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The Social Epidemiology and Burden of Malaria in Bali Nyonga, Northwest Cameroon

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Abstract

Malaria is an infectious disease caused by the anopheles mosquito that kills at least one million people in Sub-Saharan Africa every year, leading to human suffering and enormous economic loses. This paper examines the complex web of cultural, poor socio-economic conditions and environmental factors for the prevalence of malaria in Bali Nyonga. The study outlines and assesses the multiple notions of malaria causation with dirty environment (80.76%) and the mosquito (76.92%) as the leading causes. Other causes are poor hygiene (46.15%), impure sources of portable water (23.08%), malnutrition (15.38%), witchcraft (11.54%), human-vector contact (34.61%),and palm wine drinking (32.69%).It reveals that any effective management of malaria must be based on an understanding of traditional cultural views and insights concerning the cause, spread and treatment of the disease, as well as gender roles within a given community since women bear a greater burden of the disease than men. This study further underscores the need to incorporate folk theories of disease causation, gender and malaria issues into malaria control strategies in order to improve their coverage and effectiveness in different contexts.

Keywords: *infectious disease; malaria; traditional cultural views; burden of disease; gender; folk models*

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I. Introduction

Malaria is a perennial public health problem in Sub-Saharan Africa with an enormous global incidence, estimated at 300 million clinical cases each year of which more than one million die. More than 90 percent of these deaths occur in sub-Saharan Africa where young children are the most vulnerable, and where malaria directly accounts for one in five childhood deaths and contributes indirectly to illness and death from respiratory infections, diarrhoeal disease and malnutrition (WHO, 1999). For example, in 2005, there were an estimated 1 million malaria related deaths of children in malaria high-transmission areas (Roll Back Malaria, 2006, RBM infosheet N°3, 2005).The World Bank and the World Health Organisation rank malaria as the leading cause of lost Disability-Adjusted Life Years (DALYs) in Africa with an annual loss of 35 million future life-years due to disability and premature mortality. It is the principal cause of morbidity in Cameroon, representing: 35-40 % of hospital recorded deaths, 50 % of morbidity in children less than five years old, 40 % of deaths in children between 0-5 years, 40-45 % of medical consultations (Bigoga et al.2007), 30 % of hospitalisations, 57 % of everyday's hospitalisations, 26 % of terminal or killer diseases and 40 % of family expenditure on health annually. It is also the principal cause of anaemia, abortion and low birth weight in pregnant women. Fifty seven (57) % of children below 5 years of age and pregnant women representing 22 % of the total population are in the most vulnerable group (Ministry of Public Health, 2011).While death from malaria mainly occurs among young children, malaria-related morbidity is reported to gradually decrease later in life, probably as a consequence of the gradual development of protection related to immunologic mechanisms following repeated Plasmodium Falciparum infections (Trape et al. 1987:260-265).

The "Roll Back Malaria" (RBM) strategy championed by the WHO, UNICEF, World Bank, and UNDP is the latest global partnership to fight against malaria, and to halve the malaria burden worldwide. This strategy advocates for the rapid, effective treatment of persons with malaria at home or at a health facility within 24 hours of onset of symptoms. The aim of the RBM in the African region is to control malaria as a contribution to its health and overall socio-economic development. Additionally, RBM in Africa further seeks to help communities and families reduce the consequences of malaria by contributing to make health care systems to function better, improve access to quality care for people with fevers, ensuring continued utility of effective and affordable anti- malarial therapies, increasing the use of effective protection, especially insecticide treated materials, predicting malaria epidemics and responding effectively when epidemics break out. RBM is to function as a broad -based multi-sectorial partnership focusing intense action against malaria at all levels (WHO 2000, Roll Back Malaria 2006).

Despite global partnership and national efforts made by Cameroon's National Malaria Control Programme to curb the disease burden, the prevalence is seemingly on the increase due to choloroquine-resistance. Previous studies have attributed this to the increasing spread of drug resistance in the parasite, insecticide resistance in the vectors, inadequate and inconsistent allocation of resources for control (Quakyi et al. 2006), and the presence of very efficient mosquito vectors of *Plasmodium falciparum(*Manga et al. 2006*)*. Malaria vector control activities in Cameroon focus mainly on the use of insecticide-treated bed nets (ITNs). However, the implementation of effective vector control strategies requires requisite information on the vector population structure, their distribution and

efficiency in malaria transmission. Previous studies in Cameroon have shown that the intensity and duration of transmission, as well as the vector species, vary greatly between different eco-zones of the country, from perennial transmission in the southern forested regions to seasonal and unstable transmission in the northern Sudano-savannah and Sahelian savannah regions (Antonio-Nkonjio et al 2006). Although the division of labour as a result of gender roles may play a significant part in determining exposure to mosquitoes, very few studies have been conducted to specifically look at this (WHO 2007).This qualitative study examines the socio-cultural and ecological factors responsible for malaria prevalence, the folk explanatory model and the socio-economic burden of the disease so as to improve malaria control strategies and coverage among the Bali Nyonga and beyond.

II. Setting and Research Methods

Bali-Nyonga is a rapidly growing town of over 80.000 inhabitants, located sixteen kilometres southwest of Bamenda, the capital of the Northwest region of Cameroon (Fokwang and Langmia, 2011).The local inhabitants, called Bali Nyonga, are slash and burn farmers who produce both foodstuff and cash crops. They also have a highly developed handicrafts works industry. The town has 6 health Centres and a General Hospital. Between 2006-2007 and the first half of 2008, 8,037 (3058 females against 1478 males) malaria cases were reported at these healthcare facilities. The major factor that favours malaria parasite growth and transmission in Bali Nyonga is poor environmental sanitation with pools of standing water and large numbers of dirt dumps and bushy areas around homes which all serve as breeding grounds for the mosquito vector. Most Bali Nyonga consume large quantities of carbohydrates and plant proteins on a daily basis, although they also grow abundant fruits and vegetables which are good sources of iron, which are rather sold for much needed cash, than consumed. This consumption pattern has thus contributed to their poor diet and the likelihood of malnutrition.

A number of qualitative methods were employed in the data collection process: in-depth interviews, focus group discussion sessions, life histories and case studies. Using these methods, data was voluntarily elicited from 52 respondents: 29 males and 23 females, aged 18-78 years, during November and December, 2008. Tape-recorded information was transcribed, grouped and eventually classified thematically in the light of issues raised and discussed with various respondents. Analysis was contextual taking cognisance of the circumstances of the conduct of the interviews as well as the non-verbal cues like the mood and facial expressions of informants during the interview. This enabled us to compare utterances across respondents and to arrive at similarities and nuances of meaning in their accounts regarding malaria. Additionally, we identified themes, patterns and processes, commonalties and differences of opinion (Miles and Huberman 1994:9). Literal and figurative meanings were sorted out in utterances. Conscious that our identity, values and beliefs could bias our interpretations, "we allowed room for alternative interpretations by allowing the facts speak for themselves"(verbatim quotations).To avoid misrepresentation, the information obtained from the informants have been reported herein word verbatim (but we have ensured that identity, unless waived by the informant is concealed). We are conscious that making sense of lessons learned (Lincoln and Guba, 1985,1994:105-117) is shaped by our experiences and background. Concepts in data were derived from transcripts of interviews and focus group discussion sessions. Data was then presented in prose and in frequency tables and interpreted by percentages where and whenever appropriate.

III. Findings and Discussion

Most respondents identified dirty environment (80.76%), and the mosquito (76.92%) as the main causes of malaria. Most people pointed out that since they work in the farms, they are exposed to mosquito bites, and therefore to the transmission of the malaria parasite: " *To me I know that mosquitoes are the root cause of malaria because they bite us in the farms"* (Ma Pepertua Titabai, Interview 26/ 11/ 2008).

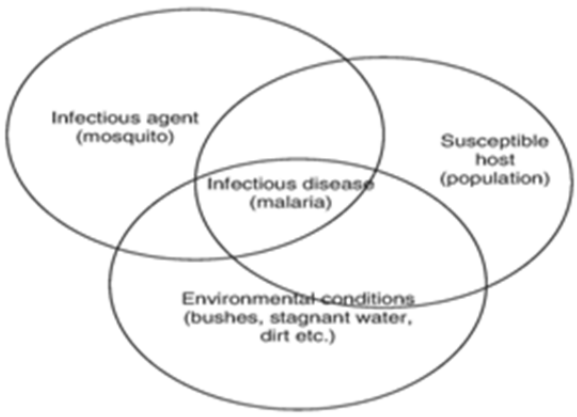
Although some respondents maintained that mosquito bites cause malaria, they however associate mosquitoes with dirt:

> Malaria is caused by mosquitoes which bite us that come as a result of dirt (Tamukong, Interview 24/ 11 /2008).
> Malaria is caused by the anopheles mosquitoes which transmits the infection to man and then it causes malaria to people (Mama Margaret Tessi, interview 25/ 11/ 2008).
>
> I understand that malaria is caused by mosquitoes which bite us. This is because at first there were hardly mosquitoes here and there was hardly malaria too (Ba Mbot David; Interview 27/ 11/ 2008).
>
> Malaria is caused by the plasmodium parasite which is carried by the anopheles mosquito and injected into man through a mosquito bite. As a result of its development in man, it causes malaria (Ernest Fokumlah, Interview 25/ 11/ 2008).

However, while it is recognized that lack of environmental hygiene, especially the presence of bushes around houses attracts mosquitoes, which in turn bite and transmit malaria, other causes of malaria were reported: poor hygiene (46.15%), impure sources of portable water (23.08%), malnutrition (15.38%), witchcraft (11.54%), drinking palmwine (32.69%), transmission from one host to the other (34.61%). Apart from environmental factors, socio-cultural factors likely to enhance human-vector contact and malaria transmission include gender roles, family structure, housing arrangement, funerary customs and dressing.

Dirty environments

There is an association between dirty environment, poor hygiene and impure sources of portable water as they provide a niche for the breeding of mosquitoes. Some forty six per cent (46.15%) and (23.08%) of respondents attributed malaria to poor hygiene and impure sources of portable water respectively. Malaria transmission in any locale depends upon a complex interaction of the mosquito vector, the physical, socio-economic, environmental factors, human biology, demography and human behaviour. The landscape that distinguishes a place is a complex expression of physical, biotic, and cultural processes (McElroy and Townsend, 2008**)**. The illustration below shows the interaction of these three factors and the outcome:



Respondents felt that dirt serves as a breeding ground for mosquitoes since it harbours mosquitoes, which bite people and cause them to be sick of malaria. The presence of bushes therefore suggests disease in folk knowledge and representation:

> Bushes around the house, stagnant water in the gutters and tins, the throwing of dirt especially rotten foods like cabbages, fruit peelings, keeping domestic animals too close to the house and their urine

and faeces makes places nasty, slow running water around the house according to me makes the environment or our surrounding dirty and as such will contribute to bring mosquitoes which will bite us and cause malaria (Ma Judith Njenu, Interview 25/ 11 /2008).

The presence of water bearing crops around households which provides some security in case of food shortage, is a permanent source of mosquitoes and therefore of malaria.

Fig 2: Photograph showing stagnant water around the house, © author.

We equally plant water bearing crops around the house like plantains, bananas, coco yams and even work farms around the house. The stalks or trunks of these plants harbour water and this provides a breeding ground for mosquitoes which of course cause malaria (Interview Nabila Anna, 25/ 11/ 2008)

Fig 3: Dustbin around a house, © author

Poor hygiene and impure sources of portable water

Some forty six per cent (46.15%), and (23.08%) of respondents attribute malaria to poor hygiene and impure sources of portable water respectively:

If people do not uphold proper health habits like washing their hands after toilet use or work, malaria will always prevail among the people. People's activities and what they get in contact with each time may have a relationship with mosquito larvae which is usually invisible (Ernest Fokumlah, Interview 25/11/2008).

> If the house is dirty, that is, if we keep dirty dishes, plates, and dirty clothes or wear them, mosquitoes will follow this dirt and come to the individual and bite him/her causing malaria. Carelessness is leaving oneself to be exposed to mosquitoes or keeping things around us that can call mosquitoes. All these will cause one to have malaria (Ma Anna Ngongeh, Interview 20 / 11/ 2008)

> Unhygienic conditions like toilets near the house, that is sleeping room, all these contribute to the presence of mosquitoes, which will end up causing malaria Also, the keeping of stale food inside the house, in fact poor hygiene will cause one to have malaria (Pa Gana Matthew, Interview 26/11/2008).

> We can get malaria also from where we usually go to wash clothes and equally take our bath, I'm sure. How often people wash their hair and change their clothes is countable. It is doubtful if some of the people bathe themselves thoroughly after tedious farm work. All these contribute to produce body odour, which may attract mosquitoes that transmit malaria (Ma Konla, interview, 23/11/2008).

Because of water scarcity, people in Bali Nyonga get portable water from streams and rivers. Water fetched from these sources is impure, and these sources are breeding grounds for mosquitoes:

> Malaria is caused by impure source of portable water that is taken into the system. Malaria can also be caused by impure portable water which mosquitoes have settled on it and when we drink it, it will cause us malaria. (Ma Rose Nyemkuna, Interview 15/12/2008).

> It can also be caused by bad water supply from which we drink, usually carried around the house. These streams usually flow slowly. They are breeding grounds for mosquitoes. These impure sources of portable water when drank goes and develop in our system and cause malaria
> (Ba Mbalang Matthew, Interview 10/12/2008).

This means that the mosquito larvae which is ingested through the drinking of water goes and develops- that is, completes the asexual phase of its life cycle in the human system and then causes malaria.

Poor nutrition/Malnutrition

Nutrition plays a preponderant role in maintaining health and social well-being, whereas malnutrition generates vulnerability to a wide range of diseases and general ill-health (Shankar 2000). Eight respondents (15.38%) alluded to malnutrition as one of the causes of malaria.

> When one doesn't eat well, be it a child or an adult, the person is bound to fall sick. Whenever s/he shall has malaria, the fever or malaria even becomes severe. Here in the village, people work too hard and feed poorly. This can cause them to be sick of malaria (Ba Doh Tita Juwan, Interview 10/11/2008)

"Does not eat well", means poor nutrition in terms of the various classes of food, and to worsen the situation, there is "food segregation" in this community as food items rich in protein-chicken products, and beans- which help in growth and in the building of the body's immune system are considered sacred, destined for ritual purposes and for sale, since they attract high monetary values by local standards. Furthermore, foods rich in iron constituents- plantains responsible for the building up of red blood cells, which are usually the target zone of malaria parasites, are hardly consumed by some people, but rather largely sold for money. They would rather eat corn prepared in different ways, such as corn fufu, corn-chaff, usually accompanied by very small quantity of beans, corn drink *(sha*), boiled corn and corn puff-puff, which contain starch, dietary fibres and roughage. According to the medical personnel, this and other sources of food nutrients, which are taken in small or insignificant quantities including vegetables, makes their nutritional intake to be inadequate, and render them, vulnerable against infectious diseases, explaining why in the event of a malaria attack, the symptoms can be very severe. Most people in Bali Nyonga feed on carbohydrates and plant proteins, which are unfavourable for iron absorption, when compared to vegetables and animal protein. Most children who suffer from iron deficiency also have malaria and there is a negative correlation between malaria parasite density and plasma iron concentrations. Research shows that individuals with malaria have lower plasma concentrations of several micronutrients when compared to controls (Adelekan et al. 1998, Nkuo-Akenji et al.2008). The decrease in iron levels during periods of acute malaria has been attributed to immunization of iron in haemazoin complexes and reduction in intestinal iron absorption (Frongillo et al. 1997). Although malntrition affects all groups within a community, infants and young children are more vulnerable because of their high nutritional requirements for growth and development. The etiology of mild to moderate malnutrition in most of the tropics is probably multifactorial, and does not only involve adequate or inadequate or inappropriate diet but also intercurrent infections (Nyakeriga et al. 2004). The relation between malaria and malnutrition, is important, because malaria might be a major cause of malnutrition, and may be responsible for considerable indirect mortality that could be potentially be reversed by effective malaria control measures (Nkuo-Akenji et al.2008). Müller et al (2003) have identified a synergy between malnutrition and infection as responsible for much of the excess mortality among infants and pre-school children in less developed countries. Infections are likely to have more serious consequences among persons with clinical and sub-clinical malnutrition

and infectious diseases have the capacity to turn borderline nutritional deficiencies into severe malnutrition. Therefore, malnutrition and infection can be mutually aggravating and can produce more serious consequences for the patient than would be expected from the summation of the independent effects of the two (Anderson et al.1972).

Witchcraft

According to 11.54% of respondents, an individual can also catch malaria as a result of actions by individuals (evil eye or witches) whose aim, it is believed is to cause harm to a person or his kin: *nobody loves anyone these days and the world is spoilt*.

> I equally believe that at times witchcraft has a hand in malaria that is resistant to treatment. This is because I do not understand why someone should take drugs or medication against it (malaria) and you cannot get well, somebody's hand must be there (Ba John Basi, Interview 8/11/2008).

From the respondent's statement, it is belived that people in Bali Nyonga have a multiple causal folk theory of malaria. Witchcraft offers an explanatory framework for why severe malaria that often leads to madness affects some people and not others, as well as resistance of the parasite to anti-malaria drugs. People's practices in relation to disease are not a medley of disconnected and meaningless customs, but are inspired by definite ideas concerning the causation of disease. Their modes of treatment follow directly from the ideas concerning etiology and pathology**.**

Although severe and resistant malaria are strain specific to parasitic dose, witchcraft is invoked when diagnosis is done and treatment takes a slow pace. Such beliefs tend to mask parasites or provide a favourable condition for the multiplication of parasites and the continuation of malaria attack, which can end up in the death of the victim. According to the Abagusii of Kenya, even when chronic illnesses have been positively identified in hospital, they are still considered to be the result of witchcraft. Like death, it is brought upon us by others-witches-intent on causing harm (Nyamongo 2001, Fivawo, 1993).Witchcraft incidents are widely reported in the Cameroon media and even in the United States. For example, in 2008, a Bali Nyonga woman, Mary Nabila took the world by surprise when she filed a Federal Lawsuit accusing another woman of attempting to steal her husband; Marcellus Muma from her using voodoo, but later withdrew her lawsuit (Post Newspaper, November 11, 2011)[1] . The practice of witchcraft is against Cameroonian law, but rarely are people brought to court for practicing it. What obtains, most often is that young men usually gang up and lynch suspects in the name of ''administering justice".

IV. Socio-Cultural Factors for Malaria Causation and Transmission

Gender roles

A study by the WHO entitled *Gender, Health and Malaria* (WHO, 2007) on the relationship betwen gender and malaria transmission shows that – in wording of the report – *socially institutionalised gender norms and values influence the division of labour, while family and leisure patterns, and sleeping arrangements may lead to different patterns of exposure to mosquitoes for men and women.* There are also gender dimensions in the accessing of treatment and care for malaria, and in the use of preventative measures such as mosquito nets. The WHO recommends that a thorough understanding of the gender related dynamics of treatment-seeking behaviour, as well

[1] See http://www.postnewsline.com/2009/04/witchcraft-and-justice-the-case-of-cameroon.html.Last accessed, November, 11, 2011.

as of decision-making, resource allocation and financial authority within households is key to ensuring effective malaria control programmes[2].

Observation and information abduced from hospital records revealed that more females (3058) than males (1478) went for medical treatment or consultation at the Bali District Hospital and health centres against malaria. While this is partly due to the medicalisation of the female life cycle, the data suggests that, females are more vulnerable and prone to malaria infection than men. Within the cultural universe of the Bali Nyonga, the female sex is considered as the weaker sex, explaining why if a man and his wife fall sick, the man prefers to send his wife to the hospital first while struggling to see how he can cope with his own condition later on. One man noted: *"I have to do everything for her so that she should get well and take care of the house, because I am too absent from the house*". The reason for this privilege to the woman is because she is considered as the cornerstone of the household, and her being sick may affect others within the household. This is a contributory factor to transmission because after consultation and prescription, the woman returns home and still lives with the man and her children. Mosquitoes will continue to bite and re-infect or contaminate members of the household leading to the prevalence of malaria. Nevertheless, available evidence suggests that given equal exposure, adult men and women are equally vulnerable to malaria infection, except for pregnant women who are at greater risk of severe malaria in most endemic areas (Reuben 1993). Although both men and women in areas of endemic tropical diseases suffer from discrimination due to gender hierarchies, class inequality and poverty, women are particularly disadvantaged due to factors linked with gender inequality. A study in Cameroon found that the burden of illness due to malaria rested disproportionately on economically disadvantaged women and on women with low social status. Excess morbidity was found among women who were not employed, women living in poor neighbourhoods, and those living in households without modern amenities (Defo 1997).

Additionally, the family structure which is based on interdependence among household members in taking care of the sick can foster the transmission of malaria.The responsibility for child rearing, provision of food, and care for the elderly, sick or dying, is shared among members of the family (mostly among women). *"I did not go to the farm because my sister is very sick. I have to take care of her today and tomorrow it shall be the turn of our brother to take care. After him, others too will come and do the same*"(Nubila, Interview, 7/11/2008).

In the event of a sick person in the family, most of the other members take their turns in showing concern and providing social support by keeping the sick company. This cultural expectation of showing concern for one another and being the other's keeper is hazardous to health because it can aid and abate the transmission of the malaria parasite since the vector (mosquito) is always present. In most parts of the world, women have the primary responsibility of caring for others within the household, and they are also providers of the majority of treatment to sick family members. However, decisions about seeking therapy for children are made by men and, to a lesser extent since they control the resources, by senior females in the households. Therefore, only targeting women in malaria intervention programmes is insufficient for ensuring improved access to services (Tanner and Vlassoff, 1998). A study in rural Colombia found that illness in an adult male endangered the whole household. The workload of women was significantly increased as they had to take care of sick household members as well as replace males in farm production. The study found that 64% of all tasks normally undertaken by the sick person were then performed by women. The women expressed concern about the loss of the main economic provider as well as about having to work harder in order to earn money to procure medicine and food. The study pointed out that although the

[2] Available at http://www.who.int/gender/documents/gender_health_malaria.pdf. Accessed April, 17, 2013.

disease burden was greatest amongst adult males, the indirect economic burden of the disease was greater for women (Bonilla and Rodriguez 1993).

Furthermore, housing and sleeping arrangements enhance the human-vector contact. The site on which the building is constructed, as well as the internal division of the living space, the number of occupants per room, the allocation of in-door space, by age, gender or marital status. And whether anti-mosquito screens are used in the construction of windows and doors or to divide up internal space are important variables determining infection. Some of the dwellings are constructed in marshy areas, which are breeding grounds for mosquitoes. From observation, some houses are made up of one-bed seats. This means that it serves as a sitting and sleeping room at the same time; for at least five occupants- mother, father and children. Some houses are comprised of two rooms, one sitting and one sleeping room with at least six occupants each. For three room houses, that is a parlour and two sleeping rooms, at least eight occupants live within, and sleeping spaces are not protected with mosquito nets. This implies that all occupants of the house will cluster in one place or space during sleeping time or hours when the Anopheles mosquito is very effective in the transmission of malaria. It has been pointed out that in most of the Third World, many malnourished individuals live in slums, shanty-towns or remote rural areas and do not visit hospitals (Truswell 1992:33-34).

To exacerbate this situation, very few houses have transparent window screens that are integrated into the constructed window. Rather, most houses have wooden windows with holes to allow room for the outing of smoke during cooking. These holes instead serve as passage for mosquitoes into the house. Food preparation indoors is aimed at heating internal space. But it is cooled immediately cookery is over and mosquitoes still fly in and transmit infection. This housing arrangement to the people is rather an expression of family life, identity and oneness. But it is a causal factor for malaria transmission. It has been pointed out that the acceptability and use of ITNs are strongly linked to culturally accepted sleeping patterns, in which gender plays an important role. In some instances, young children sleep with their mother and are therefore protected by her bednet if she has one. Alternatively, if a household only has one bednet, priority may be given to the male head of the household as he is often considered the primary breadwinner. In other contexts, men have very little access to ITNs if they predominantly sleep outside (Rashed et al. 1999).

Another contributory factor for malaria prevalence is funerary customs and dress code. Before burial, a dead person is displayed in public during wake keeping for close relatives and friends to pay him their last respects. It is the same case even when the person died out of the village. A convoy made up of different people who may be carriers and non-carriers of malaria, immunes and non-immunes usually accompany the deceased. This custom enhances the transmission of malaria as it provides room for people to gather. And there is transmission from one/ several individual(s) to others because of the presence of mosquitoes. One woman observed that: "*Since two days after the burial of Ma, I have had malaria*". This means that she must have contracted it from there. Closely related to this point is the culturally laid down funeral dress code. During funerals in Bali-Nyonga, the dominant colour of outfit is black, signifying grief and mourning, a colour that provides a bed for transmission. This is because mosquitoes are always attracted to black colours, this is the reason why they are always present in dark corners of the house or take refuge in the dark. As such when people put on this colour of dress, they are attracted to them, transmission takes place.

Moreover, the people's main income generating activities of farming and trading provide occasions for man and vector contact or for transmission from one person to the other or provide breeding grounds for mosquito larvae. Farming leads to exposure to infection as it makes way for man and vector contact in the farms or bushes. One man noted that: "*I have not rested these days from farm work and it is causing me to have fever"*. The implication of this statement is that contact with vector (exposure) has led to transmission of the infection. The victim is however missing the point by saying that it is because he has not rested. Hunting also put the people at

greater risk, since it requires them to go into the disease infested forest. Additionally, small-scale traders go to the market very early in the morning when mosquitoes are very effective in undertaking transmission, and the coming together of people to exchange goods and services provides a forum for human-vector contact and malaria infection. The Bali market is an open square strip of land area with bushes on three sides of the square. The fact that people come together in a malarious area, makes transmission from non-carriers and non-immune individuals to others. One trader told us that: "*After I came back from the market, I started feeling feverish in the evening*", meaning that transmission took place while she was in the market. Most village markets are no paradises with regards to cleanliness. A few hours after the development of the parasites in her system, she started feeling the symptoms of malaria. Such activities give way for the meeting of different people and carriers can transmit to non-carriers and non-immunes. Although these occupations are the means by which the people make their living, it is hazardous as it keeps them at permanent risk of the acquisition of infectious diseases. It has been reported that, men have a greater occupational risk of contracting malaria than women if they work in mines, fields or forests at peak biting times, or migrate to areas of high endemicity for work (Reuben 1993). Additionally, women who get up before dawn to perform household chores may also be exposed to mosquitoes and consequently to malaria infection (Vlassoff and Manderson 1998).

Closely related to the foregoing is poverty, which retards access to appropriate healthcare and the failure of compliance with treatment regimens. Most of the people are either subsistent farmers, pensioners, petit traders or simply dependants, with insufficient incomes to provide for adequate housing, nutrition and healthcare services. Consequently, when they fall sick, they resort to self- medication, which may provide only temporary relief. Proper health care service may be sought only when the situation has gone out of hand: ''*They [patients] only come here [hospital] when the situation is worse or has gone out of hand*" (Dr. Bijingni Pius). One man reported to us during a focus group discussion session that: *"When we fall sick, we do not usually have money to go to the hospital. What we do is that we buy a few tablets from the stores and drink while monitoring the disease"*.

Poverty and the inability to access healthcare is more accentuated among women than men, and to compound matters, women often have to seek permission from their husbands or other male relatives to access treatment for themselves and/or their children (Molyneux et al. 2002). A study on gender roles and responses to malaria in Ghana revealed that women who lacked either short-term or long-term economic support from male relatives, or who disagreed with husbands or family elders about seeking appropriate treatment, faced difficulties in accessing health care for children with malaria (Tolhurst et al. 2005). They also faced the heavy burden of the cost of seeking treatment despite often limited access to resources.

Additionally, the people's culture fosters a relaxed attitude to daily life which is common among people of the middle and old age groups who take pleasure in the drinking of palm wine. Some respondents (32.69%) believe that palm wine causes malaria since those who tap to sell usually mix the wine with other substances. They are also convinced that tapping conditions are not hygienic.

> Malaria is also caused by the palm wine we drink. Because I am sure that during the tapping process, some mosquitoes succeed in laying their eggs in it, since we do not boil the palm wine before drinking, we contract malaria after drinking it (Ba Mbot David, Interview, 27/11/2008).

In the course of the tapping process, mosquito larvae gets into the container containing the palm wine and completes the asexual phase of its life cycle there, which when drank, causes malaria. This suggest that the nasty tapping environment invites mosquitoes, who adapt, survive and lay their eggs in the drink. Although this favourite pastime keeps the people lively and provides a good forum for the discussion of cultural and village affairs, it facilitates the transmission of the malaria parasite from an infected individual to others.

> Malaria can be acquired through transmission from one person to the other by the bite of a mosquito. It could equally be caused by transmission from an infected to an uninfected person by the same mosquito. Apart from transmission from person to person by the mosquito, malaria can also be contracted through contaminated needles and or during blood transfusion. This is because these days when a zone is anaemic, and blood is needed to be transfused, the blood is only screened for the HIV virus. The medical personnel do not screen for malaria too. In fact, they care less about malaria test at the level of transfusion. As such it can be transmitted through this means from a non carrier to a carrier or to somebody who is not immunologically strong (Ernest Fokumlah, Interview, 25/11/2008).

In some societies, apart from gendered division of labour, the activities of men and women during peak biting times may result in equal risks of infection. For example, a study in Myanmar on activities that enhance human-vector contact revealed that gender-specific patterns of both leisure and work activities during peak biting periods by men and women placed them at equal risk of contracting malaria through exposure to mosquitoes (Tin-Oo 2001).

Some informants however believe that malaria is natural, and must attack an individual at least once in a life time no matter the circumstances. ''*I also know and think that malaria is a disease whose cause is natural, in that it is a disease which attacks one at times even when you live well"* (Ma Josephine Andin, Interview, *24/11/2008).*This informant clearly maintains that even if one's living conditions are improved upon, one will still have malaria. They do not know that they live in the endemic zone where everybody is thought to have malaria but that it does not manifest in the same way in everybody; neither do they understand that attack manifestation is strain specific and related to immunity. At certain ages, people acquire a certain degree of natural immunity with regards to infectious diseases. This believe that malaria is natural may lead the patient and his entourage not to seek therapy and the situation might become aggravated.

Malaria is caused by a web of environmental and socio-cultural factors. Malaria causation from an ecological perspective involves the interaction of the socio- cultural system, biology, the environment (living and non living), the population size and structure as continuously interacting and essential variables with various degrees of independence and dependence (McElroy and Townsend 2008). Some respondents seemed confused between malaria and fever given that among the Bali Nyonga almost the same words in their language refer to both realities. I take on this and the management of malaria below and then, conclude.

V. The Socio-Cultural and Biological Parameters of Malaria Causation – The Ecological Perspective

Lay perceptions and designation of malaria

The various symptoms of malaria identified by respondents include: fever (intermittent- attacking mornings and evenings), shivering, head ache, muscle and joint pains, comma, convulsions, lose of appetite, tiredness, stomach disorder, hard stool, vomiting, aches from the vertebral colon to the spinal cord, bad omens (bad dreams), bitter taste on the tongue, pallor eye, palms and soles, body weakness, general body malaise and madness (cerebral malaria). Whenever they are sick of fever, they take it for malaria, but when they take their traditional drugs and are faced with resistance, they usually go to the hospital complaining that they are sure that it must be typhoid fever. This suggests that different conditions of ill health therefore present the likely symptoms of malaria. The treatment of any disease or conditions of ill health usually involves shuttling between the different healthcare sectors- folk, popular and professional sectors. Among the Bali-Nyonga, the treatment of malaria is linked to the causes, symptoms and perceptions. Before taking on an analysis of the treatment strategies, we shall first of all attempt an

analysis of the local concept and explanatory model in relation to cause – symptom and the treatment of malaria. There is no strict distinction in the designation of fever and malaria among the Bali Nyonga from the point of view of symptom. And various representations of malaria co-exist, usually based on symptoms.

Fever is generally called / mfæ / - meaning ‘‘cold”, and the most likely symptom of cold includes: shivering, headache, fever, vomiting, and sneezing (catarrh). However, these symptoms could be the result of other febrile conditions, which is neither fever nor malaria. During attacks of fever, treatment is milder, and geared towards the popular sector- usually auto-medication with a few over – the counter drugs. People also keep warmth by bathing with warm water, wearing warm clothes and by basking by the fireside. If after all this, the fever is not relieved, it is then taken for malaria. Cold signifies attack from malaria, and is felt by a victim of fever or of malaria when the temperature within the victim is lesser than that of the surrounding environment or vice versa. This condition creates an imbalance in the victim and the resultant effect is cold caused by different factors, including high environmental temperatures and exposure. Secondly, it can be caused by a malarial attack especially the release of the first batch of merozoites into the blood stream or better still by parasites invasion of the blood stream. Thirdly, it can also be caused by dirt in the system, particularly by the ingestion of food that is not well prepared, or the accumulation of waste products including excreta, bile – the yellowish phlegm that resides in the bile duct, sweat, menses or some foreign element that may be residing in the system. These dirts generate heat in the human organism in contrast to the surrounding environmental temperature and as such cause cold in the victim.

Firstly, malaria is called /Nsùkwèŋgwèn /, meaning ‘‘bathing when coming back from the farm” because of the intermittent nature of malaria attacks and symptoms. Respondents maintained that it attacks during the mornings when people are going to the farm and in the evening when they are returning. The recurrent nature of malaria attacks is analogous to the recurrent nature and routine of farm work and reflects different periods in the traditional farming calendar –a period for clearing, raking, hoeing, planting weeding of grass and subsequently harvesting, periods characterised by different incidence and prevalence rates of mosquitoes, and therefore of malaria. Secondly, malaria is also known as / mfæ ŋyàmbùm/ and /mfæ Kwèŋimbùm / - meaning “cold in the flesh” and “cold that eats the body” respectively. This feeling of cold according to the people is usually caused by the invasion of some foreign element in the body or by exposure to cold. It implies that malaria affects their ability for farm work because “cold in the flesh eats the body”, is a foreign to the body and incapacitates normal bodily functions and the ability to work. Thirdly, malaria is called /mfæ ntiəŋkèt / and / mfæ wètwèti /, meaning “strong cold” and “cold that causes shivering”. Malaria is perceived as serious, particularly when it is chronic in a victim and causes shivering, and the patient is incapacitated and can therefore not do any work. Additionally, malaria is designated as / mfæ tɒbàŋg /, meaning “cold that removes red”. Red according to the Bali-Nyonga signifies life (blood) and the absence of “red” means death. This designation thus compares a malaria patient to a shivering bird when there is too much cold. The people perceive malaria as an illness that renders the patient anaemic, because of the invasion of some foreign element in the body or by witchcraft or the evil eye. According to the Bali Nyonga folk model, “if someone hates the other, he/she may cause the red constituents (blood) in the body of that person to dry off”. This is a subtle way of killing that person. This folk model resonates with the scientific view that when one is attacked by malaria, and treatment does not commence at the onset, it leads to anaemia in the victim. Blood is an important constituent of the body, lack of it can cause imbalance in the whole body and can result in the death of the victim.

Therapeutic recourse

In spite of all the different appellations of malaria, the therapeutic recourse strategy begins with self diagnosis, usually through one of the several symptoms of the disease and the taking of either traditional or modern medicine or both simultaneously so as to ensure a quick recovery.

/Nsùkwèŋgwèŋ / is diagnosed following its intermittent nature. For that which is designated as / Mfæ tɔbàŋg/, an inspection of the outer cells that surround the eyes is the method for diagnosis. If they appear white or faint red, people immediately conclude that the victim is short of blood (anaemic). Malaria of other appellations is diagnosed simply from the other malaria symptoms. Usually there is a slight difference in the composition of the concoction taken in function of the different appellations. For / Nsùkwèŋgwèŋ / and the others, their concoction compliments are the same but with /mfæ tɔbàŋg /, although the compliments for the others are used, some leaves known in the native tongue as / baŋg tà bà / - (scientific name Euromomastax Specioza) which produces a red liquid when squeezed, and is believed to reactivate the red blood cells and increase blood content and quantity in the system, is added. The herbal concoction is comprised of various quantities of the lemon grass, pear, mango, guava leaves, Euromomastax specioza**,** the fruits and leaves of the lime plant fruits , beet root, water, paw paw: leaves plus unripe fruits , orange, black jack, masepo leaves, honey, knife, and pot. When the concoction is ready, some people bask with it. After taking off their clothes, they use a thick blanket to cover the patient alongside the pot. The pot is then opened in front of him/her and stirred. The victim also inhales the vapour. This process lasts for between 20-25 minutes. Most often, the concoction that is used for basking is comprised of a combination of honey, beet root and limes. After the basking, the patient allows his/her body to dry up because during the process, the victim passes out a lot of sweat. After this, the patient collects some of the concoction and uses it for his/ her bath. Finally after bathing, the patient drinks one glass of the concoction. But with some people, after the concoction for bathing, has been set aside, they then add honey, limes and water and boil it again before drinking. They drink the concoction when it is still hot because they claim that is when it is very effective. When the concentration of the concoction is too high, it is diluted especially if it is to be administered to a child or to a pregnant woman. The quantity that is administered is not fixed and varies with adults, children and pregnant women. To treat / Mfæ tɔbàŋg/, the leaves of Euromomastax specioza or beet roots are boiled and drunk separately or are squeezed and then some quantity is added to the above concoction and it is then given to the malaria patient.

After the patient takes this concoction, it resultant effect is that, the patient should feel relieved of the illness or disease, but most often once the symptoms disappear, the person may still be contagious because the malaria parasite continues to shed pathogens several days to weeks after the patient may appear to have regained health. For this reason, the patient may think that s/he has fully recovered and usually stop taking medication, and the parasites will mutate and then resist other drugs. But in case the patient does not feel relieved or better, they often turn to the professional sector, usually for proper diagnosis and treatment. However, for malaria designated as /Nsùkwèŋgwèn /, they would rather go for ritual management.

Malaria /nsùkwèŋgwèn / and ritual management

Recourse is made to ritual management in an episode of /nsùkwèŋgwèn/ which is intermittent in attack or recurrent. The specialist usually requires some salt, firewood, plantain leaves with some herbs (which the specialist refused to reveal the names), as ritual objects. The ritual is usually performed at a local road junction very early in the morning (usually about 5:00 am), before people start passing there. The patient is taken by the specialist to the centre of the road junction, and prepares a fire place. The patient then undresses while the specialist goes around the fire place evoking the gods of /nsùkwèŋgwèn / to come and wad off the disease from the victim. While reciting incantations, he sprinkles the salt around. After he asks the victim to stoop low and basks while turning around. Then the specialist squeezes some of the herbs and gives the victim to drink, then sprinkles some on the spot and drinks some. After that, he asks the victim to go round the fire and thereafter, go home without looking behind until s/he reaches his/ her home.

The salt is sprinkled as sacrifice to appease the gods of illness for them to take off the illness from the victim, while the basking besides the fire is intended to restore normal bodily temperature that has not been stable in

the victim. Incantations are meant to plead with the gods to have pity on the victim. This is followed by the drinking of the concoction prepared from the herbs by both the specialist, and the victim. Interestingly, when this / nsùkwèŋgwèn/ is waded off from somebody, it usually remains at the roundabout waiting for the first passer(s)-by that morning for it to attack, while the former victim may be relieved. But in case the victim is not relieved, then modern biomedical treatment is resorted to. Usually at this time, the sickness has gone out of hand and this is when it is taken to the hospital. Mr Bijingni Pius pointed out that:

> Usually they take traditional medicines or drugs while others take quinine, paracetamol and other tablets which they say they don't even know their names. But they however have their means which they manage the disease before going to the hospital. Their management or coping strategy is characterised by auto-medication and drug interaction which of course has health dangers (Interview, 23/11/2008).

The various designations of malaria and their presumed causes exemplify the indigenous contagion theory (ICT). According to Green, ICT comprises three related types of etiologic beliefs. These are naturalistic infection, or the folk germ theory, mystical contagion (also called pollution), and environmental threats (Green 1999). In the analysis of Bali Nyonga beliefs of malaria causation, both the naturalistic infection aspects and environmental threats are evident.

VI. Conclusion

The findings of this study have implications for malaria control programmes in Bali Nyonga and in other areas where malaria is ravaging the population. Lay people in Bali Nyonga have a multiple causal theory of malaria. While the association of malaria with dirty environment (80.76%) and by implication to poor hygiene (46.15%) and impure sources of portable water (23.08%) may lead to greater hygiene and enhance community health in the process, its association to witchcraft (11.54%) can negatively impact on the utilization of health care facilities, or self-treatment with herbal remedies or over-the-counter drugs. Instead, patients may seek treatment from "specialists" thought to have supernatural powers such as ritual experts or witch doctors. Given the widespread resistance of malaria to chloroquine, local people may attribute it to the actions of ill-intentioned individuals, and may accordingly modify their behaviour in tandem with those interpretations.

Lay people in every society have developed concepts of disease causation and therapy. In other words, malaria control programme officers should identify local meanings of what "dirt" for instance is, and their biomedical correlates and craft malaria control messages on them. Knowledge always results from interpretive practices. Such an understanding of knowledge has great potential for the planning and implementation of interventions. These lay beliefs inform people's interpretations of their suffering in function of their world view. Therefore, malaria control programmes should tap from, and be, informed by people's locally derived folk theories about causation because of the interface between locally available knowledge and the knowledge brought into an area by those charged with implementing health projects such as malaria control. This calls for regional/area specific control programmes, despite the fact that lay beliefs are not scientifically derived, they do affect patient compliance to prescribed malaria regimens and treatment outcome. By drawing on people's every day lived experiences about malaria, control programmes are likely to be enhanced, but where they clash, the people should be informed and solicited to make the appropriate modifications.

This study further highlights the need to incorporate gender analysis and malaria issues into malaria control programmes in other to improve their coverage and effectiveness in different contexts, since the burden and patterns of exposure and response often coincide with gender norms and behaviour. Although women bear the burden, focus should not only be on women in malaria intervention programmes for ensuring improved access to service delivery

because therapy seeking decisions for children are largely made by men, and most often, women depend on men for resources with which to access health care services, as well as need men's authority to do so.

There is also an urgent need to inform the public on the benefits of prompt and proper treatment of malaria, instead of treating but the symptoms through auto-medication. This is more the case because there is no strict distinction between fever and malaria among the Bali Nyonga where different representations, usually based on symptoms co-exist. The population should be encouraged to eat abundant vegetables and fruits which are readily available in the local environment so as to improve the nutritive quality of foods consumed, and improve on their nutritional status so as to better fight against diseases, including malnutrition, anaemia and malaria.

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