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# PREVALENCE AND RISK FACTORS FOR SEIZURES IN STAGE-2 OF RHODESIENSE HUMAN AFRICAN TRYPANOSOMIASIS IN ZAMBIA FROM JANUARY 2013 TO JULY 2022

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**Abstract**

**Introduction**: Human African Trypanosomiasis (HAT) is a parasitic disease caused by an invasive parasite called the human trypanosomes. The disease is divided into two stages, namely stage-1 and stage-2. The aim of this study was to determine the prevalence and risk factors for seizures in stage-2 of Rhodesiense HAT (rHAT) in Zambia from January 2013 to July 2022.

**Methodology:** This was a retrospective cross-sectional study. All case files of patients that were laboratory diagnosed with rHAT from endemic hospitals in Zambia from January 2013 to July 2022 were reviewed.

**Results:** A total of 54 casefiles of all HAT patients from January 2013 to July 2022 were reviewed. There were 2 cases with history of seizures in stage-2, one Caucasian and one black Zambian out of 5 and 49 patients, respectively. There was a statistically significant difference in the prevalence rate of seizures between Caucasian and black patients ($P<0.05$). There was no statistically significant difference in age in occurrence of seizures between patients less than 30 years of age and those 30 years and above ($P>0.05$). In addition there was no statistically significant difference in occurrence of seizures between sexes ($P>0.05$).

**Conclusion:** Being a Caucasian is probably a risk factor for seizures in stage-2 of Rhodesiense HAT in Zambia.

***Keywords:*** Seizures, Caucasian, risk factor, stage-two, trypanosomiasis



## Introduction

Human African Trypanosomiasis (HAT) is a parasitic disease caused by an invasive parasite called the human trypanosomes (*Barrett et al*., 2003). There are two subspecies of human trypanosomes that cause HAT (Williams, 1996). These are *Trypanosomabruceirhodesiense* (*Tbr*) that causes Rhodesiense HAT (rHAT) that is found in East and Southern Africa, and *Trypanosomabruceigambiense* (*Tbg*) that causes Gambiense HAT (gHAT) which is found in West, Central, and parts of East Africa (Williams, 1996). HAT is classified by the World Health Organisation (WHO) as a Neglected Tropical Disease (NTD) (World Health Organisation, 2006). The disease is divided into two stages, regardless of the subspecies responsible (Kennedy, 2004). In stage-1, also called the hemo-lymphatic stage, the parasites are confined to blood and the lymphatics. Here the patient presents with early symptoms that tend to be non-specific. These include malaise, headache, fever, arthralgia, generalized weakness, and weight loss (Apted, 1970). In stage2, also called the meningo-encephalitic stage, the parasites have invaded the Central Nervous System (CNS). Transition from stage-1 to stage-2 is not always distinct in rHAT (Atouguia and Kennedy, 2000). In stage-2 the patient presents with broad neurologic spectrum ((Atouguia and Kennedy, 2000, Duggan AJand Hutchington, 1966, *Kristesson et al*., 1995, *Odiit et al*., 1997). The

presentation is categorized as psychiatric, motor and sensory abnormalities, and sleep disturbances (Kennedy, 2004). The mental disturbances include irritability, lassitude, headache, apparent personality changes, and overt psychiatric presentations such as violence, hallucinations, suicidal tendencies, and mania. Motor system involvement might manifest as limb tremors, tongue and limb fasciculation, limb hypertonia and pyramidal weakness, choreiform and athetoid movements, dysarthria, pout and palmar-mental reflexes, and cerebellar ataxia and polyneuritis. Sensory system involvement could manifest as painful hyperaesthesia, pruritis, and also deep hyperaestheia, also known as Kerandel's sign. In the final stages of the disease and if not under treatment, the patient develops seizure, severe somnolence, and double incontinence, cerebral edema, coma, systemic organ failure, and inevitable death(Kennedy, 2004).

The aim of this study was to determine the prevalence and risk factors associated with seizures in stage-2 of rHAT in Zambia from January 2013 to July 2022. The objectives were: to establish the prevalence rate of seizures in stage-2 of rHAT and to assess the risk factors for seizures in stage-2 of rHAT.

## Methodology

**Study design**: This was a retrospective cross-sectional study.

**Study participants**: Case records of laboratory diagnosed rHAT patients from January 2013 to July 2022 were reviewed by the lead author of this article who happens to be the coordinator of the National Trypanosomiasis control program of the Ministry of Health of Zambia..

**Study site**: The case records came from hospitals in rHAT endemic regions of the country. The hospitals were as follows: Chilonga Mission Hospital in Mpika district, Chipata General Hospital, Chipata district, University Teaching Hospital in Lusaka, Mansa General Hospital in Mansa district, Mbala General Hospital in Mbala district, and St Luke's Mission Hospital in Rufunsa district.

**Data collection**: A data collection form was used to extract relevant data from the case records. Data collected included: age, sex, race, stage of disease, and history of seizures. Data was entered and analysed in Epi info version 7.2.4.0.

## Results

A total of 54 complete case records of laboratory confirmed rHAT cases were reviewed. However, one case file had missing age detail. This number represents all the rHAT cases from January 2013 to July 2022.

**Table 1. Demographic data and stage of rHAT disease of the patients covered in the case records**.

| Variable | Frequency | Proportion |
|---|---|---|
| Age : Less than 30 years | 24 | 46% |
| 30 years and above | 29 | 54% |
| Sex : Male | 37 | 69% |
| Female | 17 | 31% |
| Race: Caucasian | 5 | 10% |
| Black Zambian | 49 | 90% |
| Stage of disease:1 | 31 | 58% |
| 2 | 23 | 42% |

Table 1 shows the demographic data and stage of rHAT disease of patients covered in the case records. The mean age of the patients was 32.3 years while the range was from 6 months to 81 years. Most of the patients were aged below 30 years.There more male than female patients. There weremore black Zambians than Caucasian patients. There more patients in stage-1 than in stage-2.

**Table 2. Association between age, sex, and race and occurrence of seizures in stage-2 of rHAT.**

| Variable | Frequency of seizures | Proportion with seizures | P-value |
|---|---|---|---|
| Sex: Male | 1 | 5% (1/23) | 0.5 |
| Female | 1 | 13% 1/8 | |
| Age: Less than 30 years | 2 | 8% (2/25) | 0.5 |
| 30 years and above | 0 | 0% (0/6) | |

| | | | |
|---|---|---|---|
| Race: Caucasian: | 1 | 50% (1/2) | 0.01 |
| Black Zambian | 1 | 4% (1/29) | |

Table 2 shows the association between age, sex, and race and occurrence of seizures in stage-2 of rHAT. There was a statistically significant difference in the occurrence of seizures between the two races using the Mantel-Haenszel $X^2$ ($P<0.05$). There was no statistically significant difference in occurrence of seizures between the two age groups ($P>0.5$) and the two sexes ($P>0.5$) using the Mantel-Haenszel $X^2$.

## Discussion

Seizures are a not so common a feature of stage-2 of HAT. They are a presenting complaint that cannot be forgotten easily by either relatives or guardians of HAT patients. Our study has demonstrated that the prevalence rate of rHAT cases with history of seizures is rather low in rHAT patients in Zambia when compared with neighbouring nation of Malawi (*Madanitsa et al*, 2009). This could be explained by the observation that severity of rHAT in East Africa is associated with geographic location, parasite genotype, and host inflammatory cytokine response profile (*MacLean et al*, 2004).

Our study has shown that the risk of seizures developing in stage-2 of rHAT is higher in Caucasian patients than in black Zambian patients. This observation hasn't been reported in literature before. Similar observation in the differences between races in the clinical presentation of stage-2 has been reported in the case of deep hyperaesthesia (*Duggan et al*, 1966). Here deep hyperaesthesia is commoner in Caucasian patients than in black Africans. If being a Caucasian is a risk factor for seizures in rHAT then white tourists should be advised to be screened for rHAT once they return to their respective countries. This would enable infected persons being commenced on antitrypanosomal drugs as soon as possible. Prognosis for stage-2 HAT with history of seizures in good when patients are commenced onantitrypanosomal drugs and anticonvulsants such as carbamazepineas soon as possible (*Etedal et al*, 2022). In our study age did not appear to be a factor for developing seizures in stage-2 of rHAT when age was categorized as less and equal or greater than 30 years. Similarly sex did not appear to be a factor for development of seizures in stage-2 of rHAT.

## Conclusion

Race is probably a factor in the aetiology of seizures in stage-2 of rHAT in Zambia, Caucasian patients being at a higher risk than black Zambian patients.

## Study limitation

The sample size of stage-2 rHAT patients was too small to make definitive conclusion. There is need to observe a bigger sample size.

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