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Paragonimiasis: A knowledge and awareness survey of clinicians in southern Nigeria on a neglected tropical disease

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Abstract

Context: Paragonimiasis is one of the re-emerging neglected tropical diseases endemic in southern Nigeria. Its symptomology is similar to that of tuberculosis resulting in frequent cases of misdiagnosis
Objective: To determine the knowledge of clinicians in one of the endemic states in southern Nigeria on the cause and transmission of paragonimiasis.
Methods: A questionnaire based, descriptive cross-sectional study was conducted among Resident doctors in the departments of Internal medicine, Paediatrics, family medicine, community health and Obstetrics and gynaecology practising in University of Uyo Teaching Hospital. The doctors were consecutively recruited during their weekly academic training meetings in February 2020. Data was analysed using Stata version 10.
Results: A total of 61 respondents filled the questionnaires out of which 45 (73.8%) doctors admitted to have heard about the disease previously and the commonest source was from medical school in 29 (60.4%) of the respondents. Forty five (73.4%) respondents correctly identified the causative agent of paragonimiasis as a helminth. The top three symptoms identified by respondents were haemoptysis 37 (60.7%), cough 37 (60.7%) and chest pain 30 (49.2%). Seventeen (27.9%) respondents could correctly identify the sequelae of paragonimiasis. The confirmatory investigations requested for were stool analysis, sputum analysis by six (28%) and five (23.8%) respondents respectively. Nineteen (31.1%) respondents knew the correct mode of transmission and 23 (37.7%) respondents knew that paragonimiasis mimics TB. Only 3 (15%) respondents knew praziquantel as drug of choice. The majority 43 (70.5%) had never treated the condition. Only 21 (34.4%) of the respondents had a good level of knowledge of the symptoms of paragonimiasis.
Conclusion: This study has identified a knowledge gap in the aetiology, route of transmission, diagnosis, treatment and complications of paragonimiasis among clinicians in an endemic area in southern Nigeria. We therefore recommend intensified efforts in training clinicians and other health workers on the aetiology and diagnosis of paragonimiasis through regular continuous medical education of their professional associations, departmental academic programs and update courses of the various postgraduate colleges in order to prevent misdiagnosis and delayed treatment of patients with paragonimiasis.

Keywords: Paragonimiasis, knowledge, clinicians, southern Nigeria.

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Introduction

Paragonimiasis is one of the remerging neglected tropical diseases (NTD) being targeted for eradication by the World health organisation.[1] Reports from Southern Nigeria have confirmed its endemicity in this area. [2-6] A previous study has reported a prevalence of 4.9% among children in a

water-adjoining/riverine community that shares a common boundary with Cameroon.[7] Paragonimiasis is a food borne disease caused by the trematode Paragonimus, a lung fluke with about 10 species associated with morbidities in man. The commonest specie in man is *P. westermani*. Others include *P. uterobilateralis* and *P. africanus*, which are endemic in Africa.[3] Human infection is acquired by the consumption of raw or partially cooked crustaceans (including crayfish and crabs).[8] The pulmonary infection is characterized by cough, haemoptysis, chest pain and radiographic abnormalities, which are very similar to those seen in tuberculosis. The close similarities between paragonimiasis and tuberculosis both clinically and radiologically usually leads to a lot of misdiagnosis and confusion amongst clinicians.[9, 10,11] As a result of frequent misdiagnosis, many patients end up having anti-tuberculous chemotherapy with a consequent delay in initiating the relevant treatment for paragonimiasis.[10,12] Shim and co-workers [13] reported that TB was diagnosed in 46% before the final diagnosis of pulmonary paragonimiasis was eventually made. Jeon *et al*[14] reported that 30% of their patients had received a tentative diagnosis of pulmonary TB on their initial visit. Another diagnostic dilemma in adults is differentiating paragonimiasis from malignancies, even in areas where paragonimiasis is endemic.[15] Twenty-eight percent of the pulmonary paragonimiasis patients in the series by Jeon et al[14] were presumed to have had pulmonary malignancies on their initial visit. These results emphasize the necessity of generating awareness among clinicians about the inclusion of paragonimiasis in the differential diagnosis of TB, as well as pulmonary malignancies. These reports of delayed diagnosis and misdiagnosis are pointers to the emerging need for the parasitological training of doctors and other health workers as raised in some previous reports.[16, 17]

This study is therefore an attempt to determine the knowledge of the cause, transmission, diagnosis and treatment of paragonimiasis by clinicians in one of the endemic states in southern Nigeria. It is hoped that information from this study will assist in the design of interventions for the training of clinicians in paragonimiasis and TB endemic areas. It will also enable health policy makers to plan appropriate control measures subsequently.

Method

This descriptive questionnaire based cross-sectional study was conducted among medical doctors practising in Akwa Ibom State from January to February 2020. The study was carried out in Uyo, the capital city of Akwa Ibom state. The state is located in the south-south geopolitical zone of Nigeria. It has 31 Local Government Areas, 3 Senatorial Districts and a 2018 projected population of 5,737, 270.[18] There are a total of 220 Resident Doctors in University of Uyo Teaching hospital (UUTH). Majority of them are fulltime residents, however they are quite a number of supernumerary residents from the state government employ and some private facilities. The teaching hospital trains Resident Doctors in subspecialties of Community Health, Family Medicine, Internal Medicine, Paediatrics, Laboratory Medicine, Radiology, Dental Surgery, Ophthalmology, Otolaryngology, Obstetrics and Gynaecology and Surgery. Sub-specialties that are usually at the front line of seeing cases that may have paragonimiasis either in outpatient consultations or during outreaches include Community Health, Family Medicine, Internal Medicine, Paediatrics and Obstetrics and Gynaecology.

The study was conducted among the 113 frontline resident doctors practicing in UUTH. Resident Doctors in other departments were excluded from the study. The study period of January and February coincided with when most residents attend update courses with either the National Postgraduate Medical College of Nigeria or West African colleges as such some residents attended these courses. All residents in the five selected departments who consented were recruited into the study during their departmental academic meetings. Total sampling was thus used to recruit all available residents at the level of the departments. Consecutive sampling technique was used to recruit every consenting resident doctor at such meetings. Each department organizes weekly academic sessions as part of training for her resident doctors. Consent of the doctors were sought and all who agreed were recruited into the study by research assistants trained to collect data. Participants were asked not to complete the questionnaires if they had done so in previous meetings to avoid double recruitment of same participants

A self- administered semi structured pretested

questionnaire developed by researchers based on the specific objectives of the study after a thorough literature review was used for data collection. It was pre-tested among NYSC doctors in the state and was further evaluated by experts in public health to ensure quality and content validity.

The questionnaire consisted of two sections (A and B). Section A obtained respondent's awareness and knowledge of causative agent, host, habitat, organs affected by paragonimiasis while section B obtained information on symptoms, diagnosis and treatment of paragonimiasis. In all, 20 questions assessed knowledge in these various areas. Every correct response was scored one point and wrong responses zero point. The maximum score per respondent was 20 points and minimum of zero point. The level of knowledge of paragonimiasis was categorized into poor (scores of less than 10) and good (scores of 10-20).

Data obtained was collated and analysed using Stata statistical software version 10.0 for windows. Categorical variables were summarised using frequencies and percentages.

Ethical clearance was obtained from the UUTH ethical committee. Informed consent was obtained from respondents. The voluntary nature of study was explained to them and non-participation attracted no penalties. They were assured of absolute confidentiality of data obtained from them.

Results

A total of 61 resident doctors responded to the questionnaires. The majority 57 (93.4%) were government employed doctors. About a quarter 15 (24.6%) were from obstetrics and gynaecology department. Twenty three (38.3%) doctors have spent between 6 to 10 years as doctors, while 22 (36.1%) doctors usually see patients /clients of all ages both males and females. (Table 1)

Forty five (73.8%) doctors had heard about the disease previously and the commonest source was from medical school in 29 (60.4%) of the respondents. The majority of doctors (73.8%) knew that helminths were the causative agent, however, only 8 (13.1%) knew that humans were the natural/definitive host. More than half of the doctors

Table 1: Employment and clinical characteristics of respondents

Variable	Number (n)	Frequency (%)
Place of employment		
Private	4	6.6
Government	57	93.4
Specialty		
Community Medicine	9	14.8
Family Medicine	13	21.3
Obstetrics and Gynaecology	15	24.6
Internal Medicine	11	18.0
Pediatrics	13	21.3
Duration in medical practice		
1-5 years	18	30.0
6-10	23	38.3
11-15	18	30.0
16-20	1	1.7
Type of patients seen		
Children only	13	21.3
Adults only	11	19.0
Women only	15	24.6
All ages both males and females	22	36.1

Table 2: Awareness and knowledge of causative agent and Host of the disease

Variable	Number (n)	Frequency (%)
Ever Heard of Paragonimus Uterobilateralis?		
Yes	45	73.8
No	16	26.2
Source of information (45*)		
Medical school	29	60.4
Self read	12	25.0
Colleagues	2	4.2
Others	5	10.4
CME	0	0
Causative organism		
Helminth	45	73.8
Don't know/can't remember	11	18.0
Fungi	2	3.3
Bacteria	1	1.6
Virus	1	1.6
Others	1	1.6
Natural Host		
Don't know/can't remember	24	39.3
Crabs	20	32.8
Snails	9	14.8
Humans	8	13.1
Intermediate Host		
Don't know/can't remember	37	60.7
Snails	13	21.3
Crabs	5	8.2
Crayfish	4	6.6
Boars	2	3.3
Natural Habitat		
Don't know/can't remember	28	45.9
Lungs	26	42.6
Urinary tract	5	8.2
Stomach	1	1.6
Blood stream	1	1.6
Other organ it can affect		
No response	25	41.0
Liver	20	32.8
Brain	12	19.7
Kidney	2	3.3
Scrotum	1	1.6
Others	1	1.6

*=Multiple responses allowed

Table 3: Knowledge of symptoms, place of occurrence and sequelae among respondents

Variables	Number (n)	Frequency (%)
Symptoms *		
Cough	37	60.7
Haemoptysis	37	60.7
Chest pain	30	49.2
Weight loss	18	29.5
Fever	14	22.9
Endemic in Nigeria		
Don't know/can't remember/No	48	78.7
Yes	13	21.3
Any other endemic country		
Don't know/can't remember/NR	45	73.8
Equatorial guinea	6	9.8
Cameroun	5	8.2
Liberia	4	6.6
Others	1	1.6
Any sequelae		
Yes	30	49.2
No	12	19.7
No response	19	31.1
Known sequelae (n=17)		
Respiratory failure	1	5.9
bronchiectasis	1	5.9
Enterocolitis	1	5.9
Pneumonia	1	5.9
Lung collapse	3	17.6
Secondary bacterial infection	1	5.9
Lung fibrosis	1	5.9
Hemoptysis	1	5.9
Severe anaemia	4	23.5
Chest pain	1	5.9
Death	2	11.8

*=Multiple responses allowed

Table 4: Knowledge of diagnosis and transmission of Paragonimiasis

Variables	Number (n)	Frequency (%)
How is diagnosis confirmed*(n=21)		
Stool microscopy	6	28.6
Sputum microscopy	5	23.8
Urine MCS	7	33.3
CXR	3	14.3
Clinically	2	9.5
PCR	1	4.8
Liver biopsy	1	4.8
Serology	1	4.8
Mode of transmission		
Eating improperly cooked crustaceans	19	31.1
Faeco-oral	11	18.0
Water-borne	10	16.4
Don't know/don't remember/No response	20	32.8
Aerosol	1	1.6
Common Infection it can mimic		
Tuberculosis	23	37.7
Schistosomiasis	17	27.9
Don't know/don't remember	17	27.9
Onchocerciasis	4	6.6
Facilities in your hospital for Lab diagnosis	10	16.4
Yes	33	54.1
No	18	29.5
No response		
Do you request investigations for paragonimiasis?		
Never	38	62.3
Occasionally	11	18.0
Frequently	1	1.6
No response	11	18.0
If you do, what test do you request?[n=12]		
Chest x ray	2	16.7
Stool microscopy	3	25.0
Urine microscopy	1	8.3
Sputum microscopy	1	8.3
No response	5	41.7

*=Multiple responses allowed

Table 5: Knowledge of Treatment of Paragonimiasis infection among respondents

Variables	Number (n)	Frequency (%)
How is it treated		
Antihelminthic	20	32.8
Antifungal	1	1.6
Drug/medications	3	4.9
No response	37	60.7
Antihelminthic class [n=20]		
Non-specific Antihelminthic	16	80.0
Praziquantel	3	15.0
Pyrantel pamoate	1	5.0
How often do you treat		
Never	43	70.5
Rarely	8	13.1
Fairly frequently	1	1.6
No response	9	14.8

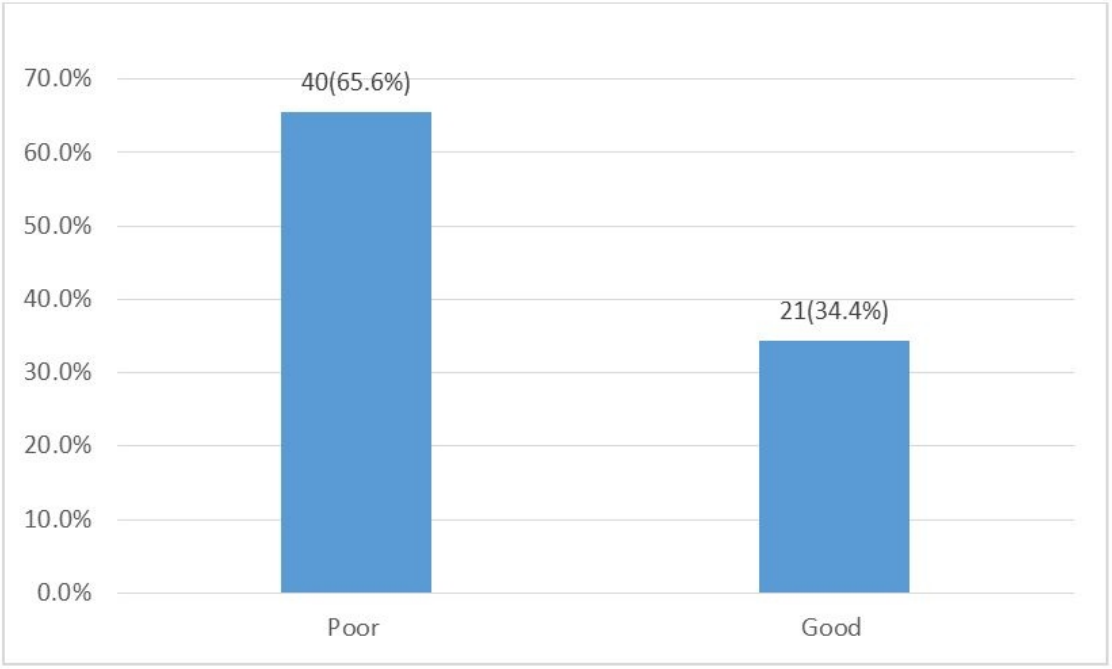

Figure 1: Level of knowledge of Paragonimiasis infection among respondents

(37 out of 61) did not know the intermediate host. Twenty six (42.6%) doctors knew that the lungs was the natural habitat of the agent. The liver and brain were the other two organs known by the respondents as areas of affectation (32.8% and 19.7% respectively). (Table 2)

The two top symptoms known by the respondents were cough and haemoptysis 37(60.7%) respectively. Forty eight (78.7%) of the respondents did not know that paragonimiasis is endemic in Nigeria and almost an equal number 45(73.8%) did not know any other country where the disease is endemic. Thirty (49.2%) of the respondents knew the disease had sequelae; severe anaemia and lung collapse (23.5% and 17.6% respectively) were the top two sequelae mentioned by the respondents.

(Table 3)

Only a few respondents knew the correct methods for confirming the diagnosis of paragonimiasis. The confirmatory investigations requested for were stool analysis, sputum analysis by six (28%) and five (23.8%) respondents respectively. Nineteen (31.1%) respondents knew the correct mode of transmission and 23 (37.7%) respondents knew that paragonimiasis mimics TB. Only 10 (16.4%) respondents knew that paragonimiasis could be diagnosed in their hospital. Only one (1.6%) respondent frequently requested for investigations to confirm paragonimiasis. The 2 top investigations requested by physicians were CXR and stool microscopy. (Table 4)

Twenty (32.8%) respondents knew that anti-helminthics are used for its treatment and only 3 (15%) respondents knew praziquantel as drug of choice. The majority 43 (70.5%) have never treated the condition. (Table 5)

Figure 1 shows that the level of knowledge of paragonimiasis among clinicians in southern Nigeria was generally low with 40 (65.6%) out of 61 respondents having poor knowledge of the aetiology, diagnosis, treatment and complications of paragonimiasis.

Discussion

Evidence of the re-emergence of paragonimiasis is reported in Nigeria [19] and other parts of the world.[20] Knowledge of its symptoms among doctors is thus necessary for its prompt diagnosis and subsequent management of the condition. Our study has shown that 73.4% of our respondents were aware of the disease, however the level of knowledge of the diagnosis, treatment and complication of the disease is generally low. This is not unexpected as majority of those who had some knowledge reported that they were taught in medical school. Considering that most (70%)of our respondents had been in practice for six years or more, it is therefore likely that they had forgotten most of what was taught and these may have accounted for the poor level of knowledge.

This study found that the majority of the respondents were aware of paragonimiasis. This finding is different from that of a similar study in Imo state which reported a lack of awareness of paragonimiasis amongst health workers in health centers.[21] The higher proportion of respondents that have heard about the disease in this study may be due to the fact that respondents were doctors who had been taught and are supposed to be knowledgeable about the disease in order to be able to make accurate diagnosis of the condition. The Imo state study however, did not state the category of health workers. Low level of awareness of paragonimiasis (23.7%) was also reported among community members.[21]

Knowledge of symptoms of paragonimiasis is essential to making a correct diagnosis of the disease amongst health workers. This study revealed haemoptysis and cough as the two common symptoms known by the respondents while weight loss and fever were the least known symptom. Less than half of the doctors had good level of knowledge of the symptoms. In a related study, not even one case of paragonimiasis had been suspected or diagnosed in the health centers by the health workers despite the known fact of the re-emergence of the disease.[20] This low index of suspicion of paragonimiasis may keep the reemergence unnoticed and result in an increased misdiagnosis with TB. All cases of cough and haemoptysis or rusty sputum were investigated for pulmonary tuberculosis or HIV without the inclusion of paragonimiasis in the differential diagnosis.[20]A good level of knowledge of the symptoms of paragonimiasis which are shared with pulmonary tuberculosis is necessary for its diagnosis especially in areas where both diseases are endemic.

Our study showed that 73.8% of our respondents could identify the cause of paragonimiasis as a helminth, however only 31% of respondents knew that the disease was transmitted through eating improperly cooked crustaceans. This lack of knowledge of the route of transmission is likely to result in a deficient history, with an inability to make the proper diagnosis and give appropriate treatment. In addition, the doctor will be unable to appropriately counsel the client on the correct preventive measures to take to avoid reinfection. This lack of knowledge in the route of transmission of paragonimiasis may not be unconnected to the reduced hours of didactic training in human parasitology, the lack of well-qualified teaching staff in some universities which affects the quality

of human Parasitology teaching and the compromised quality of laboratory teaching due to the ever increasing number of students, relatively restricted budgets, and limited laboratory facilities. In addition the reduced emphasis on parasite control may also contribute to the poor knowledge exhibited by our respondents. These factors have also been reported in Chinese study as some of the challenges faced in medical training in human parasitology. [22]

The three highest confirmatory test indicated in our study population were stool, sputum and urine microscopy. Previous studies have reported the usefulness of stool microscopy in the detection of *paragonimus spp* especially in children who swallow their sputum.[23,24] Some of the demerits identified in stool microscopy were its poor sensitivity, low yield and the inability to differentiate *paragonimus spp,* from similar looking ova like *clonorchis* and *schistosoma spp*.[23] Therefore sputum microscopy is still found to be superior to stool microscopy in children.[25,26] However, a combination of stool and sputum microscopy could give a higher yield.[26]

Two of our respondents reported that they occasionally requested for chest x-rays in their pursuit of the diagnosis of paragonimiasis. It should however be noted that some studies have reported the inability to differentiate paragonimiasis and tuberculosis radiologically.[13,27] A study in southern Nigeria reported soft tissue wasting as the only differentiating radiographic feature between both diseases.[9] The inability to differentiate TB and paragonimiasis has led to frequent misdiagnosis with many patients receiving Anti-tuberculous medication initially with a consequent delay in initiating the relevant treatment for paragonimiasis as has been reported in previous series.[10,12] Another diagnostic dilemma in adults is differentiating paragonimiasis from pulmonary malignancies, even in areas where paragonimiasis is endemic.[15] Twenty-eight percent of the pulmonary paragonimiasis patients in a Korean series[14] were presumed to have had pulmonary malignancies on their initial visit. These misdiagnosis is to be noted especially in southern Nigeria, where paragonimiasis and tuberculosis are endemic. In addition, paragonimiasis should also be considered as a differential for pulmonary malignancies. In view of the low level of knowledge of the aetiology, diagnosis, differential diagnosis and treatment of paragonimiasis among our resident doctors, we suggest that formal didactic trainings on paragonimiasis and other neglected tropical diseases should be incorporated into their residency training as this has been shown to improve their knowledge of parasitologic diseases in some residents in United States of America. [28]

Conclusion

Our study has showed a low level of awareness among clinicians on the aetiology, route of transmission, diagnosis, and treatment of paragonimiasis. These results emphasize the necessity of generating awareness among clinicians about the inclusion of paragonimiasis in the differential diagnosis of TB, as well as pulmonary malignancies. We therefore recommend intensified efforts in training clinicians and other health workers on the aetiology and diagnosis of paragonimiasis through update courses in the various postgraduate colleges, continuous medical education of their various professional associations, and regular departmental seminars in order to prevent misdiagnosis and delayed treatment of patients with paragonimiasis.

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