PREVALENCE OF HUMAN AFRICAN TRYPANOSOMIASIS IN AND AROUND REFUGEE CAMPS IN KASULU DISTRICT, KIGOMA REGION, TANZANIA

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE MASTERS OF PUBLIC HEALTH OF THE UNIVERSITY OF DAR ES SALAAM.

SEPTEMBER, 2004.



CERTIFICATION

The undersigned certifies that he has read the dissertation titled: - **"PREVALENCE OF HUMAN AFRICAN TRYPANOSOMIASIS IN AND AROUND REFUGEE CAMPS IN KASULU DISTRICT, KIGOMA REGION, TANZANIA"** in partial fulfillment of the requirement for the degree Master of Public Health.

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DEDICATION

I dedicate this dissertation to my wife Lucy and our son Louis for their tolerance and keen desire for me to acquire the long-desired knowledge and skills for my self-esteem.

ABSTRACT.

A prevalence survey was carried out in six villages of Kasulu district Western Tanzania using Card Agglutination Test for Trypanosomiasis (CATT), Haematocrit Centrifugation Technique (CHCT) and both thick and thin blood smears. The aim of the study was to determine the magnitude of human African trypanosomiasis (sleeping sickness) in and around refugee camps of Kasulu district. A total of 682 persons were screened utilizing the three above-mentioned techniques, as well as conducting in-depth interviews to health workers of the surveyed health facilities so as to assess the knowledge of sleeping sickness diagnosis, and treatment. Out of the 682 individuals screened, only 10 (1.5%) were found to be positive for human African trypanosomiasis, and out of them 8 (1.2%) were seropositive and 2 were seronegative. But the 2 seronegative individuals were parasitologically positive - an indication that they were positive for rhodesiense parasites. Out of the 8 seropositive ones, 2 were also parasitologically confirmed to be harbouring the parasites.

In the in-depth interviews conducted to 8 health workers (clinical officers and in-charge of laboratories), 8 (100%) of denied receiving sleeping sickness patients in the health facilities, 6 (75%) did not know how to manage cases of human African trypanosomiasis.

With a point prevalence of 1.5% sleeping sickness does not appear to be a public health problem in Kasulu district. The positivity of CATT indicates that cases of gambiense trypanosomes have been detected in villages of Kasulu district. However,

no positive cases were detected in refugee camps, suggesting that the gambiense parasites detected in the Kasulu district villages were probably not imported from neighbouring countries of the Democratic Republic of Congo or Burundi.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
CATT	Card Agglutination Test for Trypanosomiasis
CHMT	Council Health Management Team
DED	District Executive Director
DMO	District Medical Officer
DALY	Disability Adjusted Life Years
HIV	Human Immune Virus
HAT	Human African Trypanosomiasis
HCT	Haematocrit Centrifugation Technique
SWG	Scientific Working Group
WHO	World Health Organization.

CHAPTER TWO

2.0 LITERATURE REVIEW

Although human African trypanosomiasis may not seem to be an alarming on the world stage of diseases as diseases such as malaria and AIDS, it is an important disease in sub Saharan Africa and it is responsible for the suffering and mortality in countries where it is endemic. The disease is endemic in 36 countries of sub-Saharan Africa causing a threat to rural communities in contact with the insect vector (WHO/TDR, 2002). Tanzania is affected only by *T. b. rhodesiense* where 4 million people are at risk of infection (Mlengeya, 2001); NIMR, 2002). The disease occurs in nine endemic regions namely Kigoma, Tabora, Rukwa, Mbeya, Arusha, Manyara, Lindi, Ruvuma, and Kagera, (NIMR, 2002). The estimated average annual cases of number of cases is 264 though this figure may not represent the true magnitude of the disease burden in the country due to poor diagnosis and under-reporting (NIMR, 2002). Despite the endemic nature of the disease, occasional upsurge into epidemics proportional to socio-ecological changes in the infested areas have also been reported (Kibona, 2001). Human sleeping sickness has probably been present in East Africa for many centuries, although in the literature the first descriptions were made by European colonists in the late 19th and early 20th centuries. Atkins in 1742 described a "sleepy distemper", while David Livingstone in 1857 described it as a "fly disease." In east Africa the disease has been confined to specific areas (known as foci), and many epidemics have ravaged these foci during recorded history (1900 onwards). First recorded major epidemic being the Busoga focus in Uganda, and *T.b.gambiense* was thought to be the causative agent, although at that time the more

familiar East Africa sub-species, *T. b. rhodesiense* had yet to be described. In Tanzania both forms of sleeping sickness have occurred in separate epidemics, the first being recorded at the turn of the century. *T. b. gambiense* spread from West Africa via Zaire to Uganda and subsequently reached Bukoba and Shirati in 1902 (Mwaluko *et al.,* 1991). Early studies by Dr. Feldman, who was stationed in Bukoba revealed cases in migratory workers returning from Uganda. The first autochthonous cases reported in 1904 from Kome Island in Lake Victoria, an area infested with *Glossina palpalis* (now *G. fuscipes*). A second focus was found amongst villagers living along the northern shores of Lake Tanganyika in Kigoma and Ujiji. The last case of *T.b.gambiense* was reported in Tanzania in 1958. (Kihamia *et al.,*1991). However *Trypanosoma brucei rhodesiense* is still present in scattered areas throughout Tanzania. Clinically the diagnosis of sleeping sickness is very difficult due to the fact that there is no single feature which can be regarded as pathognomonic for the disease; diagnosis relies upon demonstration of parasites in the blood, lymph and glandular aspirates or CSF. Sometimes, due to periodicity of parasitaemia, the number of parasites may be very low, multiple sampling and concentration technique are often necessary so as to detect the parasites. This is particularly common with *T. b. gambiense* due to scarcity and infrequent appearance of the parasites in the blood A number of tools do exist for the diagnosis of the disease; thin or thick blood films are still a good method, the use of micro Haematocrit Centrifugation Technique (HCT), Mini Column or Quantitative Buffy Coat (QBC) can increase the sensitivity of trypanosome detection by several orders of magnitude (WHO, 1986). Others include: Immunodiagnostic methods such as

Card Agglutination Test for trypanosomiasis (CATT), developed for *T.b.gambiense* specific antibody detection (Magnus *et al.,* 1978) used for mass surveys.

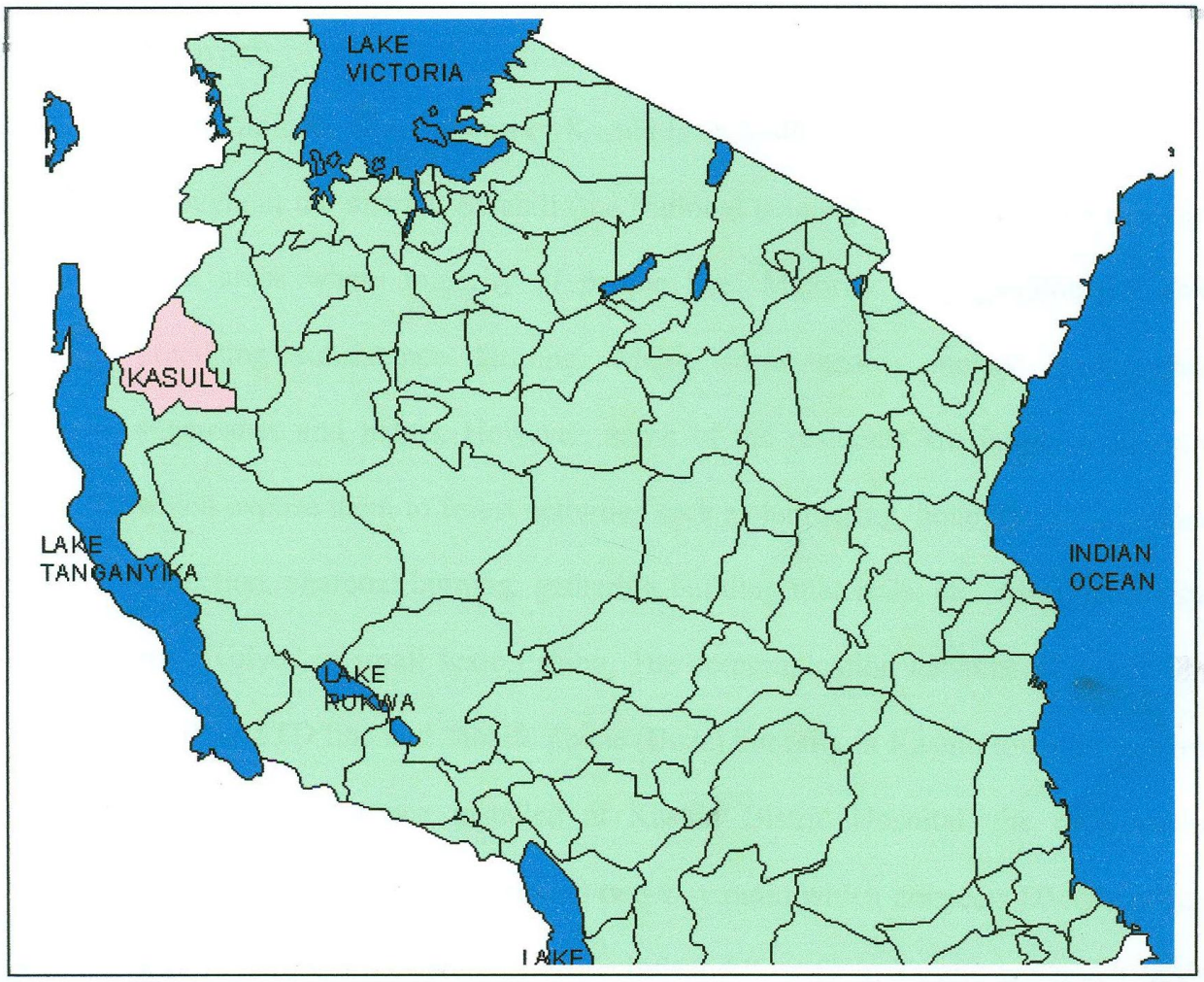
Drugs to treat HAT are old, scarce, highly toxic and encounter parasitic resistance (Croft *et al.,* 1997; Matovu *et al.,* 1997).Studies shows that West African form can overlap the East African form in countries such as Uganda and Democratic Republic of Congo (Kuzoe, 1993). There is an influx of refugees from Eastern part of DRC settled in the camps in Kasulu, and already some refugees from the camps in Kasulu are reported to be infected with human African trypanosomiasis (Kibona *et al.,* 2002). The worry is the possibility of an overlap of *T.b.gambiense* and *T.b.rodesiense* (Kibona *et al.*, 2002). DRC accounts for more than 70% of all gambiense sleeping sickness cases in sub-Saharan Africa. Therefore, this study will determine the prevalence of human African trypanosomiasis in Kasulu district using the sensitive techniques including CATT so as to find out the possibility of gambiense existence in Tanzania since this will affect management of the disease.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study site

Map 1: Location of Kasulu district in Kigoma region, western of Tanzania



Kasulu District (3°45' - 5°.0') S and (29°45' - 30°55') E; Area 9324 sqkms

Kasulu district is one of the three districts of Kigoma region, situated about 90km from Lake Tanganyika. Kasulu occupies an area of 9324 square kilometres; it is divided into seven divisions, thirty wards and ninety villages. The district is mainly

rural and has a population of about 497,574. The district also has two big refugee camps namely Nyarugusu and Mtabila. Mtabila consists of Mtabila I, Mtabila II and Myovozi. The total populations of the refugee camps are: Nyarugusu 59,683, Mtabila I 17,488, Mtabila II 43,688 and Myovozi 38,176. The residents in the camps are mainly from Democratic Republic of Congo (Nyarugusu) and Burundi (Mtabila and Myovozi)

The prominent ethnic group of Kasulu is basically Waha and Kiha is widely spoken throughout the district. Swahili (the National language) is seldom used especially in rural areas where majority of people live. Majority of population are peasants practising subsistence farming. Major crops grown include maize, banana, sugarcanes and palms. However, some of the residents are involved in activities which expose them to forest activities such as lumbering, honey gathering, firewood collection, charcoal burning, gathering building materials, etc. Also some residents are involved in small scale fishing. The communication network of Kasulu district includes STD line and Mobile phone (Buzz) but only in Kasulu town; however there is an E-mail service installed at Kasulu Distric Hospital, the only means of communication with rural areas is two-way radio which connects DMO's office and health centres and Camps health facilities. All roads in Kasulu are rough roads i.e. non-tarmac and the majority are impassable during rainy seasons.

3.2 Sampling

There are 22 villages exposed to the high risk of sleeping sickness. These include; Kitanga, Heru Shingo, Nyarugusu, Nyamidaho, Mvugwe, Nyachenda, Mwali, Makere, Nyakitonto, Kagera Nkanda-Kitagata, Mugombe, Mvinza, Kitema, Titye, Rungwe, Mpya and Kaguruka 1.

Out of the twenty two villages, three were randomly selected. Three centres from the two refugee camps (Nyarugusu and Mtabila) were also selected, making a total of six centres. All six villages were visited as planned.

Through convenient sampling, all respondents who were found in health facilities, were listed and screened for human African trypanosomiasis. The clinical officers who were in charge of the respective health facilities and their laboratory technicians were interviewed as well.

3.3 Methods

3.3.0 Data collection

Preliminary meeting was held between the researcher, District Executive Director and District Medical Officer, the aim of the study was explained and permission to conduct the study was obtained from both administrative boards, a list of villages where cases of sleeping sickness had been reported was obtained from District Medical Officer. From this list two villages located far from a health facility was selected and visited. A meeting was held with village leaders and the aim of the visit was explained and permission obtained from the village authority to conduct the survey in the village. Village leaders were requested to make announcement a day

prior to screening villagers who experienced recurrent fever, generalized body malaise or all those who were treated as cases of malaria but experienced no improvement to assemble at the selected village offices or nearby school.

3.3.1 Parasitological survey

Systematic screening of the first seventy respondents was done regardless of age and sex using Card Agglutination Test for Trypanosomiasis (CATT) and Field stain A and B and Haematocrit Centrifugation Technique.

3.3.1.1 Procedure for Card Agglutination Test for Trypanosomiasis: Tip of index fine was swabbed with a spirit, pricked using sterile lancet then blood was drawn into three different heparinised micro-haematocrit capillary tube they are then shaken for fifteen minutes using shaker (rotator), preset at 60 rotations the blood is emptied on a special card which is sub-divided in six equal small circles, the results are recorded as follows: if agglutination occurs then the result is positive for *gambiense trypanosomiaisis* if agglutination does not occur, then result is negative for trypanosomiasis.

3.3.1.2. Procedure for Blood slides: Two blood slides were taken from the each participant, out of the two, one thin and one thick blood films were prepared, thin films were fixed using acetone dried and both were stained using Field stain A washed using distilled water then stained with stain B then washed again, slides were

dried and a drop of oil emersion added then both slides were examined for trypanosomes under a microscope 100x power field and the results recorded.

3.3.2 Haematocrit Centrifugation Technique: Peripheral blood from the finger prick or heel/toe prick in case of infants was collected in three heparinised micro-haematocrit capillary tubes, the sample was then sealed with plasticine; spin hard in the micro-haematocrit centrifuge (10,000 rotations per minute for 3-4 minutes). The tubes were immediately placed under the microscope using 10x power field, examined the upper buffy coat/lower supernate area for motile trypanosomes and the results recorded.

3.3.3 In-depth Interviews

In depth interviews were conducted to clinical officers in-charge of health facilities visited and their laboratory technicians, the interview focused on disease knowledge, its current situation, transmission, management and on what measure are in place to control its further spread.

3.4 Data management and analysis

Data management started with a brief training of selected field assistants so as to maximize the quality of collected data. All instruments were reviewed for better comprehension and corrections were made accordingly. When the data collection activity started, the researcher had to participate fully in the data collection activity as well as doing some supervision in order to ensure accuracy, since one of the screening techniques used was quite new to all the research assistants particularly the technicians as it had not been used in Tanzania before. For the questionnaires, open-

ended questions were coded. All data collected, laboratory test results, and questionnaires were checked at the site the same day for completeness and entered in Dbase IV programme and analysed using Epi-info 2002 version 6.04.

3.5 Ethical issues

A letter to introduce me to the District Executive Director (DED) and District Medical Officer (DMO) was written by the School of Public Health and Social Sciences of the Muhimbili University College of Health Sciences. Information regarding the study which was to be carried out in and around refugee camps in Kasulu district was provided and both DED and DMO were requested to give their consent and provide necessary support during the study period. The DMO wrote a letter to the Immigration Officer on our behalf requesting permission for the research team to visit the refugee camps. He also wrote to clinical coordinators and team leaders of the refugee camps to introducing the research team and also explains the aim of conducting such a study in the district including the refugee camps. The other letter of introduction was written to the Heads of lower cadre health facilities and local authorities of respective villages, who gave their consent and also assist in gathering together respondents of the study. Informed consent was requested from individual participants after an adequate explanation of the objective of the study and expected outcomes and benefits for the local communities and for Tanzania as a whole.

3.6 Limitations of the study

The study was conducted in June/July and coincided with harvesting season for honey and timber products. As a result during the survey, most villagers were out for their harvesting and other forest-related activities and could not attend the screening. This had some implications in getting enough appropriate candidates for the study. Also some community members distorted the whole exercise by cheating others that we were screening for HIV as well so some got scared and refused to participate in the survey.

In few areas, respondents with other chronic conditions such as cancer and leprosy also attended the exercise as result of wrong message delivered to their communities. This complicated the whole exercise as we had to spend so much of our time counselling them. In some cases those who presented with long standing fever but were found to be negative for sleeping sickness and malaria repeated the screening exercise the next day and some even used other names, anticipating to get a solution to their long-standing health problems.

CHAPTER FOUR

4.0 RESULTS

4.1 Magnitude of trypanosomiasis

A total of 680 individuals were sampled out of 138,056 population at risk of Kasulu district (Table 1) and 2 people were sampled from the Kasulu District Hospital making a total of 682 people screened. Out of the 682 individuals screened, 10 (1.5%) were positive for trypanosomiasis. Out of the ten, 8 were CATT positive indicating that they were positive for gambiense sleeping sickness, and 2 were CATT negative but parasitologically positive indicating that they were not gambiense. Out of the 10, 2 were diagnosed at the district hospital, 4 at Kigadye village and four at Kagera-Nkanda village.

Tables 1 and 2 below show the results of human African tryponosomiasis in different areas of Kasulu district.

Table 1: Sampled population per village surveyed

Name of village	Population at risk	Actual number screened		
		Males	Females	Total
Kitanga	9,001	37	61	98
Kigadye	2,645	21	45	66
Kagera-Nkanda	5,551	102	101	203
Nyarugusu	59,683	44	83	127
Mtabila I	17,488	32	41	73
Mtabila II	43,688	59	54	113
Total	**138,056**	**295**	**385**	**680**

Table 2: Number of people screened in Kasulu District

Village	People screened	Trypanosomiasis positive		
		CATT	HCT	Field stain A & B
Kitanga	98	0	0	0
Kigadye	66	4	1	1
Kagera-Nkanda	203	4	1	1
Nyarugusu	127	0	0	0
Mtabila I	73	0	0	0
Mtabila II	113	0	0	0
District Hosp	2	0	2	2
Total	**682**	**8**	**4**	**4**

Prevalence is 10/682 x 100 = 1.46%

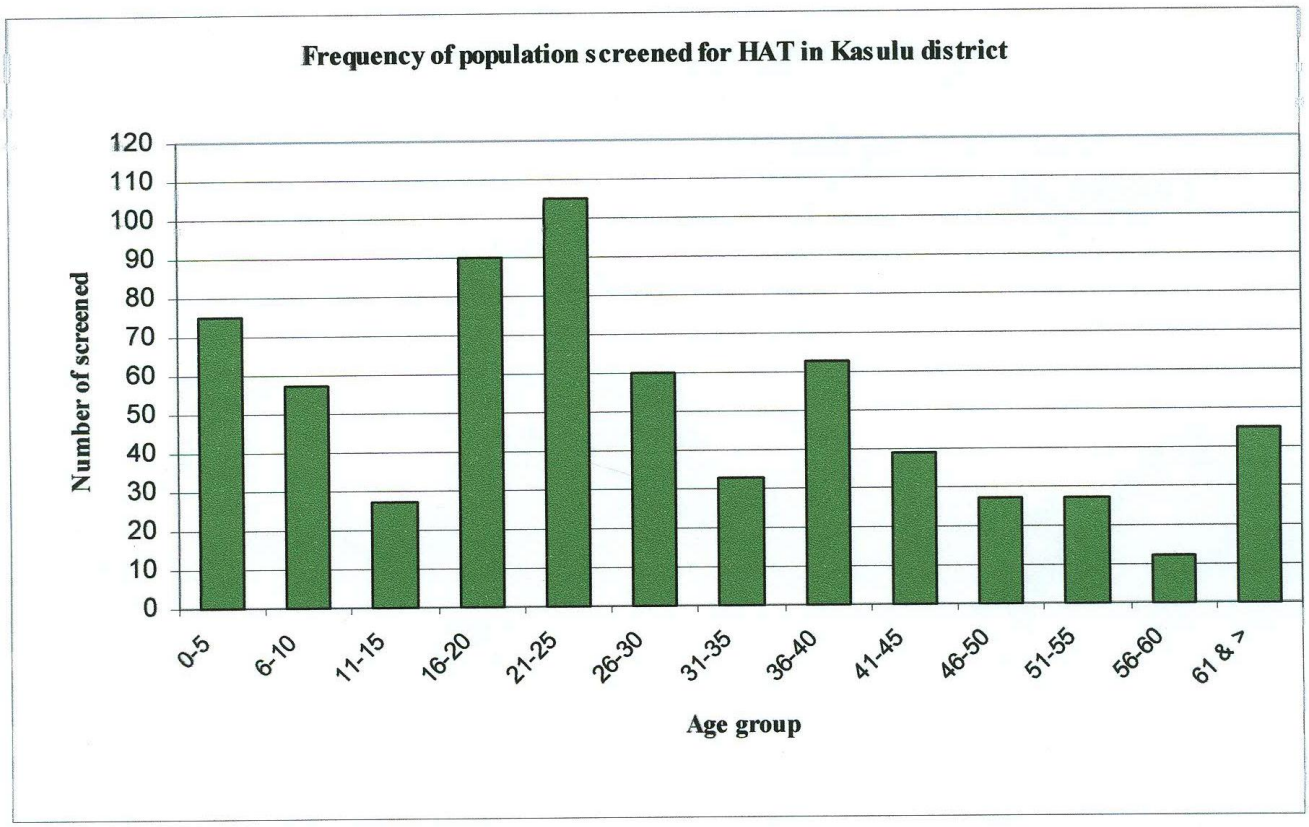
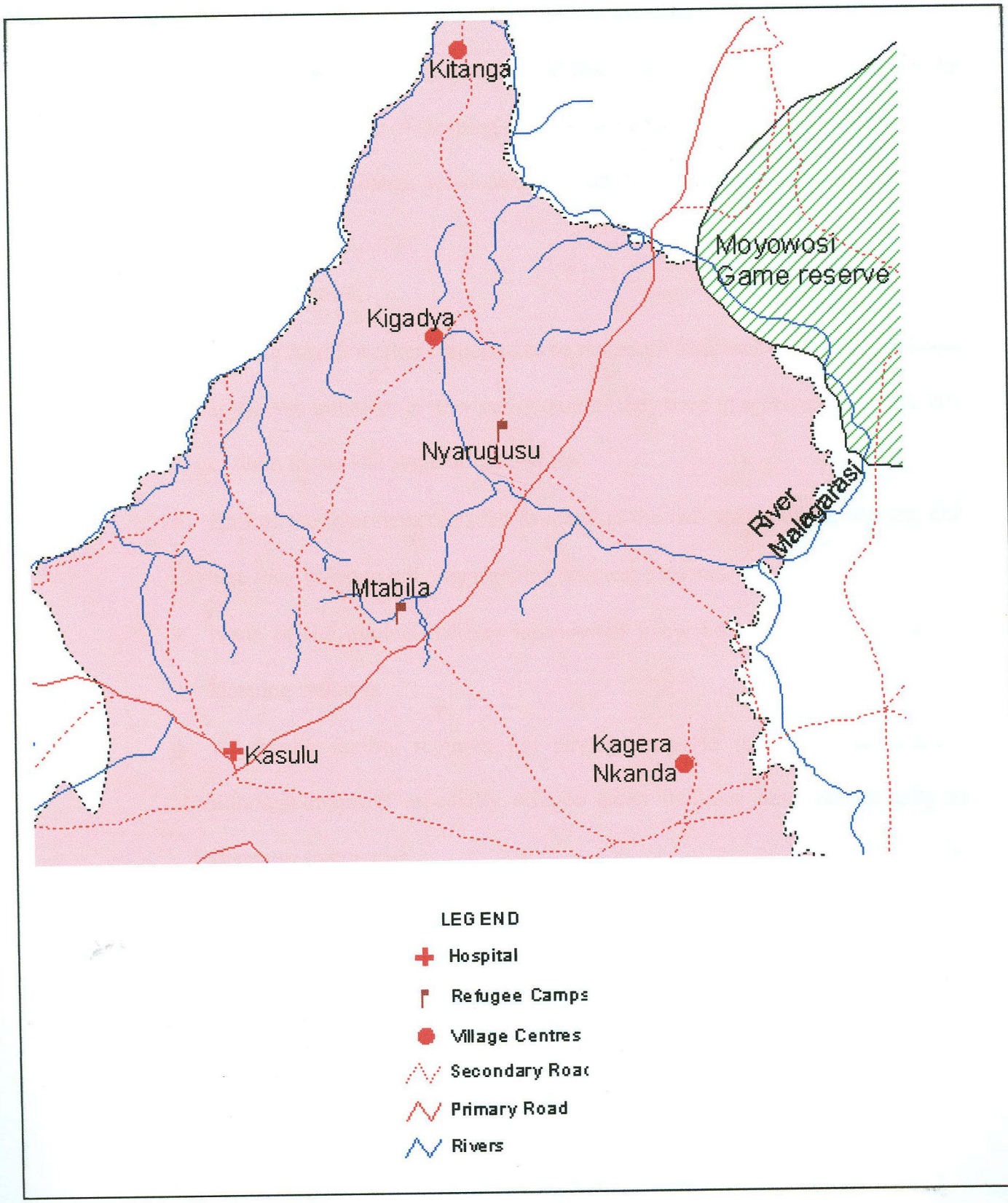


Figure 1: Age distribution of population screened in Kasulu district

Map 2. Villages and refugee camps surveyed in Kasulu district.



4.2 Health workers' knowledge on the management of sleeping sickness

A total of 8 health workers (who were heads of health facilities and laboratory technicians in charge of laboratories) in 4 health facilities surveyed were interviewed regarding their knowledge on the management of sleeping sickness (Table 3).

In all health facilities surveyed, it was noted that none of the health facilities had the capacity to manage a case of sleeping sickness; all positive cases were referred to the district hospital and Kabanga Missionary Hospital for re-confirmation and treatment.

On in-depth interviews,

- Most of health workers reported to be not receiving cases of sleeping sickness at present, although in previous occasions they used to receive cases; majority of them in the late stage of the disease.
- Half of the interviewees failed to mention the two stages of the disease, and also they failed to tell how sleeping sickness presents.
- None of the clinical officers interviewed knew how to treat any stage of sleeping sickness.
- All health facility reported not having drugs to treat sleeping sickness although majority especially refugee camp facilities have the capacity to diagnose the disease.

Table 3. Number of health workers interviewed.

Variables	Response		Total
	Yes	No	
Receive sleeping sickness patients	0 (0%)	8 (100%)	8
Presentation of sleeping sickness	6 (75%)	2 (25%)	8
Know how trypanosomes look like under microscope	2 (25%)	6 (75%)	8
Availability of equipments and reagents in the laboratory	2 (25%)	6 (75%)	8
Know control measures	4 (50%)	4 (50%)	8
Control measures in place	2 (25%)	6 (75%)	8
Total	**16 (33.3%)**	**32 (66.7%)**	**48**

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CHAPTER FIVE

5.0 DISCUSSION

Human African trypanosomiasis has been constantly reported in Kasulu district for many years. The findings of study indicated that the disease still a Public health problem in Kasulu district. However the burden of the disease varies from place to place. The present study showed that, in addition to rhodesiense sub-species which has always been believed to exist in Tanzania, gambiense sub-species was also detected in some of the surveyed villages. This form of the disease is more chronic in nature and more difficult to diagnose, as parasitaemia is not always high as in rhodesiense sub-type. Furthermore, most of the health facilities surveyed, with exception of refugee camp health facilities, have no capacity to detect, confirm and treat cases of sleeping sickness. At the same time, referral health facilities (i.e. health facilities which have the capacity to manage cases of sleeping sickness) are very far from the villages where people could contract sleeping sickness. Therefore it is possible that some villagers die undiagnosed in their rural villages for failure to reach referral health facilities and treatment could be made and treatment given. In the current study, (CATT), the method which has not been used in the country before, for the diagnosis of gambiense sleeping sickness was used, however this method is widely used in neighbouring countries where gambiense sleeping sickness is endemic e.g. Uganda and the Democratic Republic of Congo (Kibona *et al.*, 2002).

The finding of the existence of a different sub-species of human African trypanosomiasis in Tanzania i.e. *Trypanosoma brucei gambiense,* which has not been reported in the endemic area of Tanzania for almost half a century (Kihamia *et al.*, 1991), indicates that the control measures of the disease will be more complex than

they used to be. Many further questions start arising including possibility of having the disease in many other parts of the country. Also it is possible that the relapse cases of sleeping sickness which have been reported before could have been cases of gambiense trypanosomes as the two types are usually treated with different drugs (Bachi, *et al.,* 1993). The early stage of rhodesiense trypanosomiasis is treated by Suramin whereas the late stage is treated with Melarsoprol, while the early stage gambiense trypanosomiasis is treated by Pentamidine and the late stage is treated by Eflornithine as well as melarsoprol but resistance with melarsoprol has been observed in many areas. It was noted that drugs to treat trypanosomiasis were not available in all nearby health facilities visited, as a result patients are forced to travel very long distances in search of treatment. It was also noted that very few health workers were able to explain how trypanosomes looked like under the microscope hence it was difficult to understand whether they could diagnose a case of sleeping sickness. Furthermore, among the fifty percent of those who said they knew the control measures, only half of them were able to mention at least two of the control measures. This proved that the knowledge of management of the disease even among the health workers in the community is very low indicating that the disease is not considered to be an important public health issue in Kasulu district. This appears to be contrary to the information provided by the District Medical Officer and some of the Heads of lower health facilities.

All the eight cases of gambiense trypanosomiasis were detected in the communities living away from the refugee camps and perhaps there is no connection at all with the presence of large number of refugees from gambiense endemic areas of sub-Saharan Africa as it has been thought. In other words, the gambiense sleeping sickness cases

found in Kasulu are not imported but arise from local transmission. During the interview conducted to clinical officers in-charge of the refugee camps, it was noted that in the refugee camps there exists a good surveillance system, and also that they have enough good microscopes and reagents which could detect the cases of trypanosomiasis at early stages since the refugees have been in Kigoma camps for a very long time. However, lack of CATT in the refugee health facilities does not exclude the possibility of having cases of gambiense sleeping sickness in the refugee camps. These figures are small compared to other tropical diseases. The scientific working group (SWG) of WHO which met in June 2001 stated that human African trypanosomiasis without intervention has the propensity to develop into epidemics, making it a potential major public health problem. Furthermore, case fatality rate in untreated patients is 100%. This fact combined with focal nature of the disease, means that the disability adjusted life years (DALYS) averted per infection cured or prevented are very high. As a result, control of this disease in endemic areas is highly cost-effective, falling well below the accepted threshold value for money of US$ 25 per DALY averted. (WHO, 2002). During the survey it was also noted that the tsetse flies which are the vectors for human African trypanosomiasis were very low in most of the areas with the exception of Kagera-Nkanda and Kitanga villages where the population was high. This could significantly contribute to the low transmission rate of the disease observed. Other factors, which could have contributed to the low transmission rate, include:

a) Host availability: Presence of tsetse flies depends on availability of suitable host to feed on. In all areas surveyed there were very few domestic animals, and also there was no sign of presence of host like antelopes, Buffalo and wild pig where tsetse

flies would have obtained blood meal. This might have contributed to the low abundance of tsetse hence little chances of picking the parasites and transmitting to the susceptible human host:

b) Cultivation, deforestation and burning of bushes:

Tsetse fly a vector of HAT prefer stable ecological environment. Cultivation, deforestation and burning of bushes create unstable environment for tsetse survival hence reduction in tsetse population abundance and man vector contact that again reduce the chances of parasite transmission to susceptible host.

c) Impregnated targets

The presence of impregnated targets (black and dark blue coloured clothing material) have played a very big role in reducing the population density of tsetse flies hence reduction in the number of inoculation to people living close to infested forest that probably decreases the chance of disease transmission.

d) Seasonal variation

Breeding of tsetse flies depends on temperature and humidity, this survey was conducted during the dry season when the climate condition is considered unfavourable for the breeding of tsetse flies.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In view of the findings from this study trypanosomiasis constitutes one of the public health problem in Kasulu district, Majority of participants this study appreciated the screening exercise and, reported sleeping sickness as the major public health problem in the district impeding socio-economic activities of people of Kasulu whose occupational activities forces them to encroach on the forest and hence expose themselves to tsetse fly bites. Most of the income-generating activities of Kasulu district such as: lumbering, honey gathering, wood collection and charcoals burning are situated in the forest. Furthermore some of the farms are illegally situated inside the forest as residents are looking for fertile land for cultivation. Some do small scale fishing in Malagarasi River which is located along Kasulu-Kibondo boarder extending through Kagera-Nkanda, Mvinza to Mpanda district where lots of tsetse flies are found. The study also demonstrated that trypanosoma brucei gambiense has re-emerged in Tanzania. Although CATT and parasitological results showed low percentage (1.2%) and (0.7%) respectively, the information about the presence of gambiense sub-species is very important to the Ministry of Health. Similar studies conducted in Kerwa and Yumbe in Moyo district in Uganda the places which initially were considered to be hot spots, but observed prevalence of 1.1%, however the treatment failure after Melarsorprol ranged from 26.9% to 30.4%. In Western Kenya the study conducted by KETRI Scientists (Sulo *et al.*, 2002) demonstrated that active surveillance in areas with low prevalence may not be justified, considering enormous resources required. The fact that Kasulu borders Kigoma rural

and Mpanda which are also sleeping sickness endemic areas and of recent have reported many cases of sleep ng sickness, exposes Kasulu to a big risk of failing to curb the disease in the near fi ture. SWG of WHO states that Noting the possible co-existence of T.b.rhodesiense and T.b.gambiense sleeping sickness patients in foci where refugees have been settled, the difficulties in differentiating the two trypanosome species, and their different treatment schedules, they recommends the application of genomics to a comparison of T.brucei sub-species, strains and life cycle stages for the differentiation and disease management. Before applying such advanced technologies it is ideal to get a clue of the disease existence in the region.

The presence of CATT positive patients who were confirmed parasitologically indicates that there is an active transmission of gambiense sleeping sickness in the district. This call for urgent need for deliberate multisectoral joint control efforts to prevent further transmission of human African trypanosomiasis in Kasulu and neighbouring endemic districts before it becomes a major Public health problem.

The absence of the disease in refugees camps surveyed indicates that refugees are probably not associated with the existence of gambiense sleeping sickness in Tanzania; hence the parasite may have not been imported from a neighbouring country.

6.2 Recommendations

There is an urgent need of conducting a similar study in all endemic area of trypanosomiasis using CATT and also even more sensitive techniques such as polymerase chain reaction (PCR) so as to confirm and establish the distribution of gambiense trypanosomiasis in the country.

Refresher courses to clinicians and laboratory technicians in all endemic areas of the country on HAT diagnosis, treatment and control is urgently required.

There is an urgent need to order Eflornithine for the treatment of gambiense sleeping sickness as the currently available drugs in Tanzania Suramin for the treatment of early stage and Melarsoprol for the treatment of late stage rhodesiense sleeping sickness cannot properly treat gambiense type. Melarsoprol which was believed to be effective for the treatment of second stage gambiense, of recently very high refractory rates over 20%, (Matovu *et al*, 2001) have been observed even after repeated treatment

In order to reduce man fly contact; health education should be conducted to communities on the good farming practices and the hazards of encroaching the forest and game reserve which is the home of tsetse flies.

The existing impregnated targets which were observed in some villages during our survey need to be scaled up in other areas which are not yet covered.

If all the recommendations mentioned above are followed, the low prevalence which has been observed in this study will be maintained and even brought further down to a very low level.

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