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Human *Onchocerciasis*:epidemiologyamong children and teenagers aged 1-15 years, in a rural Nigerian farm settlement

Abstract

The study was carried out to determine the prevalence of onchocerciasis among children 1-15 years of age in Adani, Enugu state. The survey was done using rapid assessment method (RAM). A total of 210 subject were examined, out of which 66 (31.4%) were shown to be positive.Onchocerca skin disease (21.4%) demonstrated a higher occurrence among all the symptoms observed followed by onchocercoma (8.6%) and leopard skin (1.4%) respectively. Age was shown to be a major determinant for onchocerciasis prevalence, as 13-15years age group had the highest percentage of occurrence (41.0%) while the 1-3years age bracket had the least (16.7%), demonstrating the cumulative nature of the disease as it occurs with advance in age.There was no significant difference between the male (45.5%) and female (35.3%) infections (P>.05). The frequency of Onchocerca Skin Deisease (OSD) studied revealed that Acute Popular Onchodermatitis (APOD) appeared most among the children (71.7%) while Depigmentation (DPM) had the least occurrence (4.4%).Nodules location and leopard skin were also looked out for among the subject with none of the candidates showing sign of visual impairment or blindness.

Keywords: onchocerciasis, *Simuliumdamnosum*, prevalence, infection, children, symptoms, age, sex

INTRODUCTION

Onchocerciasisis classified as one of the neglected tropical diseases, and a member of the medically diverse group of tropical infections that is always prevalent in low-income population in developing region of Africa, Asia and America. It is a chronic, communicable, slowly progressive, parasitic disease which has been rated as the second-leading infectious cause of blindness worldwide with approximately 500,000 people blind annually [1, 2]. Besides being a disease of the warm tropical environment, its parasitic flies live under conditions favourable for their development all year round [3, 4, 5].They are parasitic diseases usually caused by filarial nematode, *Onchocerca volvulus*. Adult worm (macrofilariae) has been implicated tolodge in

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palpable nodules under the skin of infected humans and also in subcutaneous tissue [6].The initial infestation often occurs in childhood, and many of the affected individuals remain asymptomatic for long periods. It affects mostly the rural population mostly farmers. The World Health Organization's Onchocerciasis Control Program has successfully reduced the prevalence of onchocerciasis by interfering with the transmission of the parasite and by mass population treatment in the regions at risk. Despite these laudable efforts, the socioeconomic burden resulting from the disabilities caused by onchocerciasis are still enormous [7, 8].There has been report that the worst affected endemic area of this disease is thesavanna zone of West Africa especially in the Volta River basin comprising parts of Benin, Ghana, Mali, Niger and Togo and the whole of Burkina Faso, where there may be up to 15% blindness rate in some endemic villages, with an estimate of at least 70,000 people being visually incapacitated in these areas [9, 10].

Onchocerciasis is a major cause of blindness in parts of Africa where it represents a serious obstacle to socio-economic development with Nigeria estimated to have 30-40% of the world's cases or 60% of the cases in West Africa [11, 12].About 125 million people worldwide are estimated at risk of Onchocerciasis and of these, 18 million people are infected with the disease, of which 99% live in Africa [13]. The disease affects about 10 million people living in scattered foci in the Savannah and Rain forest regions of Nigeria [14].Besides being one of the widest spread filarial diseases that produces grave socio-economic consequences,onchocerciasis isalso deadly because of the feedback effectsit has to productivity, social and sexual lives of sufferers,due to blindness and other debilitating effects [10]. In a related research, Ubachukwu, [15] in a review highlighted various symptoms of Onchocerciasis that could lead to psychosocial and economic consequences in infected persons. Some of these symptoms include itching, Onchocercal Skin Disease, palpable nodules, insomnia, fatigue, Musculo-Skeletal pain, headache, visual impairment and blindness, hanging groins and elephantiasis of the genitals among others.

However, as a result of poor mass campaign and treatment, and also because in most endemic communities children are usually excluded which constitute a sizeable number of the communities. The present research was focused towards evaluating theprevalence of onchocerciasis among children age 1-15 in Adani, Uzouwani local government areaof Enugu state, Nigeria.

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MATERIALS AND METHODS

Study area:

The study area, Adani community in Uzo-Uwani local government area of Enugu state, Nigeria Coordinates: 6°43'60" N and 7°1'0" E in DMS (Degrees Minutes Seconds) or 6.73333 and 7.01667 (in decimal degrees) [16]. 50 km from Nsukka town, Adani is made up of seven villages apart from farm settlements. They are Akutara, Ajuona, Eziama, Uwenakpa, Otuguzo, Iyekeniga and Awuto-Amokwe. The area is intersected by numerous green hills, valleys, relatively rocky landform, with good agricultural soil. As a result of their advantageous rich soil fertility and climatic factors, the people are predominantly farmers as they can grow their plants with no artificial fertilizers. The area is endowed naturally with two major rivers; River Anambra and River Obinna, each linking Anambra state up East and Benue state down North respectively. These rivers are the major breeding sights for blackfly, leaving the community with no alternative for most of its domestic activities and also for consumption during farming. Also, aided by it close proximity to farm when they feel tasty. It also serves as source of water for irrigation. As a result of this high extend of dependence, the villagers make constant visit to the stream and children enjoy swimming in tributaries to the water source.

Samples collection

A total of 210 samples were collected, this was aided by the assistance of the Health Department of Uzo-Uwani health managements board. House to house campaign led by two Community directed distributors aided easy accessibility and quick compliance to questions and clinical examination. Examination of children was carried out in each house hold with the consent of their parents. A friendly and well-structured close and open ended questionnaire was administered. Physical examination of onchocerciasissymptoms was done using Rapid Epidemiological Assessment (REA) method [17], these include palpable nodules, leopard skin, ocular manifestations, and Onchocercal Skin Disease (OSD) viz; Acute PapularOnchodermatitis (APOD), Chronic PapularOnchodermatitis (CPOD), Depigmentation (DPM) and LichenifiedOnchodermititis (LOD).

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Consent

Informed verbal consent was obtained from the head of the community and the parents of the children

Statistical Analysis

The data collected was analyzed using the Statistical Package for Social Sciences (SPSS) version 16. Chi square was used to determine the level of significance in the prevalence of onchocerciasis among sexes while the age effects on the prevalence of the various forms of dermatitis was determined using 2-way analysis of variance (ANOVA).

RESULT

Prevalence of symptoms of infection

A total of 66 (31.4%) of the children studied were positive for the various symptoms of onchocerciasis(Table 1). The symptoms encountered were OSD (21.4%), Nodules (8.6%), and Leopard skin (1.4%). No case of ocular manifestation (blindness) was recorded.

Table 1:Percentage prevalence of onchocerciasis symptoms in children (1 -15 years old) in Adani community, Uzouwani local government areaof Enugu state (n = 210)

Symptoms	Positive cases	Prevalence (%)
Dermatitis	45	21.4
Nodules	18	8.6
Leopard skin	3	1.4
Blindness	0	0
Total	66	31.4

Age and sex-related prevalence of infection

The prevalence of symptoms of onchocercaisis by age grouping showed that children of age group 13-15 years had the highest prevalence of 41.0% while those of age group 1-3 years had the least with 16.7%. The prevalence rate increases with age (Table 2). The difference in infection rates between the various age groups was found to be significantly different ($P<.05$).

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The prevalence of infection between sexes showed that the males had a prevalence rate of 33.7% while the females had a prevalence of 25.5% (Table 2). Males had the highest infection prevalence rate for all age groups except the 8-12 years where the females showed higher prevalence.The difference in infection rate by sex is not significantly difference (*P*>.01).

Tables 2:Sex-specific prevalence of onchocerciasis in children, 1-15 years inAdani, Uzouwanilocal government area, Enugu state.

Age Group	**No. examined**			**Percentage infected with onchocerciasis**		
(Years)	**M**	**F**	**Total**	**M**	**F**	**Total**
1-3	6	12	18	2(33.3%)	1(8.3%)	3(16.7%)
4-7	30	30	60	7(23.3%)	4(13.3%)	11(18.3%)
8-12	24	30	54	8(33.3%)	12(35.3%)	20(37.0%)
13-15	44	34	78	20(45.5 %)	12(35.3%)	32(41.0%)
TOTAL	104	106	210	35(33.7%)	27(25.5%)	66(31.4%)

Forms of Onchodermatitis

21.4% of the sampled population was diagnosed with various forms of onchodermatitis (Table 3). Acute PapularOnchodermatitis, APOD (71.1%) was the most frequent form followed by Chronic PapularOnchodermatitis, CPOD (17.8%) while Depigmentation, DPM was the least with (4.4%).

Table 3: Prevalence of various forms of Onchocercal skin disease in children, 1-15 years inAdani, Uzouwani local government area, Enugu state.

Dermatitis	Positive cases	Percentage (%)
APOD	32	71.1
CPOD	8	17.8
DPM	2	4.4
LOD	3	6.7
Total	45	21.4

APOD=Acute PapularOnchodermatitis, CPOD=Chronic PapularOnchodermatitis, Depigmentation =DPM, LOD=Lichenified Onchodermititis.

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Figure 1: Maculo-papular rashes (APOD) on the leg of a 15 year old boy

Figure 2: Lichenified Onchodermatitis, LOD (Lizard skin) on the lower legs of a 14 year old girl

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Figure 3: Lizard skin (LOD) on the legs of a 12 year old boy

Examination and location of Onchocercal nodules

The location of palpable nodules on the various parts of the body of the age groups was examined. The head and neck region recorded the highest number of nodules (38.9%). This was followed by the thoracic region with 33.3%. The upper and lower limbs had 16.7% and 11.1% respectively while there were no nodules found on the pelvic and lumber regions.

Table 4: Anatomicallocations of Onchocercal Nodules among the age group in Children (1-15 years old) in Adani,Uzouwani, local government area, Enugu State.

Age Group	Head and regions	Upper limb	Lower limb	Thorax	Pelvis	Lumber	Total
1-3	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
4-7	3(16.7%)	0(0.0%)	0(0.0%)	1(5.6%)	0(0.0%)	0(0.0%)	4(22.2%)
8-12	3(16.7%)	1(5.6%)	1(5.6%)	2(11.1%)	0(0.0%)	0(0.0%)	7(38.9%)
13-15	1(5.6%)	2(11.1%)	1(5.6%)	3(16.7%)	0(0.0%)	0(0.0%)	7(38.9%)
TOTAL	7(38.9%)	3(16.7%)	2(11.1%)	6(33.3%)	0(0.0%)	0(0.0%)	18(8.6%)

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Figure 4: Nodules and scattered skin depigmentation on the trunk of a 9 year old boy.

Figure 5: Nodules and CPOD on the leg of a 12 year old boy

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Discussion

The results obtained from this research recorded Onchocerciasis prevalence of 31.4%. This result is in agreement with similar findings on theprevalence of onchocerciasis in mesoendemic areas of Enugu State, and Ebonyi Central Senatorial zone, Nigeria where 26.7% and 33.35% positive cases were reported [17,18].A slightly higher value of 47.5% prevalence of onchocerciasis was reported in Okpuje, Owan West Local Government Area, Edo State, Nigeria [19]. The value obtain from this research though might be considered low in children but could have high probability of increments in adult population due to exposure bearing in mind that onchocercaisis is a cumulative disease.

There has been indication that onchocercaisis related diseases occur significantly higher in male than in females owing to the evidence obtained in this research where the age ranges studied indicated a slightly higher percentage of occurrences in males than in females. This is concurrent with the findings of Anosike and Onwuliri who stated that most of the male children are more exposed to blackfly bite as they usually accompany their fathers to farm [20].This is unlike their female counterparts who assist their mothers at home with domestic chores, thereby limiting their exposure rates. Meanwhile, there has been report which suggests that the differences observed in the prevalence of nodules between male and female children suggest that male children are more exposed to infective bites.Eneanya and Nwaorgu noted that although both males and females engaged in farming, women are better clad and therefore there was less exposure of large parts of their bodies especially the lower limbs to *Simuliumdamnosum*bites[21]. The difference in the infection rate according to sex may be due to endemicity[22]; the occupational exposure [23] and to some extent on the susceptibility of individuals.Similar claims were also reported elsewhere byBrabin [24].

In this survey, age demonstrate to significantly affects the prevalence of onchrocerciasis ($P<.05$). Respondents in 13-15years age group showed the highest percentage of occurrence (41.0%). Those of 8-12years had (37.0%), 4-7years recorded (18.3%) with the least percentage (16.7%) seen among children of 1-3years.The results are similar to reported findingswhich have shown that onchocerciasis infection rate increase gradually with advancing age in Nigeria[25, 26, 22,

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20, 27]. Therefore, based on the result obtain from this research,onchocerciasis infection could be considered to be cumulative in nature.

The greatest challenges faced by onchocerciasis affected individual are impaired visual acuity and blindness, and dermatitis. In the present research blindness was not recorded but a high percentage was found in dermatitis (21.4%) which shows a high significant value. Different forms of dermatitis (onchocerciasis skin disease) observed in this work include Acute Popular Onchocerciasis, APOD (71.7%), which is characterized by a solid, scattered, pruritic papular rashes.Chronic PopularOnchocerciasis (CPOD) (17.8%), a scattered pruritichyperpigmented and flat-topped papulomacular rash, LichenifiedOnchodermatitis , LOD (6.7%) shows a discrete pruritic and hyperpigmentedpapulonodular plague associated with lymphadenopathy and Depigmentation (DPM) (4.4%).Meanwhile, the study is in consonant similar work on onchocerciasis in Okpuje, Owan West Local Government Area, Edo State, Nigeria[19] were no case of blindness was reported. However, there has been indication that the greatest burden of onchocerciaisisare visual impairment (especially among the aged population) and dermatitis which reduces life expectancy, decreases agricultural productivity, forces children out of school and results in the emigration of the work force [12, 28, 29]. The report obtained from our findingsshow ageneral fatigue, insomnia, inflammatory change in skin, and overall distractions. Similarly, recent studies in Nigeria, Ethiopia and Sudan have shown that onchocerciasis is responsible for the poor school performance and a higher drop-out rate among infected children due to itching and lack of sleep [13]. Owing to the geographical location of Adani (between rain forest and savanna region) it is believed that onchocerciasis infection in this region is cause by two dominant species of black fly which exist predominantly on each zone; the rain forest and the savanna region. Secondly, the people living in the community are predominantly farmers and so usenearby rivers as source of water supply.

Conclusion

Based on our observations and results from this survey, we want to clearly state that age was shown to be a major determinant for onchocerciasis prevalence demonstrating the cumulative nature of the disease as it occur with advance in age. Secondly, owing to the geographical location of Adani (between rain forest and savanna region) it is believed that onchocerciasis

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infection in this region is cause by two dominant species of black fly which exist predominantly on each zone; the rain forest and the savanna region. Finally, the life activities of the people living in the community - farmers contribute to their vulnerability to black fly bite. Therefore, there is a relatively high prevalence of onchocercal infections in Adani community of Uzouwani Local Government Area, Enugu state, Nigeria.

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