

Prevalence of Onchocerciasis among patients attending the NKST Eye Care programme Mkar-Gboko, Benue State, Nigeria.

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Abstract- Onchocerciasis has remained a public health problem, despite several efforts over the years to eliminate it both by the World Health Organization (WHO) and NGO's. Prevalence of human onchocerciasis was conducted amongst 274 patients comprising 154 males and 120 females within the age range of 15 to 40 years and above, who were attending NKST Eye Care Programme at Mkar-Gboko, Benue State, Nigeria from January, 2012 through June, 2013. Onchocerciasis infection was diagnosed by parasitological observations for the presence of microfilariae of *Onchocerca volvulus* in skin biopsies using standard microscopy. A total of 37(13.50%) patients were found to be infected with *Onchocerca volvulus*, comprising 26(9.49%) males and 11(4.01%) females. The highest infection rate of 12(4.28%) was observed in patients aged 40 years and above while the least infection was within the age range of 15- 19 years of age 1(0.36%). However, there was no significant difference (χ^2 -test, $p>0.05$) between the prevalence of infection and the age groups. The result shows a significant difference between the prevalence of infection and the patients' occupation (χ^2 -test, $p<0.05$); the farmers were the most infected 30(10.95%) while students were least infected 1(0.36%). The patients from the study area (Mkar-Gboko) had 0 (0%) infection out of the 21 patients examined for the disease while patients who came from the neighboring local government areas had infections as follows; Ushongo, had the highest prevalence rate of 17(6.20%) out of the 76 patients examined. Meanwhile, 97 patients were examined from Buruku with prevalence rate of 7(2.55%) while out of the 80 patients examined from Kwande, 13(4.74%) were infected. Though, the total prevalence rate was low compared to the results of other findings, efforts should be intensified to achieve improved ivermectin coverage and compliance in annual ivermectin treatment in order to completely eliminate onchocerciasis as a public health problem in the affected communities. The public health and socio-economic implications of the findings have been discussed.

Index Terms- Onchocerciasis, Patients, Eye care programme, Mkar-Gboko, Nigeria

I. INTRODUCTION

Onchocerciasis is increasingly recognized as one of the major diseases of public health importance in endemic parts of the world, especially in Sub-Saharan, Africa (Etya'ale, 2002). West

Africa includes the most endemic areas in the world; Nigeria being one of the largest countries of West Africa that has been reported to have a high incidence of onchocerciasis infection (Okonkwo *et al.*, 2010).

All the states of the federation are endemic to the disease except Lagos State (Sam-Wobo *et al.*, 2012). Onchocerciasis is basically a rural disease affecting communities sited along fast-flowing rivers with symptoms particularly irritating and disabling, often associated with long-term exposure to infection and this affects the social and economic activities of the inhabitants concerned (Okonkwo *et al.*, 2010).

Human onchocerciasis is a major blinding disease in equatorial Africa, Central and South America (Guderian *et al.*, 1997), Yemen and Asia (Marroquin, 1981). The latest epidemiological mapping data indicate that the disease is much more widespread than assumed previously and that the number of people infected and the number of disability adjusted life years (DALYs) lost are more than twice as high as originally estimated (Remme *et al.*, 2006).

Onchocerciasis is a disease of the warm tropical environment in which the flies that vector the microfilariae live under conditions favourable for their development all year round (Burnham, 1998). In Africa, the disease has been described as a disease of the future because as the development of the hinterlands proceed, particularly as dams and water projects increase, it will cease to be a disease affecting only small, isolated, poverty stricken and primitive communities in the bush and will become more and more a threat to sophisticated development personnel and other such workers (Remme *et al.*, 2006).

Onchocerciasis is a chronic parasitic infection caused by the filarial nematode, *Onchocerca volvulus*. The disease is transmitted from one individual to another through the bites of the black fly *Simulium damnosum* of the family Simuliidae (Sam-Wobo *et al.*, 2012). The adult worms are usually found in subcutaneous nodules and have an average longevity of around 9-11 years and the adult female worm produces millions of microfilariae which migrate to the skin of the host (Marroquin, 1981).

The microfilariae are the main cause of the clinical manifestations of the disease, including: dermatitis, resulting in very severe itching; papular and lichenified skin lesions; depigmentation and atrophy of the skin; and lymphadenitis (Shibuya, 2006).

The most severe complications of onchocerciasis are irreversible ocular lesions of both the anterior and posterior segment of the eye, resulting first in impaired vision and finally in total blindness (Shibuya, 2006).

It is estimated that onchocerciasis is the second leading infectious cause of blindness in the world only preceded by blinding trachoma (Thylefors, 1992). The World Health Organization (WHO, 1995) estimated that 17 million people were infected and that 900,000 disability adjusted life years (DALYs) were lost due to onchocerciasis in 1990. Recently, an estimated half a million were known to be blind due to the disease and about 1.5 million were severely visually impaired (WHO, 2011). Also, some 90 million people are at risk for becoming infected with the parasite (WHO, 2011). Approximately 37 million individuals are currently infected with onchocerciasis with 99% of its victims residing in sub-Saharan Africa (WHO, 2011). It is endemic in 36 countries in Africa, the Arabian peninsula and the Americas, but its distribution is highly concentrated on the poorest regions of the world -- 30 out of 36 endemic countries are in sub-Saharan African countries where approximately 99% of all those infected live (PBD) (Etya'ale, 2002) and the disease has had a major impact on the economic and social fabric of endemic communities (Burnham, 1998).

Nigeria is believed to have more persons infected with onchocerciasis than any other country in the world, now accounting for over one third of the global cases (Uttah *et al.*, 2004). The National Onchocerciasis Control Programme (NOCP, 1993) reported that the disease is present at varying degrees in all states of the federation, and that over 15 thousand Nigerian rural communities are endemic to the disease. According to the report by the World Health Organisation (WHO, 2011), there are 35,014 hyper-endemic communities in the country and approximately 28 million individuals reside within these communities. The report further states that hyper-endemicity zone for onchocerciasis is within the rain forest zone of the country. Some areas within this zone have low disease burden (Abanobi and Anosike, 2000).

Meso-endemic zones are the savannah zones of the country. Within the mesoendemic zones some areas have high disease burden and new foci are still being discovered (WHO, 1995). Factors that contribute to this include the large size of the country's population, and conditions in many parts of the country that favour sustained transmission (Abanobi and Anosike, 2000). Another important factor in the prevalence of onchocerciasis is the human population relative to fly population (Oye, 2008), which is also an important indicator of the man-fly contact.

In Nigeria, most of the work activities of the individuals in these communities include farming, fishing, handicraft, trading etc. Rural dwellers flee from this plaque and migrate to urban cities disrupting the socioeconomic development in their communities (Alonso *et al.*, 2009). According to Ubachukwu (2006), some of the social consequences associated with onchocerciasis include the disruption of family life and relationships as disabled persons desert rural villages to urban cities for better quality of life. However, they are unable to access and secure employment, and thus experience extreme poverty and become beggars on the streets. They end up settling in shanty towns and resort to living in slums. Additionally, the burden of the disease impacts women and children. It affects the

age of marriage in young women, limiting their choice of partners such as older men and divorcees. It also prevents infected mother to practice exclusive breastfeeding, reducing bonding between new born and mother. The educational impact of the disease is especially on children as they drop out from school to care for and lead blind family members (Ubachukwu, 2006).

Disease occurrence in human society is normally influenced by environmental factors which include both the physical and behavioural environments (Uttah *et al.*, 2004). The complex system of interaction among the physical environment, population and cultural behaviour forms the triangle model of human ecology and forms the basis of disease occurrence in human population (Uttah *et al.*, 2004). Onchocerciasis exists virtually throughout the country but there are variations in levels of endemicity.

In Benue State, onchocerciasis is endemic with bulk of the farming settlements situated along river banks due to fertility of the land (Gemade and Dipeolu, 1983), thus the need for this study as a protocol to enhancing preventive and control measures. This paper therefore, presents the findings of a research into the prevalence of onchocerciasis, their relation to age, sex and occupation among patients attending NKST eye care programme in Mkar-Gboko, Benue State, Nigeria. The prevalence of onchocerciasis in relation to the location of the patients among the four local government areas from where the patients came from, is also presented.

II. MATERIALS AND METHODS

Study Area

Benue State is one of the 36 States in the Federal Republic of Nigeria, a tropical country on the west coast of Africa. The state derives its name from River Benue, the second largest river in the country and is located in the central region of the country where it lies between latitude 7° 13 and 7° 49, longitude 8° 15 and 8° 42. The state covers an area of about 34,059 square kilometers with a population of over 4.2 million people (National Population Commission, 2007). Majority of the inhabitants live in rural agricultural areas and engage in peasant agriculture. However, the state's reputation as the food basket of the nation is being seriously jeopardized by the socio-economic consequences of parasitic diseases (Omudu and Ochoga, 2011).

Gboko is a fast growing town in the [Benue State](#) of North-central [Nigeria](#). The population of the town is over 500,000 people, made up of mostly [Tiv](#) people. It is the traditional capital and ancestral home of the Tiv tribe and it has the official residence of the Tor-Tiv, who is the paramount traditional ruler of the Tiv people that spread across Benue, Taraba, Plateau, Nasarawa, and Enugu States. Gboko was also the headquarters of the Tiv Native Authority. Buruku [Local Government Area](#) has its headquarters in the town of Buruku. It has an area of 1,246 km² and a population of 203,721 as at the 2006 census. Kwande [Local Government Area](#) has its headquarters in the town of Adikpo. It has an area of 2,891 km² and a population of 248,697 at the 2006 census. Ushongo [Local Government Area](#) has its headquarters in the town of Lessel. It has an area of 1,228 km² and a population of 188,341 as at the 2006 census (National Population Commission, 2007).

Assessment of skin snips for the presence of *Onchocerca volvulus*

A blood-free skin snip for parasitological examination was taken from each individual during daytime using sterile lancets and razor blades according to the method adopted by Uttah *et al.* (2004). The size of the biopsies is known to average 0.8 mg, with a range 0.4-1.2 mg (Uttah *et al.*, 2004). The biopsies were placed in micro-titre wells containing 0.2ml of 0.85% saline solution. When completed, each plate was covered with cellophane tape and was kept for 24 hours at room temperature. At the end of the 24 hour-incubation period, the skin biopsies were fixed in formalin solution (35% formaldehyde solution) by adding two drops per micro-titre well. Thereafter, emerged microfilariae were observed and counted microscopically using x40 magnification. Thorough physical examinations of individual volunteers were performed by a physician. The leopard skin assessment was reported as present or absent upon examination of the lower limbs for the presence of depigmentation of the skin. Data were analysed using the Chi-square (χ^2) statistic.

III. RESULTS

Out of the 274 subjects examined comprising 154 males and 120 females, 37(13.50%) were infected with *Onchocerca volvulus* of which 26(9.49%) were males while 11(4.01%) were females (Table 1). There were no significant differences in the rate of infection between male and female patients examined, and the age groups (χ^2 -test, $p > 0.05$). However, there was a significant difference between the prevalence of infection and the occupation (χ^2 -test, $p < 0.05$). Patients within the age group of 40 years and above were the most infected 12(4.28%), while those within the age range of 15 - 19 years were the least infected 1(0.36%) (Table 2). In terms of occupation, the farmers were the most infected 30(10.9%) while the students were least infected 1(0.36%) (Table 3). With regards to the localities, the 21 patients who were resident from the study area (Mkar-Gboko) recorded no infection 0(0%). Ushongo was found to have the highest prevalence rate of 17(6.20%), followed by Kwande which recorded prevalence rate of 13(4.74%) while Buruku had the least among the three neighbouring local Government areas with prevalence rate of 7(2.55%) (Table 4).

Table 1: Prevalence of Onchocerciasis among Patients in Relation to Sex at NKST Eye Care Programme Mkar- Gboko.

Sex	Number examined	Number infected (%)
Male	154	26 (9.49)
Female	120	11 (4.01)
Total	274	37 (13.50)

Table 2: Prevalence of Onchocerciasis among Patients in Relation to Age at NKST Eye Care Programme Mkar, Gboko.

Age (years)	Number Examined	Number Infected (%)	Male		Female	
			Number Examined	Number Infected (%)	Number Examined	Number Infected (%)
15-20	21	1 (0.36)	13	1 (0.36)	8	(0)
20-25	30	3 (1.10)	21	2 (0.73)	9	1 (0.36)
25-30	37	5 (1.82)	33	3 (1.10)	4	2 (0.73)
30-35	55	7 (2.55)	21	5 (1.82)	34	2 (0.73)
35-40	58	9 (3.28)	27	6 (2.19)	31	3 (1.10)
>40	73	12 (4.28)	39	9 (3.28)	34	3 (1.10)

Total 274 37(13.50) 154 26 (9.49) 120 11 (4.01)

Table 3: Prevalence of Onchocerciasis among Patients in Relation to Occupation and Sex at NKST Eye Care Programme Mkar, Gboko.

Occupation	Number Examined	Number Infected (%)	Male		Female	
			Number Examined	Number Infected (%)	Number Examined	Number Infected (%)
Students	21	1 (0.36)	13	1 (0.36)	8	0 (0.0)
Civil Servants	74	2 (0.73)	37	0 (0)	37	2 (0.73)
Traders	39	4 (1.46)	17	3 (1.10)	22	1 (0.36)
Farmers	140	30 (10.9)	87	22 (8.03)	53	8 (2.92)
Total	274	37 (13.5)	154	26 (9.49)	120	11 (4.01)

Table 4: Prevalence of Onchocerciasis in Relation to Patients' Location from NKST Eye Care Programme Mkar, Gboko.

Locality	Number Examined	Number Infected (%)	Male		Female	
			Number Examined	Number Infected (%)	Number Examined	Number Infected (%)
Ushongo	76	17 (6.20)	46	11 (4.01)	30	6 (2.19)
Buruku	97	7 (2.55)	53	4 (1.46)	44	3 (1.10)
Gboko	21	0 (0)	15	0 (0.00)	6	0 (0.00)
Kwande	80	13 (4.74)	40	7 (2.55)	40	6 (2.19)
Total	274	37 (13.50)	154	22 (8.02)	120	15 (5.48)

IV. DISCUSSION

The prevalence of onchocerciasis has been established in different parts of Nigeria by different authors (Okoye and Onwuliri, 2007; Wogu and Okaka, 2008; Akinboye *et al.*, 2010; Okonkwo *et al.*, 2010; Sam-Wobo *et al.*, 2012). Its rate of occurrence as reported by these researchers varies from one geographical area to another with highest endemicity of 83% recorded in Ovia North East L.G.A of Edo State (Akinbo and Okaka, 2010) and 54.2% in Ibarapa L.G.A. of Oyo (Akinboye *et al.*, 2010). In this study, the prevalence of over 13% observed

virtually in all the study Local Government areas showed that many people still harbour *Onchocerca* microfilariae in some communities of Benue State.

Results of this study have demonstrated hypoendemic prevalence of onchocerciasis which is less than the 26.9% recorded by Nwaorgu *et al.* (1994) in onchocerciasis mesoendemic area of Enugu State, Nigeria. It is also relatively lower than 37.3% recorded by Okonkwo *et al.* (2010) in mesoendemic area of Ebonyi State, Nigeria; Sam-Wobo *et al.* (2012) along Ogun River System, southwest Nigeria and 47.5% recorded by Wogu and Okaka (2008) in Okpuje, Owan West Local Government Area, Edo State, Nigeria.

The prevalence of Onchocerciasis recorded in this study indicated a low prevalence probably due to previous mass ivermectin treatment in the studied areas. Onchocerciasis prevalence was more in males (9.49%) than in females (4.01%), although the difference was not statistically significant (χ^2 -test, $p > 0.05$). This can be supported by the findings of Gemade and Dipeolu (1983); Nnaji and Ozor (2001); Atu (2003); Uttah *et al.* (2004) and Wogu and Okaka (2008) which revealed that more males were involved in farming in the infected areas than females due to greater exposure of these males in the farms while the females were usually confined to domestic duties within the house.

Benue State occupies large area of fertile land with fast flowing streams and rivers which provide favourable breeding sites for the simuliid vectors. Therefore, it is not surprising to notice male dominance in agriculture which exposes them to vector bites. The females only take active part in harvesting, processing, transportation and selling of farm produce (Meludu and Ajayi, 2005).

In rural families, males are usually the breadwinners and they are the ones who acquire and cultivate land and the disease has been reported to be a rural condition usually among agrarian populations (Saporu, 1988; Dozie and Nwoke, 2002). This finding is however, in disagreement with the report by Akinbo and Okaka (2010) in Ovia North East L.G.A of Edo State, Nigeria with 93% onchocerciasis prevalence in females and a corresponding 74.5% in males.

The relationship between man and his environment is symbiotic. Although, it is generally believed that the environment influences human activities, these activities in turn influence the nature of the environment. Physical, social and economic factors are very important factors that determine the severity of onchocerciasis in any given society (Oye, 2008). This study revealed significant difference (χ^2 -test, $p < 0.05$) between the prevalence of infection and the occupation. This can be supported by Edungbola (1982) that onchocerciasis is more common among farmers, fishermen, hunters, nomads and others who are engaged in outdoor activities that bring them in constant contact with the *Simulium* fly.

Human emigrants from endemic areas bringing patent onchocercal infection can influence the community microfilarial loads (Uttah *et al.*, 2004). In such areas where microfilaraemia is largely imported, epidemiological indices most times are not reliable, and according to Sabry (1991), they do not conform to known models. There is no significant relationship (χ^2 -test, $p > 0.05$) between age-related infection rates observed in this study, although patients who were 40 years and above were more infected than younger age group. The increase in onchocerciasis with age reported in this study has also been documented in Uttah *et al.* (2004); Nmorsi (2002) and Akinbo and Okaka, (2010) in which they found that increasing age was associated with stabilising (plateau) onchocerciasis, possibly as a result of enhanced immunity and reduced exposure. Exposure factors can be held largely responsible for this pattern of infection because the majority of the individuals in the localities studied were farmers and fishermen. Farming exposes people to an on-going risk of *Simulium* bites and *Onchocerca volvulus* transmission throughout their lives, irrespective of their age.

Despite the prevalence of onchocerciasis in the three neighbouring Local Government areas, there still existed wide differences in onchocerciasis prevalence rate. These differences could be attributed to variations arising from the frequency, duration and degree of exposure to the bites of infected blackflies, the vector of *Onchocerca volvulus*, possibly imposed by differences in the distances of the communities from the breeding site of the vector. This could probably explain why there was variation in the prevalence of infection amongst the neighbouring Local Governments and zero prevalence in the study area where the hospital is located. Alternatively, these differences could reflect the variations in the susceptibility of the residents to the infecting organism or the variations in the amount and regularity of drug treatment.

According to Uzoegwu and Aloh (2004), the role played by proximity is supported by the fact that differences in prevalence rates of onchocerciasis obtained by different diagnostic methods show inverse relationship with the respective distances of the communities from Adada river, the breeding site of *Simulium damnosum* as well as the worm-burden results in which Nkpologu, the nearest community to the river exhibited the highest worm-burden of 3.90 Mf/mg skin, while Obimo, the farthest community showed the least worm-burden of 1.25 Mf per mg skin. This could also explain why Ushongo Local Government which is in close proximity to the fast flowing river (River Amile), a tributary of River Benue as well as other tributaries in the region, had the highest prevalence rate while Gboko Local Government which is farthest from the breeding site of *Simulium damnosum* had zero prevalence rate. It could therefore, be hypothesised that the incidence of onchocerciasis is a function of population and proximity to disease vector breeding site (Meludu and Ajayi, 2005). This hypothesis will help us to ascertain the extent to which these factors explain the disease prevalence in this study.

V. CONCLUSION

The hypoendemic prevalence observed in all the studied Local Government areas may probably signify the possibility of elimination of onchocerciasis as a public health problem in those communities in Benue State. There is still need to improve people's attitude towards the disease and improve disease awareness through appropriate health education. Improved and consistent ivermectin coverage, coupled with overwhelming compliance in drug usage is required to completely eliminate onchocerciasis as a public health problem in the studied Local Government areas. There is also need for more commitment on the part of the world bodies and the non-governmental development organizations (NGDOs) to get involved in efforts to eliminate onchocerciasis as a public health and socio-economic burden and save the lives of infected individuals in the study areas from the socio-economic consequences of the disease.

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