Market Survey of Loiasis: Prevalence and Adverse Reactions to Ivermectin Using a Rapid Procedure For Loiasis

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ABSTRACT

Objectives: *1. To assess the levels of endemicity of loiasis in a total of 30 selected villages covering an area of 5.2 sq km in Owo, Akure North, Akure South, Ondo East, Ondo West and Ifedore local governments in Ondo State, Nigeria, using Rapid Assessment for loiasis technique.*
2. To obtain information on adverse reactions which occurred during previous administrations of the drug ivermectin used for the treatment of loiasis and onchocerciasis in the study area.
Methods: *Consent was obtained from the chairman of each local government village head and individuals were co-opted into the study. A total of 480 individuals were interviewed, 80 from each of the six local governments, during the regular scheduled community market days. Survey for* Loa loa *was carried out according to specifications in "Guidelines for rapid Assessment of Loa loa (TDR, 2002).*
Results: *Among the 480 respondents, 80 (16.7%) reported having had a history of loiasis while 11 (2.3%) had recent occurrence of the disease. The local name given to the disease in all the villages studied is "aran oju". Respondents in Ondo East local government had an eyeworm history of 23 (28.8%) and occurrence of loiasis was 02 (2.5%), these were the highest figures recorded. Using the SPSS version 10 package for data analysis, demographic factors of age and gender were not significant determinants of prevalence (> 0.05). Ondo East and Ifedore local governments had significant levels of loiasis prevalence (*$p < 0.05$*). Adverse reactions from the retrospective ivermectin administration was 04 (0.83%). This was statistically insignificant (*$p > 0.05$*).*
Conclusion: *Market surveys in rural communities were considered to be cost effective and rapid in the determination of prevalence of any disease. Since less than 40% of the respondents in the study area reported having had a history of eyeworm, the entire area was classified as "low risk" as regards the administration of ivermectin.*

Encuesta de Mercado de Loiasis: Prevalencia y Reacciones Adversas a la Ivermectina Usando un Procedimiento Rápido para la Loiasis

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RESUMEN

Objetivos: *1. Evaluar los niveles de endemicidad de loiasis en un total de 30 poblados seleccionados, que abarcan un area de 5.2 sq km in Owo, Akure North, Akure South, Ondo East, Ondo West y los gobiernos locales de Ifedore in Ondo State, Nigeria, usando una evaluación rápida para técnica de loiasis.*
2. Obtener información acerca de las reacciones adversas que ocurrieron durante las administraciones previas del medicamento invermectina usado para el tratamiento de loiasis y onchocerciasis en el área de estudio.
Métodos: *Se obtuvo el consentimiento del presidente de cada uno de los gobiernos locales de los poblados de cabecera, así como de los individuos cooptados para la realización del estudio. Se entrevistaron un total de 480 individuos, 80 de cada uno de los seis gobiernos locales, durante los días*

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de mercado regularmente programados para la comunidad. Se llevó a cabo una encuesta de Loa loa *de acuerdo con las especificaciones de las "Guías para la evaluación rápida de* Loa loa".

Resultados: *De los 480 encuestados, 80 (16.7%) reportaron haber tenido una historia de loiasis, mientras que 11 (2.3%) tuvieron padecimientos recientes de esta enfermedad. El nombre local dado a esta enfermedad en todos los poblados estudiados es "aran oju". Los encuestados en el gobierno local de Ondo East local tenían antecedentes de gusano ocular de 23 (28.8%) y la manifestación de loiasis fue 02 (2.5%). Estas fueron las cifras más altas registradas. Usando el paquete SPSS versión 10 para el análisis de datos, se observó que los factores demográficos de edad y sexo no fueron significativamente determinantes de la prevalencia (> 0.05). Los gobiernos locales de Ondo East y de Ifedore tuvieron niveles significativos de prevalencia de loiasis (*$p < 0.05$*). Las reacciones adversas de la administración de ivermectina retrospectiva fue 04 (0.83%). Esto fue estadísticamente significativo (*$p > 0.05$*).*

Conclusión: *Las encuestas de mercado en las comunidades rurales fueron consideradas costo-efectivas y rápidas en la determinación de la prevalencia de cualquier enfermedad. Puesto que menos del 40% de los encuestados en el área de estudio reportaron haber tenido una historia de gusano ocular, toda el área fue clasificada como de "bajo riesgo" en relación con la administración de la invermectina.*

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INTRODUCTION

Loa loa commonly referred to as the eye worm and the causative agent of loiasis is one of the filarial diseases ravaging rural dwellers in the rain forest zone of Southern Nigeria, Ondo State inclusive (1). Some studies have been reported on *Loa loa* in Nigeria, these include Giles (2), Ogunba (3–5), Udonsi (6), Ufomandu *et al* (7) and Ranque *et al* (8). Akinboye and Ogunrinade (9) reported *Loa loa* prevalence rates ranging from 0% to 10% in different study sites in Ibadan, Western Nigeria. In Northern Nigeria, Akogun (10) and Ufomandu *et al* (7) recorded *Loa loa* prevalence rates of 0.9 – 5.2% and 12.4% for Gongola State (now Taraba and Adamawa States) and Plateau State respectively. In Eastern Nigeria, Udonsi (6) found *Loa loa* microfilariae in the blood of 10 – 15% of persons sampled in villages in Imo State. In endemic areas of *Loa loa*, coinfection with onchocerciasis or lymphatic filariasis in patients treated with ivermectin have resulted in adverse reactions such as encephalopathy (11). This threatened the success of the African Programme for Onchocerciasis Control (APOC), which was set up in 1995 by the World Health Organization. The goal was to establish sustainable community directed systems for ivermectin delivery to over 50 million people in 19 countries. The ultimate aim was that of eliminating onchocerciasis as a disease of public health importance. It became imperative therefore, to assess the level of loaiasis endemicity in communities before initiating mass treatment. Rapid Procedure for Loiasis (RAPLOA) (12) was developed to enable rapid assessment of the disease prior to ivermectin distribution. Ondo State lies in the rain forest vegetational zone with established endemic prevalence of onchocerciasis (4). Ivermectin distribution commenced in Ondo State in 1995 and the six local government locations studied are definite areas of community directed treatment with ivermectin.

Regular community scheduled market days operates in traditional rural societies in developing countries. These community markets bring together people of diverse interests and occupations from nearby towns and villages within the local government, thus providing an interactive forum for obtaining information. It is considered that a market survey is rapid and cost effective, as many villages are isolated and difficult to access by road especially during the rainy season. This approach was hereby incorporated with the rapid procedure for loiasis.

The objective of this study is to evaluate the prevalence of loiasis and investigate retrospectively the adverse consequences reported by some individuals in the state's research on *Loa loa* in Nigeria which will be relevant to two disease control programmes namely, the ongoing onchocerciasis control programme and the National Lymphatic Filariasis Control programme which is yet to commence on a nationwide basis.

METHODS

Study Area

The study area consisted of thirty villages in six local government zones covering an area of 5.2 sq. km. in Ondo State viz. Owo, Akure North, Akure South, Ifedore, Ondo East and Ondo West. These locations have ongoing programmes of Community Directed Treatment with Ivermectin (CDTI). Ondo State is in the rain forest and forest mosaic vegetation zone of South West Nigeria.

Survey for *Loa loa*

Advocacy visits were made to the administrative headquarter of each local government where permission was granted to carry out the survey. The scheduled market days in the local government were obtained. The exercise was carried out in collaboration with Ministries of Health in the State/Local Government Areas as well as the communities to be sur-

veyed. The study was conducted within the period September 7, 2003 to May 20, 2005.

Preliminary visits were made to the villages for mobilization. A date preferred by the villages for the exercise was selected and a timetable for the visits prepared. During these visits, coordinates of the villages was taken using Geographical Positioning System (GPS) and recorded. Survey for *Loa loa* was carried out according to specifications in "Guidelines for rapid assessment of *Loa loa*" (12). The community level questionnaire was administered to key informants in order to identify and record local names used for eye worm. These names were then used during interviews of individuals. In each village, a guide was assigned by the village head to take team members around.

The bottle spinning method was adopted in sampling. A bottle was spun on the ground and the direction of the mouth of the bottle, when it came to standstill, was selected. The first household was visited and all persons 15 years and above, who have been resident in the village for at least five years, were interviewed using rapid assessment of *Loa loa* technique.

Individual consent was obtained before the interview. This was continued for other households in the selected direction until 80 respondents had been interviewed. These 80 respondents were selected out of 500 individuals in each local government area (12).

Whenever the team got to the last house in the selected direction without reaching 80 adults, the bottle was spun again in the original spot to select another direction. As specified in the guidelines, three questions were asked in the following order:

1. Have you ever experienced or noticed worms moving along the white part of your eye?
   The response to this question was recorded, then a photograph of the eye was shown before asking the second question.
2. Have you had the condition in this picture?
   The response was recorded before the third question was asked.
3. The last time you had this condition, how long did the worm stay?
   For each village, the results of the survey were summarized on a special form.

Collection of information on adverse reactions

Information on adverse reactions was collected from key informants and individuals interviewed during rapid assessment of *Loa loa*.

Data/information processing

Information gathered was entered in the summary of survey results form. Proportion of subjects who said yes to the three questions (history of eye worm) was determined for each village. The villages were further classified as: (a) High risk – where more than 40% of the respondents report a history of eye worm. (b) Low risk – where less than 40% of the respondents reported a history of eye worm.

Statistical Analysis

Simple linear regression using SPSS Version 10 package was applied to determine the relationship of rapid assessment of *Loa loa* indices with occurrence of adverse reactions.

RESULTS

The major language in the state is Yoruba. The existence of a local name was confirmed during the interviews. The local name for the eyeworm in the various ethnic groups of the state is "aran oju" meaning worms of the eye. The Calabar swelling in some areas is known as "awoka" or "ebutu". The prevalence of loiasis as expressed by the history, occurrence and reaction to ivermectin treatment in the six markets, in different local governments are shown in Table 1. In these markets, out of a total 480 respondents, 80 (16.7%) reported having a history of loiasis, 11 (2.3%) had occurrence of loiasis and 04 (0.83%) experienced adverse reactions to ivermectin treatment. Markets in Ondo East and Ifedore local governments recorded the highest figures with respect to the three factors. Respondents in Ondo East local government had the highest record of eye worm history (28.8%) while Ondo West had the least report of eye worm disease [3.8%], (Table 1). In all markets visited, 12.5% of males and 18.2% of females reported having had a history of eye worm infection (Table 2) but the difference was not statistically significant ($p > 0.05$). In the age stratified survey of loiasis history, the category > 71, recorded the highest percentage of 50.0% and the least was reported in the category 21–30 years, 11.9% (Table 3).

Table 1: Prevalence of Loiasis by Market Survey in South West Nigeria

LG Code	Local Govt Name		History		Occurrence		Severe adverse reaction	
			Yes	No	Yes	No	Yes	No
01	Owo	Count	17	63	0	80	0	80
		%	21.3	78.8	0	100.0	0	100.0
02	Akure North	Count	06	74	0	80	0	80
		%	7.5	92.5	0	100.0	0	100.0
03	Ifedore	Count	22	58	08	72	01	79
		%	27.5	72.5	10.0	90.0	1.2	98.8
04	Akure South	Count	09	71	0	80	0	80
		%	11.3	88.8	0	100.0	0	100.0
05	Ondo East	Count	23	57	02	78	02	78
		%	28.8	71.3	2.5	97.5	2.5	97.5
06	Ondo West	Count	03	77	01	79	01	79
		%	3.8	96.3	1.2	98.8	1.2	98.8
Total		Count	80	400	11	469	04	476
		%	16.7	83.3	2.3	97.7	0.83	99.2

Respondents in Ifedore local government had the highest number of occurring cases, 08 (Table 1), while Owo,

Table 2: Gender based prevalence of Loiasis by market survey in six Local Governments of Ondo state, South West Nigeria

Gender		History of Loiasis		Occurrence		Severe adverse reaction report		Total	
		Yes	No	Yes	No	Yes	No	Yes	No
Male	Count	16	112	1	127	02	126	19	109
	%	12.5	87.5	0.8	99.2	1.6	98.4	14.8	85.2
Female	Count	64	288	10	342	02	350	76	276
	%	18.2	81.8	2.8	97.2	0.6	100.0	21.6	78.4

Table 3: Age stratified market survey of Loiasis history in six Local Governments of Ondo State, South West Nigeria

Age category (years)		History of loiasis		
		Yes	No	Total
15–20	Count	12	57	69
	%	17.4	82.6	100.0
21–30	Count	17	126	143
	%	11.9	88.1	100.0
31–40	Count	17	102	119
	%	14.3	85.7	100.0
41–50	Count	13	55	68
	%	19.1	80.9	100.0
51–60	Count	07	31	38
	%	18.4	81.6	100.0
61–70	Count	10	25	35
	%	28.6	71.4	100.0
> 71	Count	04	04	08
	%	50.0	50.0	100.0
Total	Count	80	400	480
	%	16.7		

Akure North and Akure South did not report any occurring cases at all. Only one male and ten female respondents had occurring cases of loiasis (Table 2).

Table 4: Stratified occurrence of Loiasis by market survey in six Local Governments of Ondo State, South West Nigeria

Age category (years)		Occurrence of Loiasis		
		Yes	No	Total
15–20	Count	01	68	69
	%	1.4	98.6	100.0
21–30	Count	0	143	143
	%	0	100.0	100.0
31–40	Count	03	116	119
	%	2.5	97.5	100.0
41–50	Count	02	66	68
	%	2.9	97.1	100.0
51–60	Count	01	37	38
	%	2.6	97.4	100.0
61–70	Count	02	33	35
	%	5.7	94.3	100.0
> 71	Count	02	06	08
	%	25.0	75.0	100.0
Total	Count	11	469	480
	%	2.3	97.7	100.0

Age category 31–40 years recorded the largest number of occurring cases of loiasis, 03 (2.5%) while the age group 21 – 30 years had no occurring cases at all. Statistically, the difference was insignificant [$p > 0.05$], (Table 4). Ondo East reported the largest number of cases of adverse reactions, 02 (2.5%), while Owo, Akure North and Akure South had no cases at all (Table 1). Gender based considerations showed that 02 (1.6%) males and 02 (0.6%) females reported adverse reactions to ivermectin administration (Table 2). The difference was not statistically significant ($p > 0.05$). Age group 61–70 years reported only one case of adverse reactions, (2.9%) while age groups 15–21, 21–30 and > 71 years had no such reports. The difference in the values reported for each group was not statistically significant ($p > 0.05$; Table 5).

Table 5: Age stratified market survey of severe adverse reaction (SAR) to ivermectin administration in six Local Governments of Ondo State, South West Nigeria

Age category (years)		Occurrence of Loiasis		
		Yes	No	Total
15–20	Count	0	69	69
	%	0	100.0	100.0
21–30	Count	0	143	143
	%	0	100.0	100.0
31–40	Count	01	118	119
	%	0.8	99.2	100.0
41–50	Count	01	67	68
	%	1.5	98.5	100.0
51–60	Count	01	37	38
	%	2.6	97.4	100.0
61–70	Count	01	34	35
	%	2.9	97.1	100.0
> 71	Count	0	08	08
	%	0	100.0	100.0
Total	Count	04	476	480
	%	0.8	99.2	100.0

DISCUSSION

The morbidity due to loiasis has recently gained renewed attention because of reported reactions to ivermectin (Mectizan) treatment (11). In communities where *Loa loa* is highly endemic, there were reports of severe adverse reactions following administration of ivermectin as treatment for either

onchocerciasis or lymphatic filariasis (12). Mass treatment with ivermectin is the principal intervention in the programmes to eliminate onchocerciasis and lymphatic filariasis as public health problems from the African continent (12). The risk of adverse reactions has been shown to increase with intensity of *Loa loa* infection (13). In Ondo State, local government scheduled market days are held in high esteem, hence the congregation of a large population from diverse communities for varied business transactions. It is considered that the market survey is rapid and cost effective, eliminating the problems of movement to the diverse isolated communities with usually poor quality or unmotorable roads. The opportunity of the market day was utilized in this survey to interact with the people and obtain relevant information.

Using the rapid procedure for loiasis technique, 16.7% of 480 respondents reported having had a history of eye worm in past years and a present occurrence of 2.3%. Akinboye and Ogunrinade (9) reported *Loa loa* prevalence rates ranging from 0–10% in different study locations in Ibadan, Oyo State, Western Nigeria. Similarly, in the north, Akogun (10) and Ufomandu *et al* (7) recorded loiasis prevalence of 0.9–5.2% and 12.4% for Gongola State (now Taraba and Adamawa States) and Plateau State respectively. However, Udonsi (6) reported a higher prevalence of 10 – 15% in Imo State. In Ondo State, the prevalence of loiasis occurrence reported in this study ranged from 0% to 16.7%. Ondo East local government recorded the highest prevalence of loiasis within the area under community directed treatment with ivermectin.

The African Programme for Onchocerciasis Control (APOC) in Ondo State, commenced in 2001, with annual record of ivermectin distribution in most of the villages. It is probable that the low prevalence of loiasis reported in this study, may account for the low occurrence of adverse reactions to ivermectin administration. The continued distribution and administration of ivermectin will result in low community infection rates with microfilariae thereby interfering with transmission. As recorded for most respondents with loiasis, the first administration of ivermectin elicited the most severe reaction, subsequent administrations did not result in adverse reactions. It has also been reported that the occurrence of adverse reactions reduces with yearly repeated treatment with ivermectin (12). With time, most community directed treatment with ivermectin areas in the state will continue to experience reduced reactions as treatment would have been repeated for years. This survey has shown that loiasis infection in areas studied is of low risk since less than 40% of the respondents reported a history of eye worm.

Loiasis distribution was also found not to be gender or age biased as none of these factors were statistically significant when tested. It is necessary to determine the endemicity of *Loa loa* in areas qualified for community directed treatment with ivermectin before the commencement of drug administration. Similar *Loa loa* endemicity report should be obtained for various locations in Nigeria where control of lymphatic filariasis will be effected using ivermectin and albendazole.

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