause of concern in the fight against the disease. In fact, this

anti-malarial behaviour has led to some people to stop making any attempts in malaria prevention. For example the reported low bed net use by the informants (9.1%) is an immediate challenge to any malaria control strategy in the area. Given that currently the use of ITNs has been noted to reduce significantly morbidity from malaria (Snow *et al.* 1988, Ter Kuile *et al.* 2003) The study recommends that an intensive public health education be undertaken in the area, since according to Nyamwaya (1987), the behaviour can be attributed to lack of proper knowledge about the measures, difficulties by the lay people in perceiving the efficacy of the measures and the impracticability in the use of some of the measures by the lay people.

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References

- Agyepong IA (1992). Ethnomedical perceptions and practice in an Adangbe farming community. *Social Science and Medicine*, 35 (2):131-137.
- Githeko AK and Ndegwa W (2001). Predicting malaria epidemics in the Kenyan highlands using climate data: A tool for decision makers. *Global Change and Human Health* 2: 54-63.
- Karanja DMS, Alaii J, Abok K, et al., (1999). Knowledge and attitudes to control and acceptability of permethrin impregnated sisal curtains. *East African Medical Journal*, 76 (1):42-46.
- Khayundi FE (2000). Local people's response to malaria in pregnancy in Bar Chando

Mila (N.S.), Vol. 8, 2007

- Sub-location, Siaya district, Kenya. M.A. Thesis, Institute of African Studies, University of Nairobi.
- McCombie SC (1996). Treatment seeking for malaria: A review of recent research. *Social Science and Medicine*. 43 (6):933-945.
- Munguti KJ (1998). Community perceptions and treatment seeking for malaria in Baringo district, Kenya: implications for disease control. *East African Medical Journal*, 75 (12):687-691.
- Mwenesi H (1993). Mother's definition and treatment of childhood malaria on the Kenyan coast, *Final Report, WHO/TDR/8E.R.*
- Nyamongo IK (2002). Health care shifting behaviour of malaria patients in a Kenyan rural community. *Social Science and Medicine*, 54:377-386.
- Nyamwaya D (1987). A case study of the interaction between indigenous and western medicine among the Pokot of Kenya. *Social Science and Medicine*, 25 (12):1277-1287.
- Rep. of Kenya (1998). National Guidelines for Diagnosis, Treatment and Prevention of Malaria: For Health Workers. Nairobi: The Regal Press Kenya Ltd.
- Rep. of Kenya (2001a). National Malaria Strategy 2001-2010, Nairobi: Ministry of Health.
- Rep. of Kenya (2001b). 1999 Population and Housing census, central Bureau of statistics, Ministry of Finance and Planning, Nairobi, Government printer, Vol. 1, 125- 127.
- Rep. of Kenya (2006). Training Guide for the 2006 National Guidelines for Diagnosis, Treatment and Prevention of Malaria in Kenya. Nairobi: Ministry of Health
- Ryan GW (1998). What do Sequential Behavioral Patterns Suggest About Medical Decision-making Process? Modeling Home Case Management of Acute Illness in a Rural Cameroonian Village. *Social Science and Medicine*, 46 (2), 209-225.
- Siso JM (2003). Malaria: Lay people's lived experience in Rigoma Division, Nyamira district Kenya, M.A. thesis, Institute of African Studies, University of Nairobi.
- Some ES (1994) Effects and control of Highland malaria epidemic in Uasin Gishu district, Kenya. *East African medical Journal*, 71 (1) 2-8.
- Snow RW, Rowan KM, Lindsay SW and Greenwood BM (1988). A trial of bed nets (mosquito nets) as malaria control strategy in a rural area of Gambia, West Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene* Vol. 82:212-215.
- Snow RW, Peshu N, Foster D and Mwenesi H (1992) The role of shops in the treatment and prevention of childhood malaria on the coast of Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, Vol. 86: 237-239.
- Snow RW, Kathryn MR, Lindsay SW and Greenwood BM (1996). A trial of bed net (Mosquito nets) as malaria control strategy in a rural area in Gambia, West Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, Vol. 82, 212-215.
- Ter Kuile FO, Terlouw DJ, Phillips-Howard PA, Hawley WA, Friedman JF, Kariuki SK, Shi Y, Kolczak MS, Lal AA, Vulule JM and Nahlen BL, (2003) Reduction of malaria during pregnancy by permethrin-treated bed nets in an area of intense perennial malaria transmission in western Kenya, *The American Journal of Tropical Medicine and Hygiene*, 68 (4suppl.): 50-60.
- WHO (1998). Malaria- W.H.O Information fact sheet No. 94. <http://www.who.int/mediacentre/factsheets/fs094/en/index.html>. Accessed in May 2007