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Knowledge of aetiology of onchocerciasis among the inhabitants of riverine areas in southeast Nigeria

Emeagui Edith Chinedu[1], J O Okafor[2]
[1] Department of Human Kinetics and Health Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria
[2] PhD, Department of Human Kinetics and Health Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

Abstract
This study determined the knowledge of aetiology of Onchocerciasis among the Inhabitants of Riverine Areas in Southeast Nigeria. The study was guided by eight research questions and six null hypotheses. Descriptive survey design was used and the population of the study consisted of 4,177,828 of inhabitants in Anambra State and 3,927,563 of inhabitants of riverine areas in Imo State. The sample consisted of 1,200 inhabitants of the riverine areas in Anambra and Imo state selected using multi-stage procedure. The instruments for data collection Knowledge of the aetiology for Oncherciasis (KOAO). Research questions 1 and 2 were answered using Aggregate scores. frequencies and percentages were used to answer research questions, Chi-Square, statistics were used to test the hypotheses. The results showed that majority of the in Anambra and Imo states riverine inhabitants have knowledge of the aetiology of Onchocerciasis. The following recommendations were made among others: There should be Community-based Campaigns on the knowledge and preventive strategies of Onchocerciasis for the Inhabitants of Riverine areas. Development of Health Education materials should focus on the epidemiological information in other to ensure better understanding of individuals risk perception to the disease as far as they are living in the riverine areas. Awareness Campaign should be intensified among the Riverine areas in other to educate the people on Onchocerciasis occurrence and prevention.

Keywords: karpooravalli, overripening, nutribars, tray dries, control panel

Introduction

Modification of lifestyle has been a problem to many. That may be the reason people are infected with most of the preventable diseases. The adage that says that prevention is better as well as cheaper than cure is a common saying, yet people find it very difficult to adhere to it. Today, the world is ravaged by diseases. One of the commonest of such diseases among riverine inhabitants is onchocerciasis which is otherwise known as river-blindness. Onchocerciasis according to Michele (2018) [19] is an infectious disease caused by the filarial worm Onchocerca volvulus and is one of the neglected tropical diseases (NTD). Onchocerciasis is transmitted by the bite of blackfly simulium damnosum which breeds in fast flowing streams and rivers. The disease is also termed river blindness because the vector, the blackfly, is commonly found in areas where there are rapidly flowing streams and rivers. The common manifestation of the infection is blindness. The disease is also known for causing skin lesions with severe itching, a serious eye lesion and blindness known as river blindness. It is a chronic and slowly progressive disease (Beteab and Abiyu 2019) [4].

According to Robyn (2020) [25], Onchocerciasis, or river blindness, is caused by the tiny parasite worm Onchocerca vovulus, which is passed on to humans after being bitten by an infected blackfly. Most of the physical discomforts people experience when they have river blindness happen when the worms die which can happen years after becoming infected. The disease causes blindness, lifelong human suffering, and grave socio-economic problems (Nworie *et al*., 2014) [21]. Other Socio- economic effects of infection with Onchocerciasis include abandonment of farmlands leading to food insecurity, poor school attendance, sometimes, resulting from children having to drop out of school to assist blind parents/guardians, terrible itching and skin diseases and disfiguring leading to stigmatization of infected people by their healthy counter parts. Individuals with symptomatic infection have been found to spend an additional 15 percent of their annual income on healthcare which contribute to poverty (Fischer and Butter, 2002) [13].

Ideally, onchocerciasis also known as river blindness or Robles disease is vector born and is characterised by dermatologic, ophthalmologic, lymphatic and sometimes systemic manifestations. The parasite is transmitted from human to human through the bites of blackfly, vector of the genus Simulium, (WHO, 2011) [32]. Simulium (blackflies) breed in fast-flowing rivers and streams, thereby increasing the risk of infections among people living around such habitats. The true knowledge of diseases such as onchocerciasis and their aetiology may enables one to avoid lifestyles, practices and occasions that may constitute risk factors for onchocerciasis. Exposure to knowledge of the aetiology of onchocerciasis may also help individuals to adopt effective preventive strategies to reduce that cause.

Onchocerciasis was first reported in Northern Nigeria by Pearson, (1908). Anierobi (2010) found microfilariae of oncho-volvulus in skin of 55 out of 100 prisoners in Kaduna. In Anambra and Imo States, there are so many towns and villages located in riverine areas, which makeindividual in those states vulnerable to Onchocerciasis disease. A study by Michele (2018) [19] showed that in a previously hyperendemic rainforest area with a nodular rate of 40 percent in Anambra State, a cross-sectional survey of 894 subjects after a decade of Community Directed

Treatment with Ivermectin (CDTi) identified nodules in 86 (9.62%) persons and 186 (20.81%) had one or more forms of onchocercal skin disease. There was a total absence of onchocercal skin disease (OSD) in children less than 10 years old and only 5 (5.43%) with OSD in the second decade of life, indicative of some encouraging success of the community-directed use of ivermectin (CDTi) programme (Ogbonna and Ikani, 2020) [22].

The rate of African Programme for Onchocerciasis (APOD), however, increased with age up to the third decade and decreased thereafter suggesting on-going transmission, either due to poor compliance, low coverage of treatment and poor knowledge of the aetiology and preventive measures. Dozie, Onwuliri and Nwoke (2004), investigated human infection with Onchocerca volvulus in 13 rural communities in the upper Imo basin, Imo State Nigeria, between March 1997 – December 2000, using the skin snip method. Of the 3,311 persons examined, 889 (26.8%) had microfilariae. First vector contact occurs when children visit streams to swim, to fetch water for domestic use or for other purposes. Later in life, exposure continues during farming and other adult occupations like fishing. Resistance development is limited and the age related prevalence and intensity, therefore, shows a gradual increase. In the highly endemic areas where there is frequent exposure to infective vectors from early childhood, infection is contracted early in life (Uttah 2010) [29].

According to Adesina *et al*., (2017) [3] Africa has been estimated to have approximately 85 million people who are at risk of the onchocerciasis infection. At present, approximately 20 million people are infected with O. volvulus, the aetiologic agent of the disease. Earlier studies by Dori, Belete, Panicker and Hailu (2012) [10] showed that Africa including Nigeria was estimated to have nearly 99 percent of the cases of prevalence of onchocerciasis related diseases. Nigeria of all the countries of the world has the greatest number of persons with onchocerciasis, (Evans, *et al*., 2011; Okanlawon and Osanyintolu, 2012) [11]. riverine inhabitants, hence, the disease has continued to ravage them (Onowhakpor, Okojie and Wagbatsoma, 2016) [23]. It was based on these that the researcher has decided to the carried out this study to determine the knowledge of the aetiology and preventive strategies of onchocerciasis among riverine inhabitants in Anambra and Imo states of Nigeria.

Purpose of the Study

The main purpose of this study was to determine the percentage of the riverine inhabitants with knowledge aetiology and the preventive strategies of onchocerciasis among the inhabitants of the riverine areas in Southeast, Nigeria. Specifically, the study determined the percentages of the riverine inhabitants with knowledge of:

1. aetiology of onchocerciasis
2. aetiology of onchocerciasis based on age.
3. aetiology of onchocerciasis based on their educational level.
4. aetiology of onchocerciasis based on their occupation.

Research Questions

The following research questions guided the study. What percentage of:

1. riverine inhabitants in Anambra and Imo states that have the knowledge of the aetiology of onchocerciasis?
2. riverine inhabitants in Anambra and Imo states that have the knowledge of the aetiology of onchocerciasis based on their age?
3. riverine inhabitants in Anambra and Imo states that have the knowledge of the aetiology of onchocerciasis based on their educational level?
4. riverine inhabitants in Anambra and Imo states that have the knowledge of the aetiology of onchocerciasis based on their occupation?

Hypotheses

The following hypotheses were stated and tested at 0.05 level of significance.

1. There will be no significant difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge aetiology of onchocerciasis based on their age.
2. There will be no significant difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge aetiology of onchocerciasis based on their educational levels.
3. There will be no significant difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge of the aetiology of onchocerciasis based on their occupation.

Methods

The design that was adopted for this study was a descriptive survey design. The study was be carried out in two states of South East Nigeria, Southeast. Southeast is one of the six geopolitical zones in Nigeria representing both a geographic and political region of the country. Anambra state has a population of 4,177,828 (2006 census), and a population density of 862.The states account for 2.97 percent of Nigeria's total population (Zaccheus Onumba Dibiaezue Memorial Libraries 2022). The sample size for the study which comprises of 1,200 Anambra and Imo states riverine inhabitants were used for the study. Multistage sampling procedure was employed to draw sample for the study. The first stage involved the use of sample random sampling of balloting without replacement, sampling to select two states in South East Nigeria namely, Anambra and Imo states. The second stage involved the use of simple radon sampling technique to select six Local Government Areas, each from Anambra and Imo states respectively, producing a total of 12 Local Government Areas. The third stage involved the use of convenience sampling technique to draw five towns each from the sampled Local Government Areas. This produced a total of sixty communities used for the study. Furthermore, 20 riverine inhabitants were equally drawn from each of the sampled communities to produce a total of 1200 riverine inhabitants used for the study. The instrument for data collection was a test developed by the researcher. Construction of the text items was done based on the literature review and interactions with the inhabitants of riverine areas on onchoncerciasis. The test titled 'Knowledge of the Aetiology of Onchoerciasis (KOAO). The data generated for the study were analysed using, descriptive statistics of frequencies and percentages to answer the research questions. Chi Square statistics was used to test the hypotheses, at 0.05 level of Significance The decision rule was that whenever p-value (Probability Value) was less than or equal to 0.05, the null hypothesis was rejected; otherwise, the null hypothesis was accepted.

Presentation and Analysis of Data

Research Question 1

What percentage of riverine inhabitants in Anambra and Imo states have the knowledge of the aetiology of onchocerciasis?

Table 1: Percentages of Riverine of Inhabitants in Anambra and Imo States with Knowledge of Aetiology of Onchocerciasis

	Frequency	Percent
Knowledgeable	908	77.6
Not Knowledgeable	262	22.4
Total	1170	100.0

Table 1 shows that out of the total respondents, 77.6% have knowledge of aetiology of onchocerciasis while 22.4 are not knowledgeable about aetiology of onchocerciasis.

Research Question 2

What percentage of riverine inhabitants in Anambra and Imo states have the knowledge of the aetiology of onchocerciasis based on their age?

Table 2: Percentage of Riverine Inhabitants in Anambra and Imo States with Knowledge of Aetiology of Onchocerciasis Based on their Age

Knowledge of Aetiology	15-24	25-34 years	35-44 years	45+	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Knowledgeable	100 (8.5)	189 (16.2)	353 (30.2)	266 22.7)	908 (77.6)
Not Knowledgeable	31(2.6)	48(4.1)	95 (8.1)	88 (7.5)	262 (22.4)
Total	131(11.2)	237 (20.3)	448 (38.3)	354 (30.3)	1170 (100)

Results in Table 2 shows that 8.5% of the riverine inhabitants who are between the ages of 15-24 years have knowledge of the aetiology of onchocerciasis while 16.2% of those between 25-34 years have knowledge of aetiology of onchocerciasis. The table further reveals that 30.2% of the riverine inhabitants between 35-44 years have knowledge of aetiology of onchocerciasis whereas 22.7% of those aged 45 years and above have knowledge of aetiology of onchorcerciasis. On the other hand, the percentages of riverine inhabitants that do not have knowledge of aetiology of onchocerciasis were 2.6, 4.1, 8.1 and 7.5 for those between the ages of 15-24, 25-34, 35-44 and 45 years above respectively.

Research Question 3

What percentage of riverine inhabitants in Anambra and Imo states have the knowledge of the aetiology of onchocerciasis based on their educational level?

Table 3: Percentage of Riverine Inhabitants in Anambra and Imo States with Knowledge of Aetiology of Onchocerciasis Based on their Educational Level

Knowledge of Atiology	Educational Qualification					Total
	Illiterate	FSLC	WASSCE	BSc/HND	MSc & PhD	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Knowledgeable	67(5.7)	145 (12.4)	403 (34.4)	285 (24.4)	8 (0.7)	908 (77.6)
Not Knowledgeable	37 (3.2)	72 (6.2)	114 (9.7)	39 (3.3)	-	262 (22.4)
Total	104 (8.9)	217 (18.5)	517 (44.2)	324 (27.7)	8 (0.7)	1170 (100)

Table 3 shows that of the total respondents, 5.7% of illiterates have knowledge of aetiology of onchocerciasis while 12.4% of those with FSLC have knowledge of aetiology of onchocerciasis constitute. Of the total respondents, 34.4% of those with WASSCE have knowledge of aetiology of onchocerciasis. The table revealed that 24.4% of B.SC/HND holders have knowledge of aetiology of onchocerciasis constitute while 0.7% of those with M.Sc/PhD have knowledge of the aetiology of the disease. On the other hand, 3.2% of illiterates do not have knowledge of aetiology of onchocerciasis while 6.2, 9.7 and 3.3 percent of holders of FSLC, WASSCE, BSC/HND and MSc/PhD respectively do not have knowledge of aetiology of onchocerciasis.

Research Question 4

What percentage of riverine inhabitants in Anambra and Imo states have the knowledge of the aetiology of onchocerciasis based on their occupation?

Table 4: Percentage of Riverine Inhabitants in Anambra and Imo States with Knowledge of Aetiology of Onchocerciasis Based on their Occupation

Knowledge of Aetiology	Occupation					Total
	Civil servant	Farmer	Fisherman	Trader	Student	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Knowledgeable	181(15.5)	354 (30.3)	163 (13.9)	127 (10.9)	83 (7.1)	908 (77.6)
Not Knowledgeable	26 (2.2)	107 (9.1)	57 (4.9)	40 (3.4)	32 (2.7)	262 (22.4)
Total	207 (17.7)	461 (39.4)	220 (18.8)	167 (14.3)	115(9.8)	1170 (100)

Table 4 shows that 15.5% of the civil servants have knowledge of aetiology of onchocerciasis while 30.3% of the farmers have knowledge of aetiology of onchocerciasis. Furthermore, fishermen and traders that have knowledge of aetiology of onchocerciasis constitute 13.9 and 10.9 of the total respondents respectively. The riverine inhabitants that are students who have knowledge of the aetiology of onchocerciasis make up 7.1% of the total respondents. On the other hand, percentages of riverine inhabitants that do not have knowledge of aetiology of onchocerciasis according to occupation were 2.2% for civil servants, 9.1% for farmers, 4.9% for fishermen, 3.4% for traders and 2.7% for students.

Hypothesis 1

There will be no significance difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge aetiology of onchoerciasis based on their age.

Table 5: Chi-Square Analysis on Knowledge of Aetiology of Onchocerciasis Riverine Inhabitants By Age (N=1170)

Knowledge of Aetiology	15-24 years	25-34 years	35-44 years	45+	df	X^2	p-value	Decision
	N (%)	N (%)	N (%)	N (%)				
Knowledgeable	100 (8.5)	189 (16.2)	353 (30.2)	266 (22.7)				
					3	2.35	.503	NS*
Not Knowledgeable	31 (2.6)	48 (4.1)	95 (8.1)	88 (7.5)				

*Not Significant

The chi-square (X^2) analysis in Table 9 shows that riverine inhabitants of different age categories were not significantly different in their knowledge of aetiology of onchocerciasis, X^2 (df,3) = 2.35, p-value > 0.05. Since the p-value was greater than 0.05, the null hypothesis was not rejected.

Hypothesis 2

There will be no significance difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge aetiology of onchoerciasis based on their educational levels.

Table 6: Chi-Square Analysis on Knowledge of Aetiology of Onchocerciasis Riverine Inhabitants By Educational Levels (N=1170)

Knowledge of Aetiology	Educational Qualification					df	X^2	p-value	Decision
	Illiterate	FSLC	WASSCE	BSc/HND	MSc & PhD				
	N (%)	N (%)	N (%)	N (%)	N (%)				
Knowledgeable	67(5.7)	145 (12.4)	403 (34.4)	285 (24.4)	8 (0.7)				
Not Knowledgeable	37 (3.2)	72 (6.2)	114 (9.7)	39 (3.3)	-	4	47.27	.000	S*

* Significant

The chi-square (X^2) analysis in Table 10 shows that riverine inhabitants of different educational levels differ significantly in their knowledge of aetiology of onchocerciasis, X^2 (df,4) = 47.27, p-value < 0.05. Since the p-value was less than 0.05, the null hypothesis was rejected.

Hypothesis 3

There will be no significance difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge aetiology of onchoerciasis based on their occupation.

Table 7: Chi-Square Analysis on Knowledge of Aetiology of Onchocerciasis Riverine Inhabitants By Occupation (N=1170)

Knowledge of Aetiology	Occupation					Df	X^2	p-value	Decision
	Civil servant	Farmer	Fisherman	Trader	Student				
	N (%)	N (%)	N (%)	N (%)	N (%)				
Knowledgeable	181 (15.5)	354 (30.3)	163 (13.9)	127 (10.9)	83 (7.1)				
						4	15.45	.004	S
Not Knowledgeable	26 (2.2)	107 (9.1)	57 (4.9)	40 (3.4)	32 (2.7)				

The result displayed in Table 11 shows that riverine inhabitants of different occupations differ significantly in their knowledge of aetiology of onchocerciasis, X^2 (df,4) = 15.45, p-value < 0.05. Since the p-value was less than 0.05, the null hypothesis was rejected.

Discussions of Results

The Riverine Inhabitants' Knowledge of the Aetiology of Onchocerciasis.

The result in Table 1 showed that 78 percent of riverine inhabitants in Anambra and Imo states were knowledgeable of the aetiology of onchocerciasis. The finding was expected and not surprising, this is because the riverine inhabitants of Anambra and Imo States have lived long in this onchocerciasis endemic area that predispose them to the risk of contacting the filarial worm onchocera volvulus, and as such will in turn help them to acquire the knowledge of aetiology of onchocerciasis. This assertion is supported with the study of Ikpeze, *et al*. (2014) [15] who reported an increased knowledge of onchocerciasis among residents of Achiagu, Adani and Aguobowa Communities in Enugu State. Also, this finding collaborated with Kaliyaperumal, *et al*. (2010) [16], that examined the knowledge and beliefs about onchocerciasis among rural inhabitants in endemic area of Ethiopia, the result showed that 75.9 percent of the subjects were aware of the aetiology of onchocerciasis. The finding was expected and not surprising. The finding was in agreement with the theory that was propounded by Hennekens and Buring (1987) [14], according to the theory, the triad consists of the external agent, a susceptible host, and an environment that brings host and agent together. So, one need to have the knowledge of the agent that is responsible for the disease (onchocerciasis) within one's environment. The finding of this present study was also in consonance with the findings of Adeoye, *et al*. (2010) [2], who studied the perception and attitude of people towards onchocerciasis in South Western Nigeria.

Adeoye *et al*. recorded that aetiology of onchocerciasis was well known by its local name among 91.6 percent of the respondents. The finding was attributed to the facts that most of the local inhabitants had knowledge of the environmental health challenges, that they have long lived with. The result was also in consistent with the finding of Dinah, *et al*. (2014) [9], who assessed the knowledge and perception of the community members of the causes, effect, and control of onchocerciasis in Bui Township Ghana. The result showed that (79) percent of respondents were knowledgeable about black-fly bite as the major cause of onchocerciasis. The finding could possibly be attributed to the knowledge of the aetiology of onchocerciasis due to so many years they have been on sensitization message by WHO and other non-governmental organizations like Pan American Health Organization and also the African Programme for Onchocerciasis Control that was launched since 1995. The finding was at variance with the study by Eyo, *et al*. (2013) [12], that 34.8 percent of the subjects had

poor knowledge of onchocerciasis, of the vector that causes onchocerciasis. This finding many be attributed to inadequate information regarding onchocerciasis which is one of the neglected tropical and endemic disease found in the area.

The result in table 2 showed that riverine inhabitants in Anambra and Imo states between the ages of 35-44 years had the highest percentage 30.4 % of those with the knowledge of aetiology of onchocerciasis while those between 25-34 years had the lowest percentage 16.2 % of those with knowledge of aetiology of onchocerciasis. The finding was expected and not surprising. This is because age always plays a significant role on acquisition of knowledge and information. The finding could also be attributed to the fact that inhabitants between the age group 35-44 years had lived longer in the riverine area than their counter parts of the lower age group. This finding is consistent with the study of Onowhakpor, Okojie and Wagbatsoma (2016) [23], who reported an increased knowledge of onchocerciasis among residents of Edo state. However, this finding contradicts the findings of a survey done in Imo state in which a higher proportion of respondents less than 35 years had good knowledge of onchocherciasis compared to those more than 35 years.

Furthermore, the chi-square analysis showed that there was no significant difference in the percentage of riverine inhabitants in Anambra and Imo states on their knowledge aetiology of onchocerciasis based on their ages. This finding affirms the report of Onowhakpor, Okojie and Wagbatsonma (2016) [23], that age was a significant factor in knowledge acquisition.

The knowledge of aetiology of Onchocerciasis as presented in the Table 3 showed that riverine inhabitants in Anambra and Imo states with WASSCE had the highest percentage 34.4% of those with the knowledge of Aetiology of Onchocerciasis while those with M.Sc/Ph.D made up the lowest percentage 7.1 %. This result was surprising and not expected. This is because M.Sc/Ph.D holders had higher educational qualification than SSCE holders. However, this result could be attributed to the fact that these SSCE holders were in the digital age and had access to the internet. Also, it could be that their experience from the farm while assisting their parents improved their knowledge about aetiology of onchocerciasis. This finding collaborates with the findings of Weldegrabreal *et al*. (2014) [31], that adults with lower level of education recorded higher knowledge of aetiology of onchocerciasis than adults with higher level education. The findings however contradict the finding of Manafa and Isamah, (2022) [17] that there was a low-level knowledge among locals with low level education. The findings were attributed to the fact that most of the locals with high level of education had also increased awareness arising perhaps from long standing information through education.

Chi-square analysis revealed that there was a significant difference in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge of the aetiology of onchocerciasis based on their level of education. The finding was expected and not surprising because level of education is positively associated with disease knowledge and prevention. Also, inhabitants with higher level of education were expected to have more access to internet, mass media and the likes than adults with low level of education. This finding is a variance with Weldegebreal, (2014) [31].

The findings in Table 4 showed that riverine inhabitants in Anambra and Imo states who were farmers were of the highest percentage (30%) of those with the knowledge of aetiology of onchocerciasis, while 7.1 percent of the them were students. The finding was expected and not surprising because the farmers had age long experience with onchocerciasis in the farm compared to students. The finding was consistent with the finding of Busari *et al*. (2022), which showed that farmers had high knowledge of onchocerciasis due to the long time presence of simulium in the area. Furthermore, the rivers served as a major source of water for the domestic and occupational needs of the community. However, the finding contradicted the finding of Ukpai and Ezeji, (2003) [26], where residents who were not famers had increased knowledge of onchocerciasis than farmers. This could be attributed to high level of awareness in the region.

Furthermore, the chi-square analysis revealed that there was a significant different in the percentage of the riverine inhabitants in Anambra and Imo states on their knowledge of the aetiology of onchocerciasis based on their occupations. This finding is expected and not surprising. This is because occupation is an independent predictor of knowledge and prevention of the disease which is a good opportunity for further intervention. In this context, a significant difference means that occupation plays a significant role in knowledge of onchocerciasis aetiology. The finding was consistent with the finding of Umoke *et al*. (2018) [27], who recorded significant difference in knowledge of onchocerciasis based on occupation.

References

1. Adeleke MA, Sam-Wobo SO, Olatunde GO, Akinwale OP, Ekpo UF, Mafiana CF. Bioecology of simuliumdamnosumtheobald complex along Osun River, Southwest Nigeria. Journal of Rural Tropical Public Health,2011:10:39-43.
2. Adeoye AO, Ashaye AO, Onakpoya OH. Perception and attitude of people toward onchocerciasis (river blindness) in south western, Nigeria. Middle East African of Opthamology,2010:17(4):1-5.
3. Adesina FP, Awosolu OB, Olusi TA. Incidence of onchocerciasis and vector knowledge among residents of some parts of ondo state, Nigeria. Public Health Research,2017:7(5):107-111. DOI: 10.5923/j.phr.20170705.01
4. Beteab G, Abiyu T. Knowledge, attitude and practices towards Onchoerciasis, prevention and control in Bench Maji Zone, South Western Ethiopia. Retrieved from www.juniperpublishers.com,2019:7(5):555725. DOI:10.19080/JoJo.2019.07 555725.
5. Bolisani E, Bratianu C. The elusive definition of knowledge, 2018.
6. In E Bolisan I, Bratianu C. Emergent knowledge strategies: Strategic thinking in knowledge management. Cham: Springer International, 2018, 1-22. DOI: 10.1007/978-3-319-60656_1
7. CDC. National environmental public health tracking program, 2010. background Retrieved from URL: http://www.cdc.gov/nceh/tracking/background.htm.
8. Damian W, Julia L. Guide to preparing an eradication investment case, 2013. Retrieved from http://eicguidelines.org/Guide%20to%20Preparing%20an%20EIC_Draft%208.pdf

9. Dinah A, Andrew A, Mary A. Perception of inhabitants in Bui township on causes and effects of onchocerciasis, Ghana. International Journal of Scientific and Technology Research,2014:3(4):326-331.
10. Dori GU, Belay T, Belete H, Panicker KN, Hailu A. Parasitological and Clinic epidemiological features of onchocerciasis in West Wellega, Ethiopia. Journal of Parasitic Diseases: Official Organ of the Indian Society for Parasitology,2012:36(1):10-18.
11. Evans D, McFarland D, Adamani W, Eigege A, Miri E, Schulz J, *et al*. Cost effectiveness of triple drug administration (TDA) with praziquantel, ivermectin and albendazole for the prevention of neglected tropical diseases in Nigeria. Annals of Tropical Medicine and Parasitology,2011:105(8):537-547.
12. Eyo J, Onyishi G, Ugokwe C. Rapid epidemiological assessment of onchocerciasis in a tropical semi-urban community, Enugu state, Nigeria. Iranian Journal of Parasitology,2013:8(1):145-151.
13. Fischer P, Buttner DW. The epidemiology of Onchoerciasis and the long term, impact of exiting control strategies on this infection, 2006. Retrieve from www.research gate. net DOI:10.100710-306-47661-45.
14. Hennekens CH, Buring JE. Epidemiology in medicine. Lippincott: Williams and Wilkins, 1987.
15. Ikpeze OO, Iwueze MO, Egbuche CM, Ngenegbo UC, Onwuzulike IFV. Knowledge, attitude and practice of residents of Achiagu, Adani and Aguobuowa communities in Nigeria regarding river blindness. International Journal of Agriculture and Biosciences,2014:3(3):115-119.
16. Kaliyaperumal, K, Eyerusalem K, Aschalew E. Knowledge and beliefs about onchocerciasis among rural inhabitants in an endemic area of Ethiopia. International Health,2010:2:59-64.
17. Manafa OU, Isamah AN. Local knowledge and attitudes about onchocerciasis in Oji-River local government area of Enugu State, Nigeria. Epidemiology & Infection,2002:129(3):629-633.
18. MasreshaL S, Melada T, W/Michael MR. Assessment of knowledge, attitude and practices of Onchoerciasis prevention and control in Becho Woredia, illu Abarbora Oromia. Regional State, South West Ethiopia. American Journal of infectious diseases, 2019, 15(2). DOI: 10.3844/ajids.p.2019 62.68.
19. Michele EM. Onchodermatitis: Where are we now? Tropical Medicine and Infection Disease,2018:3(94):1-22. doi:10.3390/tropicalmed3030094
20. Nworgu BG. Educational research: Basic issues and methodology. Ibadan: wisdom Publisher Limited, 2015.
21. Nworie O, Ukpabi NN, Oli AN, Okonkwo CI, Okoli CS, Ejiofor OS. The prevalence and distribution of human onchocerciasis in two senatorial districts in Ebonyi state, Nigeria. American Journal of INFECTIOUS Diseases and Microbiology,2014:2(2):39-44. doi: 10.12691/ajidm-2-2-3.
22. Ogbonna EC, Ikani OR. Systematic review on onchocerciasis infection in Nigeria in the past five decades. International Journal Medical Public Health,2020:10(1):1-7.
23. Onowhakpor AO, Okojie OH, Wagbatsoma VA. Prevalence of onchocerciasis in Edo state, Nigeria. African Journal Online (AJOL),2016:15(2):12-19.
24. Rao RU. Endosymbiotic Wolbachia of parasitic filarial nematodes as drug targets. Indian J. Med. Res,2005:122:199-204.
25. Robyn C. An overview of Onchoerciasis (River blindness), 2020. Retrieved from www.verywellhealth.com
26. Ukpai OM, Ezeji JC. Social implications of onchocercal dermatitis among females in endemic communities of Okigwe LGA of Imo State, Nigeria. Nigerian Journal of Parasitology,2003:24(1):59-64.
27. Umoke PIC, Umoke M, Ene CU, Arua CC, Ede M. An investigation of onchocerciasis disease in Ebonyi state, Nigeria: Implication for community health counselling programs. International Journal of Applied Engineering Research,2018:13(21):15143-15148.
28. UNESCO. What is a river, 2020. Retrieved from http://www.unesco.org/new/fileadmin.
29. Uttah EC. Onchocerciasis in the Upper Imo River Basin, Nigeria: Prevalence and Comparative study of waist and shoulder snips from mesoendemic communities. Iranian Journal of Parasitology,2010:5(2):33-41.
30. Uttah EC. Clinical manifestations of mesoendemic: Onchocerciasis in the Upper Imo River Basin, Southeastern, Nigeria. Iranian Journal of Parasitology,2009:5(2):33-41.
31. Weldegebreal F, Medhin G, Weldegebriel Z, Legesse M. Assessment of community's knowledge, attitude and practice about onchocerciasis and community directed treatment with Ivermectin in Quara District, north western Ethiopia. Parasites & vectors,2014:7(1):1-8.
32. WHO. Monitoring and epidemiological assessment of mass drug administration in the global programme to eliminate lymphatic filariasis: a manual for national elimination programme, 2011 Retrieved from WHO/HTM/NTD/PCT/2011.4 on 26 August, 2021.