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Full Length Research Paper

Vitamin A status and ocular lesions in some rural Nigerians with onchocerciasis

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The vitamin A and ocular lesions in 98 rural Nigerians who excreted microfilariae in their skin tissues and had at least one clinical manifestation of onchocerciasis were investigated. The highest prevalence rate of 18 (69.2%) occurred among adult males with leopard skin. The overall mean vitamin status of (20.3 ± 2.6 µg/dl) was comparatively lower (χ^2 = 41.0; p>0.05) than the control inhabitants (76.2.3 ± 3.8 µg/dl). The mean vitamin status was higher among the infected children (22.7 ± 0.5 µg/dl) than their adult counterparts (17.9 ± 6.1 µg/dl). Also the mean vitamin A status of their infected children (22.7 ± 5.0 µg/dl) was lower (χ^2 = 31.1; p> 0.05) than their control subjects (73.5 ± 2.1 µg/dl). The vitamin A status of the infected adults (17.9 ± 6.1 µg/dl) was lower (χ^2 = 47.2; p>0.05) than their control counterparts (78.9 ± 4.1µg/dl). The mean microfilarial load of the different age groups of the infected volunteers showed negative correlation with the mean vitamin A status (r = -0.93). In all, five different ocular lesions namely cataract, optic atrophy, chroroidoretinitis, iriodocyclitis and sclerosing keratitis were reported. Visual impairment was absent and the ocular lesions were low among the children as they had only optic atrophy and sclerosing keratitis among the five different lesions encountered.

Key words: Vitamin A, Ocular lesions, Visual impairment, Microfilariae, Onchocerciasis, Rural Nigerians.

INTRODUCTION

Onchocerciasis is ranked as one of the most important parasitic infections after malaria and intestinal helminthiasis which causes morbidity and at times mortality in the tropic. One of these mortalities that arise includes the socio-economic repercussion of the disease due to visual impairment, ocular lesions and blindness. Blindness has also been attributed to vitamin A deficiency. A link between vitamin A deficiency and helminthiasis has been established (Mahalanabis et al., 1976; Storey, 1982). Vitamin A is fundamental in maintaining the integrity of epithelia tissues (Villamor and Fawzi, 2005). Vitamin A deficiency is known to be associated with immune dysfunction (Zambou et al., 1999). It was reported that vitamin A deficiency is concomitant with the development of onchocercal pathogenesis (Rodger, 1962). Also a significant observation was made that retinal concentration of adult *Onchocerca volvulus* was eight times higher than that of the surrounding host tissues, suggesting that perhaps these parasites absorb and concentrate vitamin A (Sturchler et al., 1981, 1983; Sani, 1985).

An important observation is the association of vitamin A deficiency with the pathological alterations in ocular epithelial diseases (Hatchell and Sommer, 1984). In this part of the globe, onchocerciasis exists in holoendemic proportion (Gemade and Dipeolu, 1983; Edungbola et al.,

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1987; Nmorsi and Obiamiwe, 1992; Anosike and Onwuliri, 1993; Nwoke et al., 1998; Nmorsi et al., 2002). These information are epidemiological and revealed the persistence of some clinical pictures of this infection namely leopard skin, nodules, ocular lesions, visual impairment despite the intervening ivermectin therapy in some localities such as Egoro-Eguare in Nigeria. The search for some contributing factors such as vitamin A to the pathological processes in the persistence of some morbidities of onchocerciasis such as visual impairment, nodules, leopard and lizard skin as well as blindness despite existing ivermectin therapy is much desirable in Nigeria. Therefore in this communication, we report the vitamin A status in onchocerciasis and establish its role in the pathological processes of this parasitic infection in our studied locality.

MATERIAL AND METHODS

Surveyed area and population

Our surveyed area is Egoro-Eguare, Esan West Local Government Area of Edo State, Nigeria. It is situated about 7 km away from Ekpoma, which is an urban town and the headquarters in Esan Local Government Area. Egoro-Eguare lies approximately lat. 6º N, 5º E and lat. 6º N, 8º E.

It is located within the rainforest belt of Edo State. Egoro-Eguare is a rural settlement without a school and market. This locality has a small stream which is shaded with luxuriant green vegetation. This stream constitutes the breeding site of the biting *Simulium damnosum* complex encountered in the locality. It is the source of water for their domestic and recreational activities. The settlement has an estimated population of about 900 people. Majority of these people are farmers while some especially the female inhabitants are petty traders.

The investigation commenced by educating the people on the objective, nature and scope of the study for the purpose of seeking their consent and cooperation. The consenting villagers were assembled in the palace of the village head for further investigations where a pre-designed questionnaire seeking age, sexes and occupations were first administered individually and later analyzed. These volunteers were subjected to physical examination individually in a room for the symptoms and signs of onchocerciasis.

Skin snips

Two skins snips were taken from the iliac crest bilaterally. These skin snips were transported to our Tropical Diseases Research Laboratory for laboratory examinations. The skin snips were processed, examined microscopically, weighted and quantified for microfilariae as previously described in the report of Nmorsi et al. (2002). The 98 volunteers who had positive microfilariae in their skin snips and showed clinical features of onchocerciasis and 30 control subjects were recruited for the next stage of the study. The presence of HIV, intestinal parasitic infections and malaria were ruled out in these volunteers using the standard kits and procedures.

Ocular Investigation

Ocular investigations were undertaken. The visual impairment and blindness were categorised using WHO standard (WHO, 1973).

Analysis of vitamin A status

Vitamin A was analyzed using the standard method as previously described by Sobel and Snow and modified by Henry (1964) in these 98 onchocerciasis infected as well as the 30 control volunteers.

Statistics

The data obtained in this study was subjected to statistical analysis using Chi square and correlation in Microsoft Excel package.

RESULT

The mean vitamins status and microfilarial load according to the age groups of the inhabitants examined are presented in Table 1. The overall mean vitamin A status of 20.3±2.6 µg/dl was reported among the inhabitants. Comparatively, this status was lower than the mean vitamin status of their control inhabitants (76.2±3.8 µg/dl). This difference was statistically significant (χ^2 = 41.0, p>0.05). The least vitamin status of 16.0±4.1 µg/dl was observed among the inhabitants in the second decade of life that had the highest microfilarial load of 20.0 ± 3.1mff/mg. The children within the first decade of life and the elders >61 years old had the highest vitamin status of 23.2±5.0 and 23.1±2.6 µg/dl, respectively. The mean microfilarial load of the different age groups of the infected volunteers showed negative correlation with vitamin A status at (r = -0.93).

Table 2 presents the pattern of clinical manifestations among the 98 inhabitants with microfiladermia. Leopard skin and lizard skin were found only among the adults while onchocercal nodules occurred in both the children and adults. In all, 50 (51.0%) cases of leopard skin were the highest prevalent clinical features while the least of 2 (20.0%) of lizard skin was the least clinical features. Also the male inhabitants above 60 years had the highest prevalent cases of leopard skin as 6 (100%). The difference in the pattern of prevalence of the different clinical features was statistically significant (χ^2 = 40.48, p > 0.05). Also the difference between the males and the female volunteers was statistically significant at (χ^2 = 9.38, p > 0.05).

The visual impairment among the 98 onchocerciasis infected volunteers in Egoro-Eguare is presented in Table 3. Visual impairment was absent among the children within the first decade of life. The highest visual impairment of 2 (100%) was observed among the male inhabitants examined within the second decade of life. In all, 36 (36.7%) volunteers had reduced vision while low vision occurred among 17 (17.3%) inhabitants. This difference is statistically significant at (χ^2 = 6.81, p > 0.05).

Table 4 presents the pattern of ocular lesion among the 98 onchocerciasis infested volunteers. Choroidoretinitis and iriodocychitis were reported only among volunteers above 60 years of age. The female inhabitants within 11-20 years of age had the highest prevalence of ocular les-

Table 1. The mean microfilarial load and vitamin A status according to the difference age groups of the volunteers.

Age group in years	Microfilarial load (Mff/mg)	Vitamin A (µg/dl)
1-10	10.5±4.1	23.2±5.0
11-20	20.0±3.1	16.0±4.1
21-30	16.5±4.2	18.0±4.5
31-40	12.0±1.1	19.2±3.5
41-50	12.5±3.5	20.5±1.5
51-60	8.3±4.1	21.6±3.0
761	6.5±1.1	23.1±2.6
Infected volunteers	12.33±4.7	20.3±2.6
Control	-	76.2±3.8

Table 2. The visual impairment and ocular leisions among the volunteers in Egoro-Eguare examined.

Age	Children	Adult	≥16 years old
Sex	**Male**	**Male**	**Female**
No. Examined	12	26	56
Infected Parameters	No (%)	No (%)	No (%)
Reduced Vision	0	16 (61.5)	20 (35.7)
Low Vision	0	9 (34.6)	8 (14.3)
Cataract	0	6 (23.1)	8 (14.3)
Optic atophy	2 (50.7)	9 (34.6)	6 (10.7)
Chloroidoretinitis	0	2 (7.6)	1 (1.8)
Iriodocyclitis	0	2 (7.6)	1 (1.8)
Sclerosing Keratis	1 (7.1)	7 (26.9)	7 (1.8)

Table 3. The visual impairment among the 98 onchocerciasis infected volunteers in Egoro-Eguare.

Age groups in years	Reduced vision		Low vision	
	Male No (%)	Female No (%)	Male No (%)	Female No (%)
1-10	0 (0)	0 (0)	0 (0)	0 (0)
11-20	1 (25.0)	2 (100)	0 (0)	1 (50.0)
21-30	2 (33.3)	3 (30.0)	0 (0)	1 (10.0)
31-40	3 (60.0)	3 (15.0)	3 (60.0)	2 (10.0)
41-50	3 (75.0)	4 (40.0)	1 (25.0)_	1 (10.0)
51-60	4 (80.0)	2 (28.6)	1 (20.0)	1 (14.3)
>61	3 (50.0)	6 (6.7)	4 (66.7)	2 (22.2)
Total	16 (42.1)	20 (33.3)	9 (23.7)	8 (13.3)
Grand total	36 (36.7)		17 (17.3)	

ion 2 (100%). In all, the cases of these two ocular lesions were the least prevalent while the most prevalent ocular lesion is optic atrophy 19 (19.4). The difference in the prevalence of the ocular lesions encountered in our study area is statistically significant ($\chi^2 = 20.55$, $p > 0.05$).

DISCUSSION

We report the prevalence of four clinical features of onchocerciasis namely onchocercal dermatitis, leopard skin, lizard skin and onchocercal nodules in 98 inhabitants who excreted microfilariae in their skin tissues. The pattern

Table 4. The ocular lesions among the 98 onchocerciasis infected volunteers in Egoro Eguare.

Age groups in years	Cataract		Optic atrophy		Choriodoretintis		Iriodocyclitis		Scerosing keratitis	
	Male No (%)	Female No (%)	Male No (%)	Female No (%)	Male No (%)	Female No (%)	Male No (%)	Female No (%)	Male No (%)	Female No (%)
1-10	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
11-20	0 (0)	0 (0)	2 (50.0)	2 (100.0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (25.0)	1 (50.0)
21-30	0 (0)	1 (10.0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (10.0)
31-40	2	0 (0)	3 (60.0)	2 (10.0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (40.0)	2 (10.0)
41-50	0 (0)	2 (20.0)	2 (50.0)	1 (10.0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (25.0)	2 (20.0)
51-60	1 (20.0)	2 (28.6)	2 (40.0)	2 (28.6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (20.0)	1 (14.3)
>61	3 (50.0)	3 (22.2)	2 (33.3)	1 (11.1)	2 (33.3)	1 (11.1)	2 (33.3)	1 (11.1)	3 (50.0)	1 (11.1)
Total	6 (15.8)	8 (13.3)	11 (28.9)	8 (13.3)	2 (5.3)	1 (1.7)	2 (5.3)	1 (1.7)	8 (21.1)	8 (13.3)
Grand total	14 (14.3)		19 (19.4)		3 (3.1)		3 (3.1)		16 (16.3)	

showed preponderance towards the adult male inhabitants who are involved in farm activities unlike their female volunteers and children. For instance, the female volunteers are engaged in petty farming while the children go to school in their surrounding towns. This implies less exposure of female adults and children to *S. damnosum* complex bite.

The mean status of (20.3 µg/dl) of the volunteers conform favourably with the report of Zambou et al. (1999) who documented an overall vitamin status of (20 µg/dl) among 82.25% of the onchocerciasis infected people in the rural region of Cameroon. The data in this study indicated vitamin A deficiency among these onchocerciasis infected rural inhabitants in the locality. We believe that this lower vitamin A status in adults contributed to the pathological processes in the development and persistence of some skin lesions such as lizard skin and leopard skin among the adults despite the intervening ivermectin therapy instituted over a decade in the locality. This assertion is further proved valid by the observation of Rodger (1962) who documented that vitamin A deficiency contributes to onchocercal pathogenesis.

The data which revealed the higher vitamin A in children than adults could reflect the impact of persistence and chronicity of *O. volvulus* infection since this parasite is known to preferentially absorb vitamin A. This observation has been documented by Sani et al. (1985) who observed that retinol content in *Onchocerca* tissues are eight times greater than that of the surrounding epithelial tissues. This assertion is further supported by the negative correlation between microfilarial load and vitamin reserves in the blood of the onchocerciasis infected volunteers. We, therefore, deduce that *O. volvulus* is associated with the depletion of vitamin A in man.

Visual impairment was observed among adults. Also the ocular lesions were preponderant to the adults than the children. The association of these ocular lesions and onchocerciasis has been documented earlier (Potter, 1991; Marshall et al., 1986; Nmorsi et al., 2002; Dadzie et al., 1990; Newland et al., 1991). However, the prevalence of this ophthalmic involvement was lower in this present study. The lower level of occurrence of these ocular lesions may be due in part to the level of exposure in Egoro – Eguare and more importantly to the intervening ivermectin therapy. The persistence of these ocular lesions can be attributed to the vitamin A deficiency reported among these inhabitants in Egoro – Eguare. These assertions can be proved valid by the report of Hatchell and Sommer (1984) who documented that vitamin A deficiency is associated with pathological alterations in ocular epithelial tissues. In the continual depletion of vitamin A, visual impairment, ocular lesions and indeed blindness will increase because of the possible increase in virulence of the parasite in this vitamin A deficient state which is normally associated with depressed immune responses.

Since vitamin A is implicated in reduction of immune status of man, we believe that it is involved in the maintenance of chronicity of onchocerciasis in our studied area. Also vitamin A deficiency is linked with the persistence of ocular lesions and visual impairment in Egoro – Eguare, Nigeria despite the intervening ivermectin therapy. It is therefore recommended that vitamin A supplement should be incorporated into the existing chemotherapeutic control using ivermectin in Nigeria to achieve meaningful reduction and eradication of the morbidities and socioeconomic consequences of onchocerciasis in our environment.

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