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## Document heading

## Human African trypanosomiasis in endemic focus of Abraka, Nigeria

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## ABSTRACT

**Objective:** To investigate the prevalence of human African trypanosomiasis (HAT), a neglected tropical disease caused by *Trypanosoma brucei gambiense* in an endemic focus of Nigeria, as it relates to age, sex and occupational differences. **Methods:** A total of 474 human subjects were screened using card agglutination test for trypanosomiasis kit. Positive samples were further investigated for parasite positivity in blood/serum and cerebrospinal fluid (CSF). **Results:** Of the 474 screened, 44(9.3%) were seropositive with seroprevalence of 22(9.6%) in Urhouka, 14(9.5%) in Umegehe and 8(7.9%) for Ugonu. The number of seropositives, observed for weakly, moderately and strongly positives for the three communities were 4, 7 and 11 in Urhouka, 4, 5 and 5 in Umegehe and 3, 2 and 3 in Ugonu respectively. Among the 16 volunteers with detected parasite in their blood, 4 of them were weakly positive, 5 of them were moderately positive and 7 of them strongly positive. 4 volunteers from Urhouka community were found parasites in their CSF and they were all strongly positive. The difference between the seroprevalence of males and females was not statistically significant ( $OR=1.14$ , 95%  $CI=0.37-3.4$ ,  $P>0.05$ ). The prevalence difference between age group 21–30 years old and the youngest and oldest age groups was statistically significant ( $OR=3.5$ , 95%  $CI=1.08-12.57$ ,  $P<0.05$ ) but not significant for other age categories ( $P>0.05$ ). It was observed that farmers had significantly higher prevalence of HAT infection as well as greater risk of *Trypanosoma brucei gambiense* infection than inhabitants with other occupations ( $OR=3.25$ , 95%  $CI=0.99-11.79$ ,  $P<0.05$ ). **Conclusions:** Human activities such as farming and visits to the river have been identified as major risk factors to HAT. Also the breakdown of HAT control program has been advanced for the rise in HAT in Abraka, an endemic focus in Nigeria.

## 1. Introduction

Human African trypanosomiasis (HAT) is a neglected tropical disease and 60 million people have been estimated to live in areas where the disease is transmitted with 300 000–500 000 new cases each year<sup>[1]</sup>. The first or early stage of the disease is defined by the restriction of the trypanosomes to the blood and lymph system while the second or late stage of the disease is characterised by the presence of the parasites in the cerebrospinal fluid (CSF)<sup>[2]</sup>. In some African countries including Nigeria, the disease has re-emerged after long years of control<sup>[3–5]</sup>. Regular surveillance and monitoring activities to establish present

disease status of resurgence and new cases of infection are crucial in planning trypanosomiasis disease control and elimination programmes<sup>[6]</sup>. Demographic characteristics of endemic foci as it relates to geographical location, human behaviour and occupational activities have been associated with the incidence of trypanosomiasis infection<sup>[7,8]</sup>.

It has been reported that differences in sex is unconnected to trypanosomiasis disease incidence<sup>[7,8]</sup>. A progressive increase in the incidence of infection with age has been reported<sup>[7]</sup>. Similarly, a wide disparity in the prevalence of HAT infection was observed between the youngest and the oldest age group surveyed in Angola<sup>[8]</sup>.

It has been documented that human activities are linked to the incidence of trypanosomiasis infection. For instance, a survey carried out in Sudan reported that HAT status was connected to village daily activities and geographical location of dwellers<sup>[3]</sup>. Data on occupational activities in

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Angola revealed that the group of the population involved in farming and water transportation were at greater risk of HAT infection than those preoccupied with hunting and fishing<sup>[7]</sup>.

In our studied locality, information regarding disease prevalence as it relates to sex, age and occupational differences is lacking. We therefore investigate the prevalence of HAT infection in connection with sex and age. Additionally, we identified the occupations of inhabitants as possible risk factors of *Trypanosoma brucei gambiense* (*T.b. gambiense*) infection in Abraka, an endemic focus in Nigeria.

## 2. Materials and methods

This investigation was carried out in three agrarian villages, namely, Umeghe, Urhouka and Ugonu communities located in Abraka, Ethiope East Local Government Area of Delta State, Nigeria.

Ethical permission was obtained from Delta State Ministry of Health and Eku Baptist Hospital, Eku, Delta State, Nigeria. Prior to the commencement of this study, the inhabitants of communities were enlightened on the nature, objectives and benefits of our investigation. Thereafter, informed consents were sort and obtained from 474 consenting volunteers who were subsequently recruited for this study. Furthermore, we documented the biodata (name, sex, house address, occupation) of these consented volunteers.

Finger pricked blood samples were obtained from 474 volunteers and were 3/4 filled in heparinised capillary tube. A drop of the card agglutination test for trypanosomiasis (CATT) reconstituted reagent was added to a drop of blood on a plasticized surface. Agglutination of the mix was noted as positive<sup>[9]</sup>.

Venous blood samples were collected from 44 seropositives. Sera obtained were used to categorize the level of infection using the CATT reagent by double serial dilution as: weakly positive (1 : 2–1 : 4), moderately positive (1 : 8–1 : 16) and strongly positive ( $\geq 1 : 32$ ) according to the manufacturer’s instruction (Intituuat voor Tropische Geneeskunde, Antwerpen, Belgium). The presence of parasite was detected using various techniques, namely, blood films (thin, thick and wet) and concentration methods such as microhaematocrit centrifugation, buffy coat and in vivo inoculation of the CSF into albino rats<sup>[10]</sup>. Also, CSF was

collected using standard procedures by lumbar puncture. The CSF was examined microscopically for parasite presence of *T. b. gambiense*.

Data obtained were subjected to statistical analysis, namely, McNemar’s test using Instat statistical package.

## 3. Results

Table 1 showed the incidence of HAT infection as it related to the communities in Abraka. A total of 474 volunteers were screened for HAT disease with 44 volunteers identified to be seropositive. Of the 474 screened, the seroprevalence rates were 9.6% in Urhouka, 9.5% in Umeghe and 7.9% in Ugono. The number of seropositives, observed for weakly, moderately and strongly positives for the three communities were stated in Table 1. Parasites were found in the CSF of four volunteers from Urkouka communities and they were strongly seropositive cases.

A total of 193 males and 181 females were screened for HAT infection. The seroprevalence rates were 8.20% for male while 9.96% for female. The difference in the prevalence was not statistically significant ( $OR=1.14$ , 95%  $CI = 0.37-3.4$ ,  $P>0.05$ ).

All participants were divided into 7 age groups which were  $\leq 10$ , 11–20, 21–30, 31–40, 41–50, 51–60 and  $\geq 61$  in years. The seroprevalence rates for different age groups were listed in Table 2. The difference in prevalences between age group 21–30 years old compared to the youngest ( $\leq 10$ ) and oldest age groups ( $\geq 61$ ) was statistically significant ( $OR = 3.5$ , 95%  $CI=1.08-12.57$ ,  $P<0.05$ ). For other age categories of 31–40, 41–50, 51–60 when compared with age group 21–30, the difference was not significant at  $P>0.05$ . Meanwhile, prevalence differences between age groups 31–40, 41–50, 51–60 when compared with age groups  $\leq 10$  and  $\geq 61$  were not significant ( $P>0.05$ ).

Among the 44 seropositives, prevalences of HAT infection for the different occupations were as follows: 14.00% in farmers, 5.71% in civil servants, 0.00% in transporters, 0.00% in artisans and 10.23% in students. The difference in prevalence between farmers and civil servants was statistically significant ( $OR=3.25$ , 95%  $CI=0.99-11.79$ ,  $P<0.05$ ). Seroprevalence difference between students and civil servant was not significant ( $OR=2.25$ , 95%  $CI=0.63-8.65$ ). There was no significant difference between the prevalence rate of farmers and students ( $OR=1.44$ , 95%  $CI=$

**Table 1**  
Incidence of HAT infection in relation to the communities in Abraka (n).

Villages	Screened population	Seropositives								
		Weakly positive			Moderately positive			Strongly positive		
		CATT positive	Parasite positive in blood	CSF parasite positive	CATT positive in blood	Parasite positive in blood	CSF parasite positive	CATT positive	Parasite positive in blood	CSF parasite positive
Urhouka	227	4	2	0	7	3	0	11	6	4
Umeghe	146	4	1	0	5	2	0	5	1	0
Ugono	101	3	1	0	2	0	0	3	0	0
Total	474	11	4	0	14	5	0	19	7	4

0.57–3.67,  $P > 0.05$ ).

**Table 2**

Seroprevalence of HAT infection among age groups.

Age group	<i>n</i>	Seroprevalence [ <i>n</i> (%)]
≤10	54	3(5.55)
11–20	150	13(8.66)
21–30	96	15(15.63)
31–40	56	5(8.92)
41–50	38	3(7.89)
51–60	23	2(8.69)
≥61	57	3(5.26)
Total	474	44(9.28)

#### 4. Discussion

Our investigation shows that the incidence of HAT infection in Abraka communities is rising in the light of the survey carried out in this area by Osue *et al*[5] who reported a confirmed parasite case and one second stage trypanosomiasis–infected individual. This suggests that there is ongoing transmission in Abraka and the rate of transmission is on the rise. This result is not surprising because programmes earlier put in place to control the disease have collapsed and the sentinel site (Eku Baptist Hospital) charged with the responsibility of diagnosing and managing cases are not been funded. We also discovered that key health workers previously trained to carry out these functions are no longer with the hospital. In addition, communities (Urhouka, Ugono and Umeghe) where HAT is most prevalent are in a far distance from the sentinel site. More importantly, these rural inhabitants are poor and are unable to afford the cost of transportation to the sentinel site. The net effect is a setback in the elimination of this neglected disease[6]. We therefore suggest that both active case surveillance and vector control programmes be reinstated in Abraka endemic focus. Furthermore, training programmes involving HAT diagnosis and management should be organized regularly for health workers[10,11].

We observed that the seroprevalence of trypanosomiasis infection was higher in females than in males. We ascribed this to the cultural practice in our studied communities where the females are more involved in agricultural and water transportation activities than their male counterparts. This observation corroborates the earlier report in Angola[6]. We considered that their farms were close to the river banks which constitute ecological zones for the tsetse fly[11] and frequent visit to these areas led to increased man–vector contact and consequently increased incidence of infection in females than males.

We documented that age group between 21–30 years old was most affected with HAT when compared with other age groups. Also the least age group infected with HAT which we recognized as the least active were the youngest age group (≤10 years old) and the oldest age group (>61 years old). The activities of this age group identified to be the most active in the population, range from farming and swimming to fetching and transporting of water to the inlands. Without doubt it had contributed to the increase in HAT burden in these communities.

In our studied communities, the farmers followed by the students had the highest seroprevalence rates of HAT infection. This is in line with other report[5] who asserted that

people engaged in agricultural activities in endemic areas are at relatively high risk of HAT infection. It is important to note that the relatively high infection rate among students than the other occupational groups (civil servants, artisans and transporters) is tied to their greater involvement in recreational activities (swimming) and farming after school hours. We attribute the low prevalence of this parasitic infection among the civil servants, artisans and transporters to low exposure of infection as a result of low contact with the river and low involvement in farming activity.

In conclusion, this study re–establishes the endemicity of Abraka communities to HAT disease[12], and this trend if allowed to persist could further increase the disease incidence which may progress to epidemic proportions[13]. We therefore recommend that a structured active and passive surveillance system be instituted in order to easily and quickly identify and treat HAT infected individuals. Furthermore, alongside regular HAT surveillance, sustained vector control strategy to reduce fly population should also be incorporated in the control programmes.

#### Conflict of interest statement

We declare that we have no conflict of interest.

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