

A community survey on the knowledge of neglected tropical diseases in Cameroon

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Received: 17.06.12; Accepted: 16.07.12

ABSTRACT

Background: The neglected tropical diseases are a group of 13 infections that affect more than one billion people worldwide, especially those who live in extreme poverty. **Aim:** This study was conducted to determine community knowledge of these neglected tropical diseases (NTD) in Cameroon. **Materials and Methods:** A random sampling method was used to administer questionnaires to 3345 adults. **Results:** 2566 (76.7%) of people approached responded to the questionnaire. This comprised 1313 (51.2%) females and 1253 (48.8%) males. There was a significant level of association between the opinion of the respondents and their region of residence ($P < 0.05$). Globally the percentage of persons with good knowledge of one of the neglected tropical diseases was low (ranging from 23.1% to 80.9%). Diseases for which the population had the highest percentages of knowledge were leprosy (80.9%), soil-transmitted helminth infections (75.3%), lymphatic filariasis (70.3%), onchocerciasis (66.2%) and human African trypanosomiasis (57.8%). Diseases for which people had the least percentages of knowledge were leishmaniasis (18.0%), dracunculiasis (23.1%), buruli ulcer (23.8%), trachoma (38.2%), endemic treponemiasis (41.5%) and schistosomiasis (49.1%). Populations living in urban areas had a greater knowledge of the neglected tropical diseases than those living in rural and peri-urban areas ($P < 0.05$) and males exhibited a greater knowledge than females ($P < 0.05$). **Conclusion:** There was low community knowledge pattern of neglected tropical diseases, mostly among the female populations and people living in rural areas. We advocate mass media health education to be adopted as one of the strategies for the national control policy of NTDs.

Key words: Neglected Tropical Diseases, Cameroon, community, knowledge

INTRODUCTION

Neglected tropical diseases (NTDs) are a group of 13 chronic infections commonest in the world's poorest regions. They are of varied frequency and severity. Some are disabling and sometimes disfiguring. These infections, and more especially the people who are affected, are neglected by the national and international political authorities, by the academic, and by pharmaceutical research

(no research and development of new diagnostic tests or drugs)^[1]

although tools for prevention exist. Almost all low-income countries have been found to be affected by many neglected tropical diseases simultaneously, and many individuals who live in these countries are concurrently infected by more than one pathogen.^[2]

In Cameroon, 11 of the neglected tropical diseases exist.^[3] They are onchocerciasis, schistosomiasis, soil-transmitted helminth infections, human African trypanosomiasis, dracunculiasis, lymphatic filariosis, leishmaniasis, leprosy, endemic treponematoses and trachoma. In 2006, the country was listed amongst the world poorest.^[4] It is believed that this situation of poverty, associated with the country's geographical location (it is situated in the Gulf of Guinea) and ecological diversity has contributed for the establishment and the increase in the prevalence of many of the above listed diseases.

Despite the high burden of NTDs, the ability to treat them is largely unknown in the general medical community, and there is little response to this problem.^[5] Since infection with these diseases can trigger life-long disabilities, disfigurement, and social stigma,^[6] it is therefore important that all factors contributing to the increase of the incidence of these infections be addressed. It is probable that these factors stem from a low community knowledge pattern.

The importance of assessing community knowledge about diseases as a prerequisite before establishing an effective control programme is justified. To date, there is no data on how much the community in Cameroon know about the NTDs; such data, if available would contribute in better implementing control policies, hence this study was undertaken.

MATERIALS AND METHODS

Study area

Cameroon is situated in the Gulf of Guinea between the 2nd and 13th latitudes northward and the 9th and 16th degree longitudes.^[7] With a surface area of 475650 Km² and a density of 40.8 inhabitants/ Km², Cameroon has about 19,406,100 inhabitants, among which 51% are women and 49% are men.^[7] The distribution of this population between urban and rural areas is respectively 48.2% and 51.8%.^[8] The country is sub-divided for administrative purpose into ten regions: Far North, North, Adamaoua in the northern half of the country, Centre, South, Littoral, East, West, North-West and South-West in the southern half. Concerning the health delivery system, the geographical boundaries of the regional delegations of public health are the same as the regional administrative boundaries. Each regional delegation of public health is divided into health districts which are subdivided into health areas. The health care system includes the public sector, which originates from the colonial medicine, the para-public sector managed by public bodies not directly attached to the ministry of public health, and the confessional and non-confessional private sectors.

Sampling

Information was obtained by the use of questionnaires. A stratified random sampling method was used to select health districts, health areas, communities and households. A stratified sampling was first made to follow the organization of the administrative and health system in Cameroon. The strata included the country regions, health districts, type of health areas (urban, semi urban and rural), communities and households. Health districts were selected at random, by ballot. The same exercise was carried out for the random selection of health areas and communities. Households were selected by investigators while in the communities using the WHO method.^[9] At the centre of each community, a coin was tossed and the decision taken was based on the observed side of the coin. The study was conducted from June 2010 to December 2011.

Primary visits

For each community selected, local authorities, including the community leaders were visited and presented with the project, since their involvement was a key factor for its success. They were however told that it was not an obligation for households to participate in the research and neither was it a pre-requisite to accessing routine medical or other social services publicly available. Written informed consent forms were signed.

Administration of questionnaires

Only households whose members voluntarily accepted to sign and return the consent forms after having understood the content were administered questionnaires. Questionnaires were compiled by two persons in the household: the head of the family and the spouse or the first spouse in case of polygamy, the aim being to test their knowledge of neglected tropical diseases.

Data Management

Questionnaires were checked for the use of correct codes and completeness by the lead author. Range and consistent checks were also carried out.

Statistical analysis

Data were analysed using the SPSS statistical software package at 95% confidence limit. Chi-square and student-t-test were used to test for the significance of the results.

RESULTS

A total of 3345 adults were invited to take part in the survey. Of these, 2566 (76.7%) finally responded. This comprised 1313 (51.2%) females and 1253 (48.8%) males. Table 1 shows the knowledge of the neglected tropical diseases by

region. The percentage of persons with some good knowledge about one or the other diseases was low (ranging from 23.1% to 80.9%). There was a statistically significant difference in the percentages of respondents with some knowledge of each of the neglected tropical diseases from one region to another ($P < 0.001$). Diseases for which the population had the highest percentages of knowledge were leprosy (80.9%), Soil-transmitted helminth infections (75.3%), lymphatic filariasis (70.3%), onchocerciasis (66.2%) and human African trypanosomiasis (57.8%). On the other hand, diseases for which the population had the lowest percentages of knowledge were

leishmaniasis (18.0%), dracunculiasis (23.1%), buruli ulcer (23.8%), trachoma (38.2%), endemic treponematosi (41.5%) and schistosomiasis (49.9%). 80% of respondents who had knowledge of endemic treponematosi only knew about venereal syphilis but were ignorant of the nonvenereal treponematoses. The greatest percentages of people who had a good knowledge of leishmaniasis were found in the North (50%) and Far North (44%) regions respectively. Dracunculiasis and buruli ulcer were more widely known in the Centre (45.3%) and in the South West (50.2%) regions respectively.

Table 1: Community knowledge of the neglected tropical diseases by Region

Neglected tropical diseases	Number (%)* of Respondents with good knowledge of the disease and living in (Region)										Total (%) ^{&} (n=2566)
	Adama-oua (n=126)	Centre (n=234)	East (n=196)	Far Nord (n=294)	Littoral (n=255)	North (n=308)	North West (n=241)	South (n=319)	South west (n=317)	West (n=276)	
Buruli ulcer	42 (33.1)	106 (44.9)	114 (57.6)	187 (63.4)	104 (40.5)	155 (49.8)	36 (14.8)	95 (29.6)	130 (40.8)	19 (6.8)	615 (23.8)
Dracunculiasis	41 (32.3)	68 (28.8)	46 (23.2)	46 (15.6)	77 (30.0)	2 (0.6)	15 (6.1)	135 (42.1)	160 (50.2)	25 (9.0)	597 (23.1)
Endemic treponematosi	86 (67.7)	76 (32.2)	105 (53.0)	275 (93.2)	90 (35.0)	277 (89.1)	26 (10.7)	163 (50.8)	81 (25.4)	112 (40.3)	1074 (41.5)
Human African trypanosomiasis	96 (75.6)	205 (86.9)	175 (88.4)	241 (81.7)	129 (51.2)	245 (78.8)	174 (71.3)	278 (86.6)	166 (52.0)	237 (85.3)	1494 (57.8)
Leishmaniasis	62 (49.2)	216 (91.5)	159 (80.3)	198 (67.1)	131 (51.0)	72 (23.2)	63 (25.8)	262 (81.6)	194 (60.8)	137 (49.3)	466 (18.0)
Leprosy	21 (16.5)	29 (12.3)	46 (23.2)	132 (44.7)	3 (1.2)	158 (50.8)	21 (8.6)	30 (9.3)	12 (3.8)	14 (5.0)	2091 (80.9)
Lymphatic filariasis	24 (18.9)	107 (45.3)	65 (32.8)	88 (29.8)	45 (17.5)	18 (5.8)	17 (7.0)	121 (37.7)	92 (28.8)	20 (7.2)	1818 (70.3)
Onchocercosis	113 (89.0)	224 (94.9)	182 (91.9)	255 (86.4)	179 (69.6)	287 (92.3)	148 (60.7)	282 (87.9)	244 (76.5)	177 (63.7)	1713 (66.2)
Schistosomiasis	91 (71.7)	183 (77.5)	174 (87.9)	238 (80.7)	158 (61.75)	102 (65.0)	153 (62.7)	207 (64.5)	222 (69.6)	190 (68.3)	1291 (49.9)
Soil-transmitted helminth infections	43 (33.9)	176 (74.6)	180 (90.9)	77 (26.1)	98 (38.1)	73 (23.5)	33 (13.5)	167 (52.0)	173 (52.0)	54 (19.4)	1946 (75.3)
Trachoma	84 (66.1)	163 (69.1)	143 (72.2)	208 (70.5)	177 (68.9)	63 (20.3)	187 (76.6)	280 (87.2)	155 (48.6)	253 (91.0)	988 (38.2)

*percentage based on number of respondents in the Region

[&]percentage based total number of respondents

Table 2 shows the knowledge of the neglected tropical diseases by setting (rural, urban or peri-urban). People living in urban settings were significantly more knowledgeable of the neglected tropical diseases than those living in rural and peri-urban areas ($P < 0.05$).

Table 3 shows the knowledge of the neglected tropical diseases by gender. There was no significant difference in percentages of males and females with good knowledge on leprosy, lymphatic filariasis and Soil-transmitted helminth infections ($P > 0.05$). However, with the other neglected tropical diseases, males were

significantly more knowledgeable than females ($P < 0.005$).

Table 2: Community knowledge of the neglected tropical diseases by setting

Neglected tropical diseases	Number (%) [*] of Respondents with good knowledge of the disease and living in (setting)			Total
	Rural	Urban	Peri-urban	
Buruli ulcer	357 (58.0)	84 (13.7)	174 (28.3)	615
Dracunculiasis	317 (53.1)	64 (10.7)	216 (36.2)	597
Endemic treponematosi	579 (53.9)	104 (9.7)	391 (36.4)	1074
Human African trypanosomiasis	879 (58.8)	131 (8.8)	484 (32.4)	1494
Leishmaniosis	325 (69.7)	33 (7.1)	108 (23.2)	466
Leprosy	1307 (62.5)	151 (7.2)	633 (30.3)	2091
Lymphatic filariosis	1112 (61.2)	130 (7.2)	576 (31.7)	1818
Onchocercosis	1017 (59.4)	122 (7.1)	574 (33.5)	1713
Schistosomiasis	856 (66.3)	68 (5.3)	367 (28.4)	1291
Soil-transmitted helminth infections	1238 (63.6)	146 (7.5)	562 (28.9)	1946
Trachoma	597 (60.4)	50 (5.1)	341 (34.5)	988

*percentage based on number of respondents with good knowledge of the disease

Table 3: Community knowledge of the neglected tropical diseases by gender

Neglected tropical diseases	Number (%) ^{&} of Respondents with correct knowledge of the disease		Total
	Females (n=1313)	Males (n=1253)	
Buruli ulcer	185 (30.1)	430 (69.9)	615
Dracunculiasis	271 (45.4)	326 (54.6)	597
endemic treponematosi	444 (41.4)	630 (58.6)	1074
Filariose lymphatiques*	893 (49.1)	925 (50.9)	1818
Human African trypanosomiasis	584 (39.1)	910 (60.9)	1494
Leishmaniosis	143 (30.7)	323 (69.3)	466
Leprosy*	993 (47.5)	1098 (52.5)	2091
Onchocercosis	584 (34.1)	1129 (65.9)	1713
Schistosomiasis	562 (43.6)	729 (56.4)	1291
Soil-transmitted helminth infections*	916 (47.1)	1030 (52.9)	1946
Trachoma	408 (41.3)	580 (58.7)	988

&percentage based on number of respondents with good knowledge of the disease

**P* > 0.05

DISCUSSION

In Cameroon, like in many sub-Sahara African countries, the control of NTDs has been overshadowed by other health challenges. The highest priority was given to the HIV/AIDS, tuberculosis and malaria, with less attention to other infections related to poverty.^[10] However the WHO had identified thirteen NTDs as being of particular importance in terms of their frequency amongst poor communities, and their clinical, social or economic impact, eleven of which are known to exist in Cameroon.^[3] This study assessed the community knowledge pattern on NTDs with the aim of providing data necessary for better implementation of control policies.

Results revealed that some of the NTDs were better known in some surveyed communities than others, maybe because of the high prevalence in these areas. Globally, leprosy, soil-transmitted helminth infections, lymphatic filariasis, onchocerciasis and human African trypanosomiasis were better known by communities than the rest of the NTDs.

Leprosy is caused by *Mycobacterium leprae*, a slow-growing pathogen that produces chronic granulomatous inflammatory changes in infected skin and peripheral nerves causing long-term disfigurement and disability.^[11,12] In Cameroon, leprosy is no longer regarded as serious health problem as the number of patients dropped from 15,000 in 1980 to less than 1000 in 2008.^[13] Though the prevalence of the disease is currently around 0.25 lepers for 10,000 inhabitants,^[13] many people (80.9%) were aware of disease and could easily recognise some of its clinical symptoms, probably because of the irreversible disabilities that are exhibited by its former victims, most of which are now part of the community. It should however, be noted that there still exist areas in Cameroon where leprosy remains a permanent threat that calls for special attention.^[13]

Soil-transmitted helminths (STHs) are infections which are spread through ingestion of, or contact with soil containing worm eggs or larvae. More than a billion people are infected by one or more of these parasites.^[14] Children are most affected, as they tend to harbour the greatest number of worms.^[15] The most important STHs are the common *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm) and *Necator americanus* and *Ancylostoma duodenale* (hookworms). In Cameroon this infection is perceived as an significant public health problem and tends to affect mostly schoolchildren who often harbour the heaviest infections and suffer

much of the associated morbidity, especially when co-infected with malaria parasites.^[16] In this study, many of the interviewees (75.3%) knew about the STHs and could recognize some of their clinical manifestations. This is probably because of the high prevalence of the infection among school children in the study communities, and the recent sensitization campaign effort made by the Cameroon health authorities through the creation in March 2004 of a national control programme for helminth and schistosomiasis.^[17]

Lymphatic filariasis is a disease associated with endemic elephantiasis, lymphoedema and hydrocele. The causative worms include *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*. Their microfilariae are transmitted by mosquitoes. The adult worms live in the lymphatic system where they produce millions of microfilariae viviparously. Infection is acquired mostly in childhood and remains asymptomatic for several years. Enlargement of the limbs, genitals and/or breasts has high socio-economical and psychological impact on the sufferers. In Cameroon the lymphatic bancroftian filariasis is found in certain rural areas of the Far North region, but also around city of Douala where it is transmitted by 4 genera of mosquitoes:^[3] *Culex* sp, *Aedes* sp, *Mansonia* sp, and *Anopheles* sp. However the real prevalence of the disease is still unknown.^[3] In the present study, many of the interviewees (75.3%) knew the disease and could easily recognise some of its clinical manifestations.

Onchocerciasis or river blindness is caused by infection with *Onchocerca volvulus*. The adult worms live in subcutaneous nodules, where the progeny (microfilariae) emerge and migrate throughout the body, mainly within the skin. This allows uptake by biting blackflies of the *Simulium*. Two types of onchocerciasis are often described in Cameroon: the classical and the savanna types. The classical onchocerciasis is often found in the forest, principally in the East, Centre, South, North-West, South-West and West regions.^[3] According to Centre Pasteur of Cameroon,^[18] the country's focus where the disease has the highest prevalence (48%) is situated around the *Rumpi* Hills in the South-West region. The savanna onchocerciasis is present in the North of the country and its prevalence is highest around the hydroelectric dams such as the one of Mokolo-Douvar.^[19-20] In the present study, a good number of the interviewees (66.2%) knew onchocerciasis and could easily recognise some of its clinical manifestations. This is likely because of both its high prevalence in the study communities^[21] and the stigmatising nature of the intense pruritis, chronic dermatitis, skin atrophy and depigmentation to which some community

members, who have been victims of the infection, are subject to, at the severe stage of the disease.

Human African trypanosomiasis (HAT), commonly called sleeping sickness, is caused by two pathogens, *Trypanosoma brucei gambiense* and *T. brucei rhodesiense*, which are transmitted by tsetse flies (*Glossina* sp.). It is endemic in parts of 36 African countries, putting a total of about 60 million people at risk.^[22] In Cameroon, the disease exists in a few foci (*Bipindi, Campo*) despite of appropriate control strategies put in place. This is probably due to the triangular transmission scheme of *T.b. gambiense* involving the vector (tsetse flies), the terminal host (human), and the reservoir hosts (livestock and wild animals) and consequently their implication in the resurgence of the disease,^[23] especially in foci which were highly active in the last century have later become less active in recent years (Fontem and Doume in Cameroon). In the present study, a good proportion of the interviewees (57.8%) knew about sleeping sickness, probably because Cameroon is an historic area of sleeping sickness.^[24] Many other respondents (42.2%) did not know about the infection, probably because of its low incidence in the study communities; only 7 new cases of the disease were detected throughout the country in 2007.^[25] The community ignorance of the disease could also be related to its restricted geographical distribution and the fact that victims who have recovered from the disease do not usually present with stigmatising after-effects.

In this study, community had the lowest percentages of knowledge for leishmaniasis, dracunculiasis, buruli ulcer, trachoma, endemic treponematosi and schistosomiasis.

Leishmaniasis is an obligate intracellular protozoan parasites. About 20 species of this genus cause a spectrum of disease ranging from self-healing cutaneous ulcers to fatal visceral disease. Infection occurs via the bite of an infected female sandfly, infected blood or organs, or transplacentally.^[26] In Cameroon, the two forms of the disease occur mainly in the Far North region of the country, in the Mayo Tsanaga^[27] and Logone-Chari^[28-29] divisions respectively, and these foci seem to be the only known ones in the country. If the cutaneous form of the disease has been subjected to a certain number of studies, the visceral form on its part has attracted very little attention, even though the presence of the disease have been mentioned more than two decades ago.^[29-30] In the present study, only 18.0% of the interviewees knew about the disease. This may be due to the fact that the distribution of leishmaniasis is very limited in the country. It is absent in the southern half of the country, even though a case of visceral leishmaniasis was once mentioned in the localities of Fontem and cases of pediatric leishmaniasis in

the city of Yaoundé.^[31] Even in areas where the infection is found, it occurs very sporadically. For this reason, some authors have suggested a possible relationship between sporadic occurrence of leishmaniasis in the Far North of Cameroon and the existence of foci of infection in two neighbouring countries: Niger^[32] and Chad.^[33]

Dracunculiasis is an infection caused by guinea worm, *Dracunculus medinensis*. The larval stages of this organism are ingested by microcrustaceans (copepods), where they grow into the infective stage. When water-containing microcrustaceans are swallowed by human, *D. medinensis* is released to invade, mature, mate and reproduce. In Cameroon, this disease exists only in one focus in the Far North region around the Mandara mountains where it still affected about 26 % of the men and 27 % of the women in 1997.^[3] In this study only 23.1% of interviewees knew about the disease. This is probably because the distribution of the infection is highly limited; cases of dracunculiasis have not been reported in any other part of the country apart from the above mentioned areas.^[3] According to Sam-Abbenyi *et al.*,^[34] Cameroon is on the threshold of eliminating dracunculiasis from its major foci; the major obstacle is the ever increasing threat of re-infestation from neighbouring countries.^[34]

Buruli ulcer (BU) is caused by *Mycobacterium ulcerans*. This organism produces a toxin known as mycolactone^[35] which diffuses into the adjacent subcutaneous fat, most common on the limbs, causing progressive necrosis and inhibiting inflammation, which eventually results to an ulcer surrounded with an area of non-viable skin.^[36] In Cameroon, BU was first described in 1969 in 47 patients in the valley of the Nyong river.^[37] It was recently found to effects about 705 people in three regions of the country.^[38] The number of new cases varies extensively from one year to another and was estimated at 312 in 2008, distributed in five foci: Akonolinga, Ayos, Bankim, Mbalmayo and Mbongue (Cameroon Buruli Ulcer Control Programme, unpublished observations). The focus of Akonolinga remains the most important with a prevalence of about 0.49%.^[39] In the present study, very few interviewees (23.8%) had knowledge of BU. This is probably due to the fact that the causes of the disease are still not known by the population: community members relate its signs and symptoms to witchcraft.^[40] Even amongst the scientific community, the exact mechanism of transmission is still unclear.^[41-42] Besides, it is restricted to a few country foci, probably because of its association with areas where the water is slow flowing or stagnant.^[43]

Trachoma is caused by ocular serovars of *Chlamydia trachomatis*.^[44] In endemic communities, this organisms are spread from eye to eye by eye-seeking flies, fomites and direct

finger–eye contact.^[44] Infection often leads to the inflammatory changes of active trachoma in the conjunctiva and sub-conjunctival tissues, causing damages to the cornea, ultimately leading to blindness.^[44] It is estimated that 40.6 million people have active trachoma in 57 endemic countries.^[45] It is the commonest infectious cause of blindness.^[46] In Cameroon, trachoma with significant blinding potential is endemic in Kolofata Health District, in the Far Nord region^[45] where it has a prevalence of 31.5%.^[48] In this study, only 38.2% of respondents had knowledge about trachoma, probably because many interviewees were ignorant of the complications of the disease and could not relate it to blindness which many thought had spiritual causes.

Endemic treponematoses are caused by bacteria of the genus *Treponema* which are antigenically and morphologically identical although they behave so distinctly as to warrant subspecies designations.^[49] *Treponema pallidum* subsp *pallidum* causes venereal syphilis, whereas *T. pallidum* subsp *pertenue* is responsible for yaws, *T. pallidum* subsp *endemecium* for bejel (endemic syphilis), and *T. pallidum* subsp *carateum* for pinta.^[49] Nonvenereal treponematoses have prominent cutaneous manifestations and relapsing courses, such as venereal syphilis, but they are not found in urban centres, they are not sexually transmitted, and they are not congenitally acquired.^[49] Non-venereal treponematoses are spread through lack of clothing, poor hygiene, crowded conditions, and poor access to health care.^[49] In Cameroon, venereal syphilis is found among the sexually active population with an unexpected seroprevalence of 15%.^[50] This seroprevalence is higher among HIV positive than HIV negative women (35.9% vs 10.6%).^[51] Concerning the non-venereal treponematoses, their prevalence is not well known, probably because of lack of published information. In this study, 41.5% of the respondents knew about the treponematoses, but a great majority (80%) was making a special reference to syphilis of which they knew some of the clinical manifestations. This is likely because of syphilis' high prevalence and distribution in the general population.^[50]

Schistosomiasis is a chronic infection caused by digenetic trematodes (flukes) belonging to the genus *Schistosoma*. Five schistosome species (*S. haematobium*, *S. mansoni*, *S. japonicum*, *S. intercalatum* and *S. mekongi*), taxonomically and epidemiologically distinct, and using one or more species of snail intermediate host, parasitize mankind. Infection with *S. haematobium* results in urinary schistosomiasis whereas infection with *S. mansoni* and *S. japonicum* results in intestinal schistosomiasis. The parasite has a complex life cycle involving snails which are the intermediate hosts. Infected snails shed cercariae into the

water, which can penetrate intact human skin and locate and enter post-capillary venules.^[52] Further development takes place in the lungs and liver before migration to the perivesical venous plexus (*Schistosoma haematobium*) or the mesenteric veins (*S. mansoni*, *S. japonicum*, *S. intercalatum* and *S. mekongi*).^[52] Approximately 200 million people are infected worldwide, with an overdispersed distribution of infection intensity within geographically focal endemic areas.^[52] In Cameroon, four varieties of schistosomiasis exist^[3]: *S. mansoni*, *S. haematobium*, *S. intercalatum*, and the hybrid resulting from the crossbreed of *Schistosoma haematobium* and *Schistosoma intercalatum*.^[53] The prevalence of schistosomiasis varies according to the focus of infestation, sometimes reaching very high rates such as in the Baldama focus (55.5 %) in the Far North region or in the Gounougou (53.3 %) in the North region.^[3-54] This high prevalence was found to stem from the ignorance by the community of the disease's transmission mechanism.^[55-56] In the present study, 49.9% of the interviewees knew schistosomiasis and could easily recognise some of its symptoms. It is probable that the level of knowledge to schistosomiasis has increased since the Cameroonian government initiated efforts to ensure schistosomiasis and STH control in schools and communities, as it was among the priority programmes of the country.^[17]

Results show that respondents from urban areas had a greater knowledge of all the NTDs than those from the rural and periurban areas, presumably because in Cameroon, people with greater level of education are found more in urban communities,^[57] and there is no doubt that a good general knowledge of an individual (including his educational background) may help to prevent the misconceptions which usually come with health matters in many African communities. In other words, people with a higher level of education are more aware of the health consequences of many attitudes and practices than those who have not been exposed to such educational opportunity.

Males were significantly more knowledgeable than females, except for leprosy, lymphatic filariasis and soil-transmitted helminth infections. The disfigurement and disability produced at the more advanced stages of some of these diseases on the victims and the presence of these victims in the community may explain why community members, irrespective of their level of education had an idea of the diseases. For soil-transmitted helminth infections, the high prevalence of infections among children^[58] may explain why there was an almost equal knowledge distribution amongst the males and females. As concerned the other NTDs, the greater knowledge by males could be explained by relating the knowledge of this infections to the level of education of the respondents. In Cameroon, males are

proportionally more educated than females. A survey carried out by the National Institute for Statistics^[59] showed that 79.2% of males have had the opportunity to attend primary education against 74.4% of females. Concerning secondary education, the proportion is significantly higher in favour of male children.^[59] This is because in Cameroon, as in many African countries, the tendency is for parents sending male children to school than females. Although poverty may account for that tendency, the most important reason is the lack of education of parents who prefer to invest on male children.^[60] Another reason not usually admitted by parents is the practice of polygamy in some households, premature marriage of girls and multiple birth by women^[53] which do not permit parents to provide education to all their children, but to a few on the basis of profitability.

Many neglected tropical diseases remain prevalent in Cameroon. Vaccines would have represented the most cost-effective ways to relieve the health burden imposed by these infections. Unfortunately, for many of them, no vaccine exists. Community-directed treatment approach would have provided an opportunity for health services to work closely with the community to deliver interventions as community volunteers are known to be capable, motivated, and reliable.^[9] However, community participation can only be optimal if members are aware of the burden of the disease and the impact of their intervention. Our study shows that for the majority of these infections, there is low community awareness. This finding is in accordance with previous reports from Cote d'Ivoire and Brazil.^[61-62] We therefore advocate mass media health education to be adopted as one of the strategies for the control policy of NTDs in countries where these diseases are endemic.

ACKNOWLEDGEMENTS

We are grateful to the community leaders and members of households who voluntarily accepted to take part in this research.

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doi: <http://dx.doi.org/10.14194/ijmbr.128>

How to cite this article: Kamga HLF, Assob NJC, Nsagha DS, Njunda AL, Njimoh DL. A community survey on the knowledge of neglected tropical diseases in Cameroon. *Int J Med Biomed Res* 2012;1(2):131-140.

Conflict of Interest: None declared