ORIGINAL ARTICLE

Surveys for *Mansonella perstans* Filariasis in Kalabo, Kazungula, Choma and Kafue Districts of Zambia

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ABSTRACT

Background: Past case reports have documented *Mansonella perstans* infections in Zambia. However, knowledge on the epidemiology and geographical distribution of this infection in the country is lacking. This paper reports on surveys for *M. perstans* in communities in four districts (Kalabo, Kazungula, Choma and Kafue) in the Southern and Western parts of Zambia.

Design: The study was cross sectional. In Kalabo District, volunteers from three villages aged one year and above were recruited and had thick blood smears prepared. In the other three districts individuals aged 15 years and above who reported to selected health centres from the surrounding communities were recruited and had thick blood smears prepared. The blood smears were stained with Giemsa and examined for *M. perstans* microfilariae (mf).

Results: A total of 1439 individuals were recruited and examined (425, 348, 306 and 360 from Kalabo, Kazungula, Choma and Kafue, respectively). No *M. perstans* mf were seen in any of the blood smears.

Conclusions: The failure to find *M. perstans* mf was surprising considering previous case reports, even from some of the surveyed areas. There is a need for more surveys to be carried in other parts of the country to ascertain the distribution of *M. perstans.* Health practitioners should moreover be informed about this infection, and trained to be able to accurately distinguish *M. perstans* infections from those of *Wuchereria bancrofti,* which are also endemic in Zambia.

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INTRODUCTION

Mansonella perstans is a vector borne filarial nematode parasite of humans, transmitted by tiny flies of the genus *Culicoides* (biting midges). The adult females produce small larvae called microfilariae (mf) which find their way to the blood circulation. The mf are picked up by the vectors when they take a blood meal, and after a period of development in the thoracic muscles of the vector, the parasites may be transmitted onward to new human hosts when the vector bites again [1,2]. The development in the vector takes approximately one to two weeks depending on the environmental conditions but the period required for further development to mature adult stages in the human host is unknown. Adult worms appear to live mainly in the serous body cavities, but have rarely been recovered [1].

Mansonella perstans infections are widely distributed in Africa and also occur in parts of Central and South America and the Caribbean. Despite this, only a few studies have been carried out on the epidemiology and morbidity of this infection in endemic populations. This could probably be due to the lack of association with a distinct and specific clinical picture or lack of effective treatment for patients suffering from this infection [2, 3]. Diagnosis of *M. perstans* infection is mostly by detection and identification of mf in peripheral blood. The

microfilariae of *M. Perstans*s how a weak pattern of diurnal periodicity but are present in the peripheral blood both during the day and night [4].

Case reports from Zambia

The first cases of *M. perstans* infection in Zambia were reported by Buckley in 1946 from hospital patients in Lusaka, Ndola and Kasama[5]. Later on, more cases of *M. perstans* were reported by Barclay from the Luangwa basin when he carried out a survey for another filarial parasite, *Wuchereria bancrofti* [6]. Cases of individuals with *M. Perstans* infection were recently seen in Chama District in the Luangwa valley, Eastern Province [7]. More recently, two cases were reported from Mambova Health Centerin Kazungula District in 2012 by a medical officer, and in 2010 a woman from Shimabala area in Kafue District being investigated for trypanosomiasis was found with mf of *M.perstans*at the University Teaching Hospital in Lusaka (UTH records, unpublished findings). However, despite these reports of *M. perstans* since 1946, there has been no survey in any parts of the country to determine the occurrence and prevalence of *M. perstans*. Most of the reports of *M.perstans* infection were incidental findings as a result of other surveys that were being carried out. Species of *Culicoides*, which are the vectors responsible for transmission of *M. perstans* infection, have been reported near Chilanga District in Lusaka Province [8].

No distinct and clearly recognizable clinical picture is known for human mansonellosis due to *M. perstans* infection, but it might potentially interfere with the host's regulatory mechanisms and influence the outcome of other infections [1]. Moreover, considering that Zambia is endemic for lymphatic filariasis caused by infection with the filarial parasite *W. bancrofti* [9, 10],and that control activities to eliminate this disease as a public health problem are currently underway, it is important that medical personnel and scientists are aware of both parasites and are able to distinguish the mf of *M. perstans* from those of *W. bancrofti* for precise diagnosis and treatment. As a first step, the present survey was undertaken to determine the occurrence of *M. perstans* in some districts including those that had recent case reports of the parasites.

METHODS

Study sites

Spot check surveys were carried out in four districts. The first wasin August 2012 in Kalabo District, Western Province. Three villagesat an altitude of 1000 – 1100 m above sea level,namely Sishekanu (14.84071S, 22.80762E), Lutwi (15.17347S, 22.38348E) and Liumena (14.98859S, 22.32845E) were selected on the basis of previous surveys that had recorded high prevalence of *W. bancrofti* infection [10]. The other surveys were carried out in March/April 2014 in three districts in Southern parts of Zambia.In Kazungula District, study participants were recruited from two villages at an altitude of 900-1000 m above sea level and located approximately 60 km apart, namely, Mukuni (17.90759S, 25.94151E) and Mambova (17.73088S, 25.19528E) under Chief Mukuni. Mambova had previously reported two cases of *M. perstans* infections. In Choma District, the study site was located approximately 20 km east of Choma town at an altitude of about 1200 m above sea level and in close proximity to Shamphande Health Centre (16.92256S, 26.99680E). In Kafue District, study participants were recruited from three communities surrounding health centresnamely Nangongwe, Railways and Kafue Estates (15.78150S, 28.18368E) at an altitude of approximately 900 m above sea level.

Study design

The surveys were cross-sectional. In Kalabo District the three villages were originally selected for a study on the epidemiology of lymphatic filariasis [11]. Each of the villages had more than 200 inhabitants. During blood examination for lymphatic filariasis, volunteers aged one year and above were requested to supply an additional finger prick blood sample for *M. perstans* examination. In the other three districts, individuals aged 15 years and above reporting to the health centres from the surrounding communities during the survey and suspected to have malaria were recruited. In addition to being examined for malaria, they were requested to supply an additional finger prick blood sample for *M. perstans* examination. In order to recruit at least 300 individuals from each of the later three study districts, two or more communities were

surveyed in each district.

Ethical considerations

Permission to undertake the surveys was obtained from the Biomedical Ethics Committee (ref no. 007-06-11), the Ministry of Health, and the Provincial and District Health Offices. Permission was also sought from the local area chiefs and village headmen. Oral consent was obtained from the individuals before recruitment into the survey. For participants below 15 years, consent was obtained from parents or guardians. Once they consented to participate, they were requested to provide a finger prick blood smear.

Sample collection and analysis

A small amount of blood from a finger prick was used to prepare a thick blood smear. The smears were allowed to dry overnight and thereafter deheamoglobinized in clean tap water. They were then fixed with methanol, allowed to dry in the air and stored in slides boxes. Upon arrival at the parasitology laboratory at the University Teaching Hospital in Lusaka, the slides were stained using Giemsa and examined under a microscope for *M. perstans*mf [12].

RESULTS

A total of 1439 blood smears(425, 348, 306 and 360 smears from Kalabo, Kazungula, Choma and Kafue, respectively) were screened for *M. perstans*mf in the four districts combined as shown in Table 1. The overall mean age of the examined was 32.8 years and more females (65.5%) than males (34.5%) were examined. Microscopic examination revealed no *M. perstans*mf in any of the smears.

DISCUSSION

The failure to find *M. perstans* mf in the examined individuals from the four districts was surprising as previous reports had indicated the presence of this parasite in Zambia [5-7]. Two of the four districts, namely Kazungula and Kafue, were selected based on previous finding of *M. Perstans* mf there. However, it is possible that the individuals who tested positive either had travelled to or resided in other areas endemic for *M. Perstans* transmission. Unfortunately, the history and movements of the individuals had not been recorded.

While carrying out the survey in Choma District, 64 archived slides from individuals who had tested positive for malaria by the rapid diagnostic test were recovered at Shamphande Health Centre (33 from females, 31 from males; mean age 16.4 years; range 1-53 years). All 64 slides were examined for *M. perstans* mf but none were positive.

The overall present negative findings could be an indication of a recent decline in the transmission of *M. perstans* due to unfavourable environmental conditions. A recent study on human trypanosomiasis in the Luangwa valley [7], where a high prevalence of *M. Perstans* microfilaraemia (23.4%) had previously been documented [6], only recorded five incidental cases of *M. Perstans* microfilaraemia (0.8% of those examined) which might suggest a possible decline in transmission. It is likely that as a vector borne disease, transmission may be very sensitive to environmental conditions such as temperature and availability of suitable breeding habitats. Although potential *Culicoides* vectors for *M. perstans* have been identified in some parts of the country [8], a change in environmental temperature may affect both the proliferation of the vectors, the longevity of development of the parasites inside the vectors, and the transmission process.

Considering that the number of districts surveyed were few, it is likely that *M. perstans* infection may occur in other areas that were not surveyed, but with favourable environmental conditions. Hence, there is a need for more surveys to ascertain the presence of *M. perstans* parasites in other districts. Health practitioners should moreover be informed about this infection, and trained to be able to accurately distinguish *M. perstans* infections from those of *W. bancrofti,* which are also endemic in Zambia.

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