

Full Length Research Paper

Knowledge and practices relating to malaria in Ndu community of Cameroon: Signs and symptoms, causes and prevention

Dickson Shey Nsagha^{1*}, Anna Longdoh Njunda², Henri Lucien Fouamno Kamga², Jules Clement Nguedia Assob³, Charles Shey Wiysonge⁴, Sarah Mboshi Nsagha⁵, and Alfred Kongnyu Njamnshi⁶

¹Department of Public Health and Hygiene, Medicine Programme, Faculty of Health Sciences, University of Buea, Buea, Cameroon.

²Department of Medical Laboratory Sciences, Faculty of Health Sciences, University of Buea, Buea, Cameroon.

³Department of Biomedical Sciences, Faculty of Health Sciences, University of Buea, Buea, Cameroon.

⁴School of Child and adolescent Health, Faculty of Health Sciences, University of Cape Town, South Africa.

⁵Department of Educational Psychology, Faculty of Education, University of Buea, Buea, Cameroon.

⁶Department of Internal Medicine and Specialties (Dermatology and Neurology), Faculty of Medicine and Biomedical Sciences, University of Yaounde I, Yaounde, Cameroon.

Accepted 14 November, 2018

More than 90% of deaths due to malaria occur in Sub-Saharan Africa where it kills a child below five years every 30seconds. In Cameroon, malaria accounts for 40-45% of medical consultations, 57% of hospitalization days and 40% of mortality among children below 5 years. The objective of this study was to understand how people recognize malaria, its cause, prevention and modifiable risky behaviours that are important in planning approaches for its control. Questionnaire was administered to inhabitants of Ndu in a cross-sectional study. The respondent's consent was sought and those who could not read, write or understand English language were communicated to in the local 'Limbum' dialect. Data was analysed using SPSS. Majority (97.6%) [95% confidence interval (CI): 95.7-99.5%] of the 253 respondents knew at least a symptom of malaria. The commonest symptom mentioned was headache (15%). Seventy (27.7%) participants knew the cause of malaria to be mosquito bites. Incorrect causes of malaria cited included bad weather (9.5%), curse from an elder (7.1%), witchcraft (3.5%), bad food (9.0%), unclean water (5.9%) and drinking alcoholics (2.4%). 153(60.5%) [95% CI:54.5-66.5%]respondents practiced a correct malaria preventive measure. Prominent correct preventive measures stated included environmental sanitation (21.3%), aerosol insecticides (10.3%), mosquito coil (7.9%), chemoprophylaxis (5.9%), mosquito net (1.2%) and traditional medicines (13.8%).Incorrect malaria preventive methods included avoiding the early morning hot sunrays (9.5%). Malaria prevention was related to the educational status of the participants ($p=0.04$). Proper health education messages on malaria determinants are required to improve upon the understanding of the disease.

Keywords: Malaria, knowledge, practices, cause, signs and symptoms, prevention, Cameroon.

INTRODUCTION

More than 90% of all deaths due to malaria occur in Sub-Saharan Africa where it kills a child below five years every 30 s. In Cameroon, malaria accounts for 40 to 45%of medical consultations, 57% of hospitalization days

and 40% of mortality among children below 5 years (Ministère de la Santé Publique, 2007). Malaria prevalence in Cameroon varies from 50 to 75% based as the zone (Bowa, 2006). An estimated malaria case

incidence of 1.750 cases per 1000 workers per year was reported among workers on the Chad-Cameroon oil pipeline in 2002 (World Economic Forum, 2002). In 1992, malaria accounted for 35% mortality in the general population in Cameroon (World Economic Forum, 2002). However, malaria was responsible for $42.1 \pm 0.1\%$ mortality in children below five years, $33.6 \pm 0.2\%$ in pregnancy and $31.8 \pm 0.07\%$ in children above five years in Cameroon in 2006 (Bowa, 2006). Currently, malaria death rate per 100000 population for ages 0 to 4 years was 89 and 103 for all ages in Cameroon in 2008 (United Nations Statistics Division, 2011). Proper health education of village mothers has proved to reduce under-five malaria morbidity and mortality significantly in Cameroon (Nkuo-Akenji et al., 2005). In a study among 1197 health service users in northern Cameroon, only 1% identified mosquitoes as a source of transmission (Einterz, 2003). Einterz and Bates (1997) have also shown that most patients in Cameroon do not know when they have fever. Contrary to Cameroonians who have poor knowledge of malaria determinants (Einterz, 2003), French nationals living in Cameroon are well informed of malaria than their Cameroonian counterparts (De Quincenet et al., 1994). Deficient knowledge on malaria treatment guidelines and irrational use of antimalarials (Sayang et al., 2009) has been reported from Cameroon. There is also evidence of major differences in malaria treatment, prophylaxis and diagnosis in Cameroon (Ndumbe, 1989).

In the developing world, the vast majority of malaria cases in both adults and children are treated at home. Only if the case is very severe, or the health services are very convenient that the health services are likely to be used for malaria treatment (Foster, 1995). This implies that the symptoms of the disease are known. However, this is not always the case because Einterz and Bate (1997) noted that a remarkable percentage (87%) of patients aged 15 years or over incorrectly claimed they had fever in Northern Cameroon. Previous studies (Aikins et al., 1994; Greenberg et al., 1989; Ongore et al., 1983; Yeneneh et al., 1993) show that the general public's knowledge on the cause of malaria and other determinants in Africa are poor.

Malaria takes precedence over all other mosquito-related problems in Africa from the point of view of public health authorities (Kilama and Kilamia, 1991). The intensification of vector control such as source reduction through destruction of mosquito breeding sites, and avoidance of man-vector contact by using protective measures, for example, bed nets and repellents (Yeneneh et al., 1993; Goriup, 1989) including environmental hygiene can fight against malaria.

Individual and community participation as well as behavioural studies can go a long way in gaining a practical understanding of local approaches towards malaria control and in developing broader-based control strategies (Ruebush et al., 1995; Wernsdorfer and Kouznetsov, 1980; WHO, 1984). Planning sustainable malaria control interventions must be based on local analysis of the malaria problem (Konradsen et al., 1997). Such analysis should include the community's knowledge and perception (Service, 1993) about the signs and symptoms, cause and prevention of malaria. This study was carried out to find out how community perception on the signs and symptoms, cause and prevention of malaria could enhance local and broader approaches towards its control.

METHODS

Study area

Ndu is a small semi-urban setting with a population of slightly over twenty thousand inhabitants located at latitude $6^{\circ} 24' \text{ ON}$, longitude $10^{\circ} 46' \text{ OE}$, and altitude 1827 m above sea level (Maps, weather and airports for Ndu, Cameroon, 2011) in the North West Region of Cameroon. It is the highest point in Donga-Mantung division and is always very cold. Ndu is the headquarters of Ndu Subdivision in the Wimbum tribe. The Wimbum tribe constitutes 80% of the inhabitants and their dialect is called "Limbum". Other major tribes in Ndu include Nso, Hausa, Fulani, Yamba and Igbo (Nigerians). It is the central commercial point and acts as one of the main exit and entry routes to Nigeria. Ndu is situated about 160 km from the regional capital, Bamenda. Neighbouring villages of Wowo, Mbipgo, Njillah and Kakar where the tea plantation is located were also included in the study. These neighbouring villages have a population of about 3000 each.

Ndu has one District Hospital, a Baptist Health Centre and the "Ndu Tea Estate" Health Centre. There is the Bansa Baptist Hospital in Kumbo, the Catholic Hospital at Shishong in Kumbo and a District Hospital in Nkambe, all about an hour's drive from Ndu. Patent medicine stores are common in this locality and antimalarials are dispensed on daily basis and weekly market days by untrained hawkers. There is no trained pharmacist in Ndu. Traditional medical care is very common in Ndu and its environs and disease causation, prevention and treatment are always linked to superstition. The "nwe chep" or traditional medicine man is common in this locality.

Ndu is mainly a farming area and most inhabitants are farmers. There are a lot of artificial forests. The climate is made up of two distinct seasons—a long rainy season from March to September and a short dry season from October to February. Temperatures can vary from 17°C in the rainy season around August and during harmattan to about 25°C in the dry season around January. Malaria transmission is seasonal and occurs mostly from May to September. Malaria is the main mosquito-borne disease in this locality and as such a public health problem of primary importance. Other diseases common in Ndu are HIV/AIDS, tuberculosis, intestinal helminthes, gastro-enteritis, cough, typhoid fever, herpes zoster, and skin infections. Cases of filariasis are common but no other mosquito-borne diseases such as yellow fever and elephantiasis has been reported from Ndu to the best of our knowledge. Ndu is predominantly a Christian community. The study took place from July to August 2002. Ethical approval was obtained from the North West Provincial (now Regional) Delegation of Public

*Corresponding author. Email: nsaghads@hotmail.com. Tel: +237 77499429

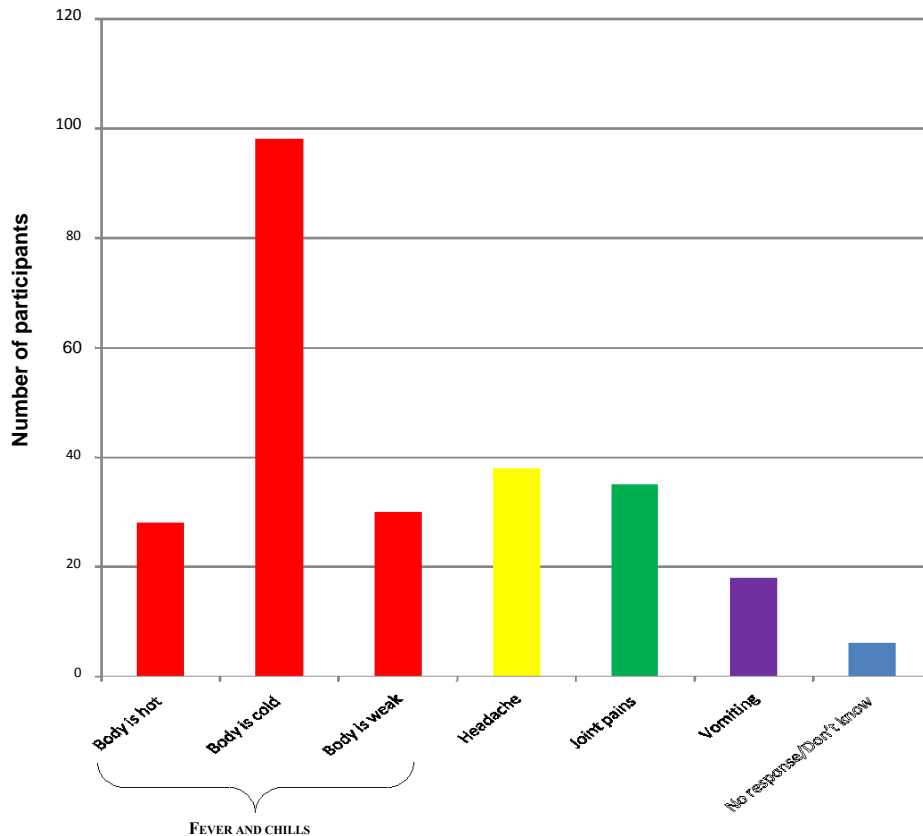


Figure 1. Frequency of signs and symptoms of malaria as stated by the study participants (n= 253).

Health in Bamenda.

Study sample

The demographic characteristics of the study sample have been described in detail (Nsagha et al., 2011). We used a convenient sample of 253 participants. The survey consisted of 112 men and 141 women including teachers, labourers, housewives, students, farmers, technicians, nurses, midwives, tea harvesters and cleaners of different age groups. The respondents' consent was sought and gained by explaining the aims of the study. Subjects who could not read or write or understand pidgin English and English languages were communicated to in "Limbum" – the local language of the Wimbun tribe. A questionnaire was administered to volunteers by trained interviewers according to the time schedule of the participants. Those who could read and/or write answered the questions immediately or at their convenience. The interviewers later collected the filled questionnaires. For those who could not read or write [27(10.7%) participants], the interviewers had to meet them at agreed times at home or specific locations to interpret the questionnaire and the participant's responses were recorded accordingly.

In institutions such as schools, farmer's cooperative societies, tea plantation, weekly and monthly contribution meetings known here as "Mngwah", permission was sought from the leaders after introducing the study and volunteers indicated by raising their hands and questionnaires were administered to them. In each case,

care was taken in order not to deviate from the open structure questionnaire. The confidentiality of the information provided was ascertained to the participants. The questionnaire contained independent variables on age, sex, profession and place of abode and questions on the signs and symptoms, cause and prevention of malaria constituted the dependent variables. The chi-square test and confidence intervals were used to compute proportions.

RESULTS

Of the 253 inhabitants sampled in Ndu and its environs, 99(39.1%) were either tea plantation labourers, cleaners, harvesters or labourers in the town while 40(15.8%) were local farmers. Most (80%) of the interviewees were of the Wimbun tribe, the dominant tribal group in this locality. The mean age of the respondents was 32.5 years. Forty-six percent of the participants live on the hills and 54% in mosquito-prone areas (valleys, forests, slums or near a stream). No relationship was established between place of abode, profession and malaria determinants.

Majority (97.6%) [95% confidence interval (CI): 95.7 to 99.5%] of respondents knew at least a symptom of malaria. Figure 1 shows the frequency of signs and symptoms of malaria as stated by the respondents. One hundred and fifty-six (61.7%) participants knew the

Table 1. Frequency of the causes of malaria as stated by the study participants (n = 253).

Causes of malaria	{Number (%)}
Correct causes	
Mosquito bite	70(27.9)
Incorrect causes	
Bad weather	24(9.5)
Curse from an elder	18(7.1)
Witchcraft	9(3.5)
Bad food	23(9.0)
Unclean water	15(5.9)
Drinking alcoholics (beer, whisky, palm wine, raffia wine, "shah" and other local liquor)	06(2.4)
Poor knowledge of environmental sanitation to prevent malaria	11(4.3)
No response/Do not know	77(30.4)
Total	253(100)

Table 2. Practice of malaria preventive methods as stated by the study participants (n = 253).

Preventive methods of malaria	{Number (%)}
Correct methods	
Environmental sanitation (clearing grasses, refilling or destroying water pools around the house, etc.)	54(10.3)
Aerosol insecticides	26(10.3)
Mosquito coil	20(7.9)
Chemoprophylaxis	15(5.9)
Mosquito net	3(1.2)
Traditional medicine (e.g. use of leaves that repel mosquitoes)	35(13.8)
Incorrect methods	
Avoiding the hot morning sunrays	24(9.5)
No response/ Do not know	76(30.0)
Total	253(100)

symptoms of malaria to be fever and chills, 38 (15.0%) to be headache, 35(13.8%) to be joint pains, 18(7.1%) to be vomiting and 06(2.4%) did not know any symptom of malaria. The local Limbum names for malaria such as "tulu", nyor-yayan", "chirr", mbeb kansi" and "mngan yayan" are respectively equivalent to the orthodox signs and symptoms of headache, fever, vomiting, chills and joint pains.

Table 1 shows that knowledge on the cause of malaria was poor and 70(27.7%) [95% CI: 22.4 to 38.7%] participants stated that malaria is caused by a mosquito bite compared to 183(72.3%) [95%CI: 66.8 to 77.8%] who did not know the cause. 183(72.3%) [95% CI: 66.8 to 77.8%] participants did not know the correct cause of malaria. There was a statistically significant difference in knowledge on the cause of malaria with those with secondary education [52(20.6%)] stating the correct reason compared to those with primary education [18(7.1%)] ($X^2 = 4.15, p = 0.04$). Table 2 shows the

practice of malaria prevention in Ndu and its environs with 153(60.5%) [95%CI: 54.5 to 66.5%] participants practicing a form of preventive method against the disease. One hundred participants (39.5%) [95%CI: 33.5 to 45.5%] did not have the correct knowledge on malaria prevention. Table 3 shows that 102(40.3%) [95% CI: 34.2 to 46.3%] of the 153 respondents who knew a correct malaria preventive method were women compared to 51(20.2%) [95% CI: 15.3 to 25.1%] men. Participants with primary school education scored more than [86(34.0%)] those with secondary school [67(26.5)] on malaria preventive methods ($p = 0.04$).

DISCUSSION

Our study on knowledge and practices is of public health importance because it investigated the malaria health behaviour on prevention and determinants of the signs,

Table 3. Practice of malaria prevention among male and female study participants (n = 253).

Methods of prevention of malaria	Gender		
	{Male number (%)}	{Female number (%)}	{Total number (%)}
Correct preventive methods			
Mosquito coil	6(2.4)	14(5.5)	20(7.9)
Mosquito net	1(0.4)	2(0.8)	3(1.2)
Traditional medicine	10(3.9)	25(9.9)	35(13.8)
Environmental sanitation	15(5.9)	39(15.4)	54(21.3)
Chemoprophylaxis	8(3.2)	7(2.8)	15(5.9)
Aerosol	11(4.3)	15(5.9)	26(10.3)
subtotal	51(20.2)	102(40.3)	153(60.5)
Incorrect preventive methods			
Avoiding hot morning sun rays	18(7.1)	6(2.4)	24(9.4)
No response/Do not know	43(17.0)	33(13.0)	76(30.0)
subtotal	60(23.7)	39(15.4)	100(39.5)
Total	112(44.3)	141(55.7)	253(100)

symptoms and causes of the disease. This study compliments a similar work on knowledge and practices relating to treatment in this locality (Nsagha et al., 2011) and agrees with an increasing recognition among health professionals that improving the health of poor people depends upon adequate understanding of the socio-cultural aspects of the context in which public health programmes are implemented (Luaniala, 2009). This study will therefore improve upon the control of malaria in Ndu and its environs even though we used volunteer sampling which is a non-probability sampling technique.

Knowledge on the signs and symptoms of malaria among the study participants

In this study, in the southern part of Cameroon, most respondents knew at least one sign or symptom of malaria compared to a study by Einterz and Bates (1997), in northern Cameroon where majority of participants incorrectly claimed they had fever. The general malaria high prevalence in Cameroon (50 to 70%) may be a contributing factor for this high knowledge. This discrepancy may also be linked to illiteracy as the northern part of the country is less scholarised (Tsounkeu, 2009). In a holoendemic area in Kenya, Spencer and co-workers (1987) found that >90% of the respondents knew specific symptoms of malaria. Another difference is that our study used 253 participants while Spencer et al. (1987) used a small sample size of 36 respondents. The use of "Yes" or "No" questions by Spencer et al. (1987), compared to an open-ended questionnaire in our study may also be responsible for the discrepancies observed. Ndu is located in an area of seasonal malaria (mesoendemic) where malaria

manifestations are not perceived as being part of normal life (Yeneneh et al., 1993) hence people always pay a lot of attention to its signs and symptoms. In Mora, Northern Cameroon, it was found that 87% of patients and carer's ability to recognize fever was poor (Einterz and Bates, 1997). This is quite different from our study, because of illiteracy or observer bias as the fever status of the patients in Northern Cameroon, was assessed by immature care givers (Einterz and Bates, 1997). Symptoms like headache ("tu-lu"), fever ("nyor yagan") were well known by the population of Ndu. Even though most respondents knew at least a symptom or sign of malaria, these were often considered as disease entities on their own which very often may lead to treatment of one symptom for long periods at home allowing the malaria to degenerate into complications. Malaria is well known among the natives of Cameroon, although the common symptoms and signs may not necessarily be compounded together to one disease entity (Lantum, 1971) as malaria.

Knowledge on the cause of malaria among the study participants

Our findings on the knowledge of the cause of malaria was confusing and poor with only few knowing the correct cause of malaria to be resulting from mosquito bites. This is contrary to a study among 1197 health service users in northern Cameroon, where only 1% identified mosquitoes as a source of malaria transmission (Einterz, 2003). This may have to do with the level of literacy in these two localities because illiteracy is more in northern Cameroon (Tsounkeu, 2009) but on average 75% of the local population in Ndu are educated. Knowledge on the cause

of malaria in this study was higher compared to a study in Ethiopia (Kilama and Kihamia, 1991) where the understanding of the cause of malaria was very low. Our findings on the cause of malaria were however, lower than a Kenyan study (Ongore et al., 1983) where 36.5% knew the cause of malaria. Malaria is a constant public health problem in Ndu during the wet seasons. Such communities may regard the disease as part of their normal life, and thus not consider it to be a health problem (Ongore et al., 1983). Less than 50% of participants gave reasons not related to the cause of malaria. If we assume that the educational status is linked to the profession of the participants, we may conclude that the poor knowledge on the cause of malaria was due to the level of education as most respondents were labourers. Poor nutrition and alcohol consumption can compromise a person's immune status and this may explain why few participants ascribed malaria to bad food and alcohol consumption. Cultural beliefs could have compelled some respondents to state that malaria is caused by a curse from the elder or witchcraft. Few participants stated that malaria was due to cold weather which corresponds to the cold climate of Ndu especially during the wet season which is the peak of malaria infection.

Practice of prevention of malaria among the study participants

Most respondents reported taking a preventive measure against malaria. This is contrary to a Zimbabwean study (Van Geldermalsen and Munochivey, 1995) where in a sample of 888, less than half of the population knew of an effective malaria preventive method but agrees with the Kenya study (Ongore et al., 1983) which reported that 72.2% of the study population thought malaria was preventable. This could be due to greater health activities and/or more educated population (Ongore et al., 1983; Spencer et al., 1987).

Some respondents mentioned environmental sanitation as malaria preventive measures which may be linked to the work of the sanitary officers who were reinforcing cleanliness in and around habitations in the 1970s. The use of aerosol insecticides and mosquito coils was commonly mentioned by the tea estate workers, maybe, because some had used them in the more humid malaria areas in the forest zones of south western Cameroon. The high level of prevention against malaria correlates with consistent results of studies in two main cities of Cameroon-Yaounde and Douala (Desfontaine et al., 1989a, 1989b).

Some participants did not practice any form of malaria preventive measure most probably because they have taken malaria to be part of their normal life and not more of a problem because of incorrect ideas about its

transmission (Yeneneh et al., 1993). Avoiding the hot morning sun rays as a means of malaria prevention as stated by some respondents indicates that the cause of malaria is not well understood. For such an incorrect response, the cause of malaria may be linked to the sun.

Variation of malaria knowledge and practices of prevention with demographic variables of study participants

The significant finding of better knowledge on the cause of malaria among those with secondary than primary education could be due to knowledge gained in school or from reading. Of the 60.5% respondents who practiced a correct malaria preventive method, there were more women than men. Malaria affects mainly young children and pregnant women (Greenberg et al., 1989; Manson-Bahr and Bell, 1987; WHO, 1990). In Africa, as elsewhere, women have the responsibility for providing nursing and health care for children (Raikes, 1989). Women are therefore more likely to seek and use antimalarial treatment and are the principal motivators and participants in household-based preventive actions (Yeneneh et al., 1993) hence their better knowledge.

In this study, more people with primary than secondary education had the correct knowledge of malaria prevention. Apart from transmitting malaria, mosquito bites are painful despite the educational status of the victim. In Africa, many people spend years attending schools in order to get better jobs which intend enable them to have better accommodation. Good and clean houses can prevent people against mosquito bites. People with little or no education cannot afford good housing and tend to live in mosquito-prone houses or slums. This entails knowing how to prevent themselves from mosquito bites which may explain why many of those who practised a form of prevention against malaria were people with primary or no education at all.

Conclusion

Proper health education messages on malaria determinants such as symptoms, cause and prevention are required to improve upon the understanding of malaria determinants of the study population.

RECOMMENDATIONS

Further efforts are needed by governmental and non-governmental health institutions in this locality to provide information on the cause of malaria to the general public through health talks and health education. Aerosol spraying would be a good preventive method. Socially

more health information can be given to the local population using flyers, posters, health talks, the radio and the television to reinforce the work of health personnel. The promotion of awareness through the radio, community groups, churches and cooperative groups would be good.

ACKNOWLEDGEMENTS

We thank Mr. William Farnyu Tantoh of the University of Buea for editing the manuscript. The authors are grateful to Mr. Tantoh Alfred and Mr. George Mbunwe for administering the questionnaire.

REFERENCES

- Aikins MK, Pickering H, Greenwood BM (1994). Attitudes to malaria, traditional practices and bed nets (mosquito nets) as vector control measures: a comparative study in five West African Countries. *J. Trop. Med. Hyg.*, 97: 81-86.
- Bowa NC (2006). Paludisme : Les chiffres qui font peur. La lettre d'information éditée par le Programme National de Lutte contre le Paludisme de Cameroun révèle que cette maladie est loin d'être éradiquée au Cameroun, p. 1.
- De Quincenet G, Louis FJ, Gélas H (1994). Paludisme: conduites, attitudes, pratiques et croyances des expatriés français à Yaoundé, Cameroun, en 1993. *Bulletin Liais. Document. OCEAC*, 27: 61-64.
- Desfontaine M, Gelas H, Cabon J, Goghomu A, Kouka-Bemba D, Carnaval P (1989a). Evaluation des pratiques et des couts de lutte antivectorielle a l'échelon familial en Afrique Centrale. Ville de Yaounde (Cameroun). *Bulletin. Soc. Path. Exot.*, 82: 558-565.
- Desfontaine M, Gelas H, Cabon J, Goghomu A, Kouka-Bemba D, Carnaval P (1989b). Evaluation des pratiques et des couts de lutte antivectorielle a l'échelon familial en Afrique Centrale II. Ville de Douala (Cameroun). *Annales. Soc. Belge. Med. Trop.*, 70: 137-144.
- Einterz EM (2003). Perceptions of malaria transmission, presentation and management in northern Cameroon. *Trans. R. Soc. Trop. Med. Hyg.*, 97: 51-52.
- Einterz EM, Bates ME (1997). Fever in Africa: do patients know when they are hot? *Lancet*, 350: 781.
- Foster S (1995). Treatment of malaria outside the formal health services. *J Trop. Med. Hyg.*, 98: 29-34.
- Goriup S (1989). Perspectives and constraints on chemotherapy and practical consideration in the use of vaccine: analysis of available measures for malaria control in Africa South of the Sahara. *Trans. R. Soc. Trop. Med. Hyg.*, 83: 81-83.
- Greenberg AE, Ntumbanzondo CM, Malaria L, Howell J, Davachi F (1989). Hospital-based Surveillance of malaria-related Pediatric morbidity and mortality in Kinshasa, Zaire. *WHO Bull.*, 67: 89-196.
- Kilama WL, Kihamia CM (1991). Malaria. In: Health and disease in Tanzania. Nwaluko GMP, Kilama WL, Mandara MP, Mrru M, Macpherson CNL, (Eds.) London Harper Collins, pp. 117-132.
- Konradsen F, Van de hoek W, Amerasingh PH, Amerasingh FP, Fonseka KT (1997). Household responses to malaria and their costs: a study from rural Sri Lanka. *Trans R Soc. Trop. Med. Hyg.*, 91: 127-130.
- Lantum DN (1971). The malaria problem in Cameroon in 1969. *W. Afr. Med. J.*, pp. 285-292.
- Launiala A (2009). How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. *Anthrop. Mat.*, 11: 1-14.
- Manson-Bahr PEC, Bell DR (1987). Malaria and babesiosis. In *Manson's tropical diseases*, 19th ed. London, Bailliere Tindall. pp 3-51.
- Maps, Weather and Airports for Ndu, Cameroon (2011). Available at : Maps, weather, videos, and information about Ndu, Cameroon. ... Latitude, 6.4000, Longitude, 10.7667, Altitude (feet), 5997 ... <http://www.fallingrain.com/world/CM/00/Ndu.html> -Accessed March 03.
- Ministère de la Santé Publique (2007). Plan stratégie national de la lutte contre le paludisme au Cameroun. 2007-2010. pp 1-134.
- Ndumbe PM (1989). Curative and preventive treatment of uncomplicated malaria in public health institutions in Cameroon. *Eur. J. Epidemiol.*, 5: 183-188.
- Nkwo-Akenji TK, Ntonifor NN, Ching JK, Kimbi HK, Ndamukong KN, Anong DN, Boyo MG, Titanji VP (2005). Evaluating a malaria intervention strategy using knowledge, practices and coverage surveys in rural Bolifamba, southwest Cameroon. *Trans. R. Soc. Trop. Med. Hyg.*, 99: 325-332.
- Nsagha DS, Njunda AL, Kamga HLF, Nsagha SM, Shey CW, Assob JCN, Tabah EN, Njamnshi AK (2011). Knowledge and Practices Relating to Malaria in a Semi-urban Area of Cameroon: Choices and Sources of Antimalarials, Self-treatment and Resistance. *Pan Afr. Med. J.*, 9(8): 1-20
- Ongore D, Kamunvi F, Knight R, Minawa A (1983). A KAP of rural community on malaria mosquito. *E. Afr. Med. J.*, 66: 79-90.
- Ruebush TK, Kern MK, Campbell CC, Oloo AJ (1995). Self-treatment of malaria in a rural area of Western Kenya. *Bull. WHO*, 73: 229-236.
- Raikes A (1989). Women's Health in East Africa. *Soc. Sci. Med.*, 28: 447-459.
- Sayang C, Gausseres M, Vernazza-Licht N, Malvy D, Bley D, Millet P (2009). Treatment of malaria from monotherapy to artemisinin-based combination therapy by health professionals in rural health facilities in southern Cameroon. *Malar. J.*, 8: 1-6.
- Service MW (1993). Community participation in vector-borne disease control. *Annals. Trop. Med. Para.*, 87: 223-234.
- Spencer HC, Kaseje DCO, Collins WE, Shehata MG, Turner A, Stanfill PS, Huang AJ, Rebert JM, Villinski M, Koech DK (1987). Community-based malaria control in Saradidi, Kenya: description of the programme and impact on parasitemia rates and anti-malaria antibodies. *Ann. Trop. Med. Para.*, 81: 13-23.
- Tsounkeu M (2009). The Millennium Development Goals in Cameroon: How far from the target in 2005. Retrieved on May 5. Available at: http://www.unaids.org/commonwealthfoundation.com/uploads/.../mdg_cameroun.pdf.
- United Nations Statistics Division (2011). Malaria mortality in Cameroon. Available at <http://www.indexmundi.com/cameroon/malaria-mortality.html>. Retrieved May 11.
- Van Geldermalsen AA, Munochivey R (1995). Knowledge, attitudes and practice (KAP) relating to malaria in Mashonaland Central, Zimbabwe. *Cen. Afr. J. Med.*, 41: 10-14.
- WHO (1990). Practical Chemotherapy of malaria. Report of a WHO Scientific Group. Technical Report Series WHO, Geneva, p. 805.
- WHO (1984). Technical Report Series Advances in Malaria Chemotherapy: Report of a WHO Scientific Group, WHO, Geneva, p. 711.
- Wernsdorfer WH, Kouznetsov RL (1980). Drug-resistant malaria-occurrence, control and surveillance. *Bull. WHO*, 58: 341-352.
- World Economic Forum (2002). Global health initiative. Private sector intervention case example-Chad/Cameroon oil pipeline. Using malaria control strategically to improve worker's health and prevent project delay, pp 1-8.
- Yeneneh H, Gyorkos TW, Joseph L, Pickering J, Tedla S (1993). Anti-malaria drug utilization by women in Ethiopia: a knowledge-attitudes-practice study. *Bull. WHO*, 71: 763.