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Review Article

Review of Onchocerciasis and Its Public Health Importance in Ethiopia

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Abstract
Zoonotic filariasis-human infections with animal filariae occur all around the world. Over a century ago, it was first mentioned in the current literature. *Filaria immitis*, *Dracunculus medinensis*, and onchocerciasis are only a few of the many diverse species of filariae that have been found as agents of infection. The most zoonotic of these filariases, onchocerciasis, was the subject of attention in this study. *Onchocerca volvulus* is to blame for this. It can spread by biting a black fly of the genus *Simulium* that is afflicted. Residents who live close to rivers or streams where *Simulium* black flies are abundant are more at risk of contracting onchocerciasis. This condition is known as "river blindness" because these flies breed in swift-moving streams and rivers. This covers Ethiopian regions, which are primarily located in the country's north, west, and south. The diagnosis can be established via a number of methods, including polymerase chain reaction and antibody testing. However, skin snipping is the most widely used diagnostic technique. A one- to two-milligram shave or biopsy is performed to detect the larvae that emerge from the skin when it is placed in physiological solutions such as normal saline. Ivermectin is the usual course of treatment for onchocerciasis. Vector control, public education, and eventual elimination as part of our schedule are the methods to manage and prevent this illness.
Keywords: Onchocerciasis, Public health importance, Ethiopia

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Introduction

Human infections with the filariae of animals, referred to as zoonotic filariasis, occur worldwide. Many widely different species of filariae have been identified as the agents of infection (Onchocerciasis, *Dirofilaria immitis*, and *Dracunculus medinensis*) (1). Zoonotic filariasis was first reported in modern literature more than 100 years ago (2). All filariae utilize bloodsucking insects as biological vectors, so humans are infected by zoo-anthropophilic species fed previously, in an appropriate time frame, on an animal with a patent filaria infection (3).

After trachoma, onchocerciasis is the second most frequent disease in the world that causes blindness (4). It is a parasitic illness brought on by *Onchocerca volvulus*, a filarial worm. The disease is spread by the bites of *Simulium* blackflies, which reproduce in swift-moving rivers and streams. The illness is endemic in Yemen, two countries in Latin America, and 31 nations in sub-Saharan Africa. According to previous research (5), there are an estimated 18 million people who have cutaneous microfilariae and are infected with the disease. About 99% of these people reside in Africa. An Italian researcher in Bonga, southern Ethiopia, published the country's first report on onchocerciasis in 1939 (6). Known by another name, river blindness, *O. volvulus* is the parasitic worm that causes this neglected tropical disease. Over 187 million individuals, mostly in sub-Saharan Africa, are thought to be at risk of contracting *O. volvulus* infection, according to recent data from the World Health Organization (5). Nodules under the skin, mild to severe dermatitis, and vision impairment or blindness can all be caused by infection. Roughly 300 000 people are expected to be blind, and over 800 000 individuals have visual impairment out of the roughly 25 million people who are thought to be infected (7). Reviewing filariasis and its zoonotic significance, particularly with regard to onchocerciasis, is the goal of this research. Ethiopia had set a 2030 deadline to eradicate onchocerciasis (8).

Literature Review on Onchocerciasis

Etiology

A filarial worm known as *O. volvulus* is the source of the skin and eye condition known as onchocerciasis, or river blindness. The reason for the alterations in skin and subcutaneous tissue is a severe parasitic infection. It is spread by the bite of a black fly of the species *Simulium* that is infected (9). The term "river blindness" refers to the fact that these flies breed in swift-moving rivers and streams.

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Epidemiology

The epidemiology of onchocerciasis is associated with the presence of black fly bites in certain areas where the parasite exists. The people most at risk for acquiring onchocerciasis are those who live near streams or rivers where there are *Simulium* black flies. Onchocercal infections are found in tropical climates (5).

For instance, in Ethiopia, more than 17 million people live in endemic areas that are at risk of infection. Studies conducted so far in Ethiopia indicated that the disease is mostly found in the southwestern, western, and northwestern parts of the country. Particularly, the disease is widespread in western Ethiopia, extending from the Takazi Valley in the northwest to the Omo Valley in the southwest, with varying levels of endemicity (10). Onchocerciasis is a disease of public health and socio-economic importance in the country and is endemic in 188 districts, which are listed in Table 1 (11).

Life Cycle

The life cycle of *O. volvulus* occurs in two different hosts, namely, black flies and humans. The infective larvae (stage L_3) are normally transmitted by the bite of Simulium flies. Once in the human body, the larvae undergo molting to reach the adult stage (12). Adult females are able to produce millions of microfilaria, which they shed typically in the skin of their human host (13). The life cycle of *O. volvulus* is illustrated in Figure 1.

Diagnosis

The most common method of diagnosis is a skin snip. Larvae that emerge from the skin while it is submerged in physiological solutions, such as ordinary saline, are identified using a skin biopsy or a one- to two-milligram shave. According to evidence (15), there are various approaches to diagnosis. A skin polymerase chain reaction can be used to detect the problem if the larvae are invisible. The recombinant antigen from finger-prick whole-blood specimens is utilized in antibody testing (16) to detect *O. volvulus*-specific immunoglobulin G4. Surgical removal of cutaneous nodules and examination for adult worms are options available to patients. An anterior segment of the eye, where the larvae or lesions they produce are visible, can be examined under a slit

Table 1. Distribution of Onchocerciasis by Region in Ethiopia

Region	No. of Endemic Districts
Oromia	105
Amhara	19
SNNPR	35
Gambella	8
Benishangul Gumuz	21
Total	188

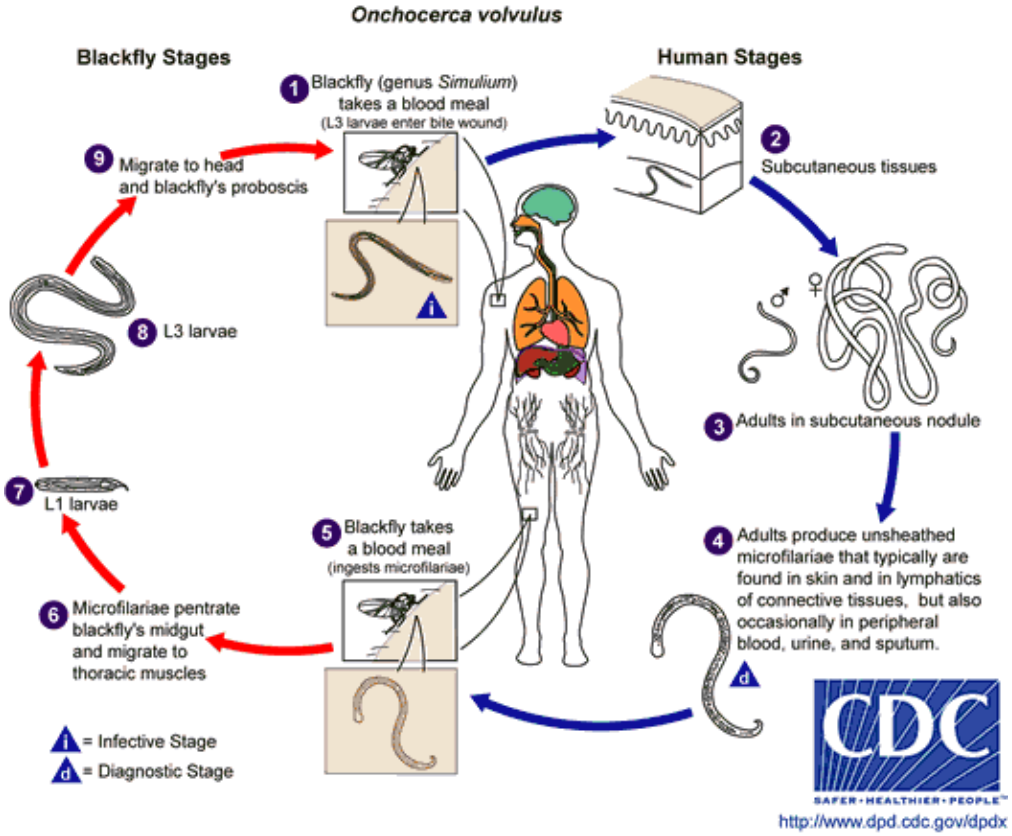

Figure 1. Life Cycle of *Onchocerca volvulus*. Source. (14) (License the Creative Commons Attribution-ShareAlike 4.0 International License ("CC BY-SA") and/or the GNU Free Documentation License ("GFDL"). Source: https://academic-accelerator.com/encyclopedia/onchocerca-volvulus

lamp to diagnose patients with eye infections.

Treatment

For onchocerciasis, ivermectin (150 mg/kg, taken orally every 6–12 months) is the usual course of treatment. It was reported that it also seems to strengthen the treated host's immunological responses against *O. volvulus* (17). The number of treatments reduced the rate of transmission by decreasing the prevalence of microfilaria and the mean intensity (18-20).

Prevention and Control

In general, endemic areas have shown greater success with vector control than with education. Using insecticides, wearing long pants, installing bug netting around sleeping areas, and avoiding the black fly's habitat are some ways to prevent the intermediate host from being bitten by the black fly and eliminate it (5).

Conclusion and Recommendation

To sum up, zoonotic filariasis is the term used to describe diseases in humans caused by animal filariae. Three species of filariae, namely, *D. medinensis*, *D. immitis*, and onchocerciasis, have been identified as agents of infection. Onchocerciasis is the most zoonotic of these zoonotic filariases. *O. volvulus* is the cause of onchocerciasis. In regions where the parasite is present, it is linked to the occurrence of black fly bites. As a result, we can treat, stop, and eradicate it.

Lastly, it is suggested that this sickness be the focus of a health disease control program so that it can be readily eradicated.

Authors' Contribution

Conceptualization: Getahun Berhanu Mulisa, Tesfaye Rebuma Abdeta, Habib Ul Hassan.
Data curation: Tesfaye Rebuma Abdeta, Habib Ul Hassan.
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Visualization: Getahun Berhanu Mulisa, Tesfaye Rebuma Abdeta.
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Competing Interests

The authors declare no competing interests.

Ethical Approval

Not applicable.

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References

1. Orihel TC, Ash LR. Parasites in Human Tissues. Chicago: ASCP Press; 1995. p. 386.
2. Addario C. Su un nematode dell'occhio umano. Ann Ottalmolog. 1885;13:135-47.
3. Anderson RC. Nematode Parasites of Vertebrates: Their Development and Transmission. CABI Publishing; 2000.
4. Gebre-Michael T, Gemetchu T. Anthropophilic blackflies (Diptera: Simuliidae) and onchocerciasis transmission in southwest Ethiopia. Med Vet Entomol. 1996;10(1):44-52. doi: 10.1111/j.1365-2915.1996.tb00081.x.
5. World Health Organization. Progress report on the elimination of human onchocerciasis, 2015-2016. Wkly Epidemiol Rec. 2016;91(43):505-14.
6. Zouré HG, Noma M, Tekle AH, Amazigo UV, Diggle PJ, Giorgi E, et al. The geographic distribution of onchocerciasis in the 20 participating countries of the African Programme for Onchocerciasis Control: (2) pre-control endemicity levels and estimated number infected. Parasit Vectors. 2014;7:326. doi: 10.1186/1756-3305-7-326.
7. Crump A, Morel CM, Omura S. The onchocerciasis chronicle: from the beginning to the end? Trends Parasitol. 2012;28(7):280-8. doi: 10.1016/j.pt.2012.04.005.
8. Hiwot S, Fikre S. Carter Center Congratulates Ethiopia on Interrupting Transmission of River Blindness in Three Former Highly-Endemic Districts: Healthier Citizen for Prosperous Nation. Addis Ababa: Ethiopian Ministry of Health (MoH); 2021.
9. Taylor MJ, Hoerauf A, Bockarie M. Lymphatic filariasis and onchocerciasis. Lancet. 2010;376(9747):1175-85. doi: 10.1016/s0140-6736(10)60586-7.
10. Legesse M, Balcha F, Erko B. Status of onchocerciasis in Teppi area, Southwestern Ethiopia, after four years of annual community-directed treatment with ivermectin. Ethiop J Health Dev. 2010;24(1):51-6. doi: 10.4314/ejhd.v24i1.62945.
11. FDREMH. Federal Democratic Republic of Ethiopia Ministry of Health. Second Edition of Ethiopia National Master Plan For Neglected Tropical Diseases. Addis Ababa, Ethiopia. Postnatal Care. 2016 Jul.
12. Uttah EC. Clinical manifestations of mesoendemic onchocerciasis in an area with multiple filarial species. Iran J Parasitol. 2009;4(4):19-28.
13. Enk CD. Onchocerciasis--river blindness. Clin Dermatol. 2006;24(3):176-80. doi: 10.1016/j.clindermatol.2005.11.008.
14. Arfan UB, Simeen BR. Onchocerciasis: a review of a filarial disease of significant importance for dermatologists and ophthalmolodists. J Pak Assoc Dermatol. 2007;17(1):32-45.
15. Ayong LS, Tume CB, Wembe FE, Simo G, Asonganyi T, Lando G, et al. Development and evaluation of an antigen detection dipstick assay for the diagnosis of human onchocerciasis. Trop Med Int Health. 2005;10(3):228-33. doi: 10.1111/j.1365-3156.2004.01384.x.
16. Weil GJ, Steel C, Liftis F, Li BW, Mearns G, Lobos E, et al. A rapid-format antibody card test for diagnosis of onchocerciasis. J Infect Dis. 2000;182(6):1796-9. doi: 10.1086/317629.
17. Ali MM, Baraka OZ, AbdelRahman SI, Sulaiman SM, Williams JF, Homeida MM, et al. Immune responses directed against microfilariae correlate with severity of clinical onchodermatitis and treatment history. J Infect Dis. 2003;187(4):714-7. doi: 10.1086/367709.
18. Samuel A, Belay T, Yehalaw D, Taha M, Zemene E, Zeynudin A. Impact of six years community directed treatment with

ivermectin in the control of onchocerciasis, western Ethiopia. PLoS One. 2016;11(3):e0141029. doi: 10.1371/journal.pone.0141029.
19. Garedaghi Y. Flea infestation in farm animals and its zoonotic importance in East-Azerbaijan province. Am J Anim Vet Sci. 2011;6(4):193-6.
20. Garedaghi Y, Firouzivand Y, Luca I. Prevalence of endoparasites and their zoonotic significance in wild rabbits of Ahar city, Iran. Am J Anim Vet Sci. 2022;17(1):31-4. doi: 10.3844/ajavsp.2022.31.34.