

A REVIEW OF GLOBAL GUINEA WORM ERADICATION: EMPHASIS ON THE NIGERIAN SITUATION

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ABSTRACT

Aim: The horror and misery of guinea worm with its attendant negative effects on human health and agricultural production is well documented. This study highlights the efforts made so far globally and nationally to eradicate the scourge.

Methods: An update on global guinea worm eradication with emphasis on the Nigerian situation was examined. Documented reports by various experts on guinea worm were examined. There was a brief presentation on some vital facts on guinea worm disease focusing on: what is guinea worm disease, what causes guinea worm, scientific classification, geographical distribution, habitat, transmission/life cycle, economic importance and the eradication efforts. The global eradication efforts covered from 1980 to 2014 while the Nigerian eradication processes covered from 1961 to 2014.

Results: The global eradication efforts culminated in the present (2015) situation with only 4 countries (South Sudan, Chad, Ethiopia and Mali) still having reported cases of guinea worm. The Nigerian eradication efforts culminated in the present (2015) situation when the WHO officially certified Nigeria as a guinea worm-free country (13th December, 2013) and subsequently presented the official certificate to President Goodluck Jonathan declaring Nigeria as a guinea worm-free nation on 17th March, 2014.

Conclusion: Nigeria is now free of Guinea Worm Disease. However, four African countries: South Sudan, Mali, Ethiopia and Chad still harbour guinea worm presently with 143 cases.

Keywords: Guinea worm, Update, Eradication, Global, Nigeria.

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INTRODUCTION

The fights put up by the International and National governments, organizations, agencies, non-governmental organizations, communities and individuals to reduce and eventually eradicate guinea worm have been subjects of discussions both at International and National Conferences and workshops (Aikhomu et al., 2000; Cairncross et al., 2002; WHO, 2012). Guinea worm transmission has a seasonal pattern. In dry regions, people generally get infected during the rainy season, when stagnant surface water is available. In wet regions, people generally get infected during the dry season, when surface water is drying up and becoming stagnant. (Greenaway, 2004; Ruiz-

Tibet and Hopkins, 2006). The risk for the disease varies by sex, age, profession, and ethnicity. These differences reflect how and where people get their drinking water in different areas and countries. In general, about the same number of men and women get infected. Guinea worm disease (GWD) occurs in all age groups but it is more common among young adults 15-45 years old. This may be because of the type of work done by people in this age group. Farmers, herdsmen and those fetching drinking water for the household can become infected more often. It is thought that they are more likely to drink contaminated stagnant water while away from home. In certain areas, GWD affects some ethnic groups more than others. (Cairncross et al., 2002;

Greenaway, 2004; Ruiz-Tibet and Hopkins, 2006). People do not become immune to infection. Many people in affected villages suffer from GWD year after year. This is probably because the same water sources are repeatedly contaminated and conditions that support the spread of disease have not changed. It might also be related to some biological factors of the person that increase susceptibility. Not everyone drinking from the same contaminated water supply will become infected. A few people seem to keep getting infected while others drinking the same water do not. (Tayeh et al., 1993; Ruiz-Tibet and Hopkins, 2006). Health education is key to the eradication campaign programme. The villagers are educated on simple practice of boiling and filtering their water to reduce infection (Aikhomu et al., 2000; Kelly and Pereira, 2006; Boisson et al., 2009). This study highlights the efforts made and achievements recorded so far globally and nationally towards the eradication of guinea worm disease.

BRIEFS ABOUT GUINEA WORM AND GUINEA WORM DISEASE

What is Guinea Worm Disease (GWD)?

Guinea worm infection (medically known as dracunculiasis or dracontiasis) is a water associated communicable disease. It is a very painful and debilitating disease with multiple adverse consequences on health, agriculture, school attendance and the overall quality of life of the affected communities. Characteristically, it is found in remote rural communities without good quality water for drinking, and people are ignorant of its mode of transmission and prevention (Edungbola et al., 1987; Olujide, 2008; WHO, 2012).

What Causes Guinea Worm?

Dracunculiasis is caused by a long thread-like round worm *Dracunculus medinensis* with female measuring approximately 80cm and male 2cm. The female worm is responsible for the actual Guinea Worm disease. Before a victim knows that he/she has the infection, the worms have remained hidden in the person's body for about one year from the day its larvae were first ingested with contaminated drinking water (Edungbola et al., 1987; Tayeh et al., 1993; Ruiz-Tiben et al., 2006).

Scientific Classification

Kingdom: Animalia
 Phylum: Nematoda
 Class: Secementea
 Order: Camallanida
 Superfamily: Dracunculoidea
 Family: Dracunculidae
 Genus: Dracunculus
 Species: D. medinensis (Linnaeus, 1758)

The common name “guinea worm” appeared after Europeans saw the disease on the Guinea coast of West Africa in the 17th century. The name dracunculiasis is derived from the Latin “affliction with little dragons” while the high incidence of the disease in the city of Medina led to the species name medinensis (Palmer and Reeder, 2005; Barry, 2007).

Geographical Distribution

It has been known since early recorded history and widely distributed in tropical Africa, Arabia, Indonesia and India (Smyth, 1976). Guinea worm infections occur mostly in tropical countries of the world and the species widely known is *Dracunculus medinensis* (Okaka, 1995).

Habitat

The adult worms occur in the connective (subcutaneous) tissues particularly tissues of the ankle and foot, arms and shoulders (Smyth, 1976). According to Wilcocks and Manson-Bahr (1978), it exhibits “geotropism” (i.e. it is drawn towards the earth). Consequently, it is drawn towards the limbs – to the fingers if in the arms; to the thighs and ankle if in the legs. Also to the scrotum and penis if in the abdomen of males, 90% migrate to the legs and feet especially behind the outer malleolus.

How is Guinea Worm Transmitted/Life Cycle?

The mature female worm pierces the skin of the lower leg causing an ulcer, when the ulcer is in contact with water, larvae are discharged into the water, the larvae infect Cyclops, a small crustacean, the water, contaminated with the infected Cyclops, is consumed by man, the ingested larvae mature in humans in one year. Guinea worm disease is transmitted entirely by drinking the contaminated water. The contaminated water is typically from open surface sources such as stagnant ponds or “step wells” as shown in Fig 1a and 1b below (Smyth, 1976; Edungbola et al., 1987; Cairncross et al., 2002; Nelson, 2012).

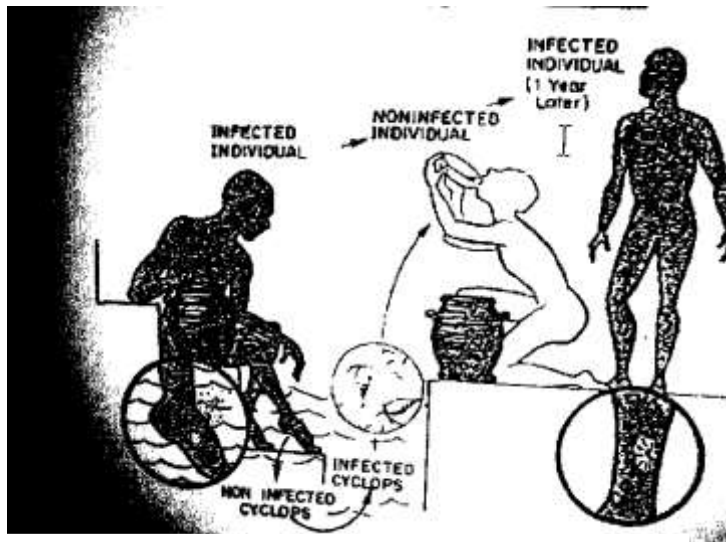


Fig 1a: Life cycle of Guinea worm (Edungbola et al., 1987)

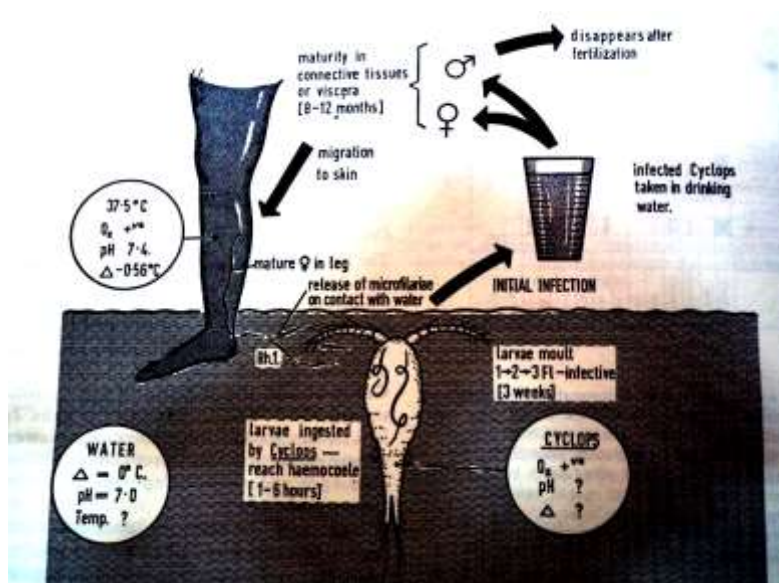


Fig.1b: *Dracunculus medinensis* – Life cycle with some biological factors (Smyth, 1976)

Is Guinea Worm Disease Eradicable?

Theoretically, Guinea worm is an easily eradicable disease. The adult worm has a relatively short life span of only one year. There is no important reservoir host other than man and the infection is transmitted exclusively through the drinking of raw contaminated water. Introduction of clean water supply in an affected community produces a dramatic; and permanent impact on prevalence of Guinea worm (Edungbola et al., 1987; Tayo, 1989; Aikhomu et al., 2000; Boisson et al., 2009; WHO, 2012).

Economic Relevance of Guinea Worm Eradication (Nigeria)

According to the report of a study commissioned by UNICEF undertaken between

September and December 1987 focusing on Guinea Worm and rice production in Anambra, Cross River, Imo and Benue State, annually, the infection is responsible for a substantial amount of lost man-days which translate into the loss of millions of dollars to the nation (Edungbola et al., 1987). The disease has multiple adverse effects on health, education, social, religious, political, agricultural and economic activities of the rural population in Nigeria (Edungbola et al., 1987; Tayo, 1989; Olujide, 2008). However, the economic benefit of Guinea worm eradication in the area was estimated at US\$20 million profit per annum in additional rice sale alone.

GLOBAL GUINEA WORM ERADICATION EFFORTS

1980 - Global Dracunculiasis Eradication Campaign (GDEC) programme began at the Centre for Disease Control and Prevention (CDC) Atlanta, USA in 1980 (Hopkins et al., 2008).

1981 – The CDC effort was adopted as a sub-goal of the International Drinking Water Supply and Sanitation Decade (IDWSSD) (1981 – 1990).

1986– The Carter Centre (CC) was at the head of a coalition that includes;

The Ministries of health of the endemic countries, CDC, UNICEF and WHO as major partners, thousands of village volunteers, supervisors and health staff. These partners were supported by numerous donor agencies, governments, foundations and other institutions (Tayo, 1989; Donald et al., 2008). Also in May 1986, the 39th World Health Assembly viewed with great concern, the implications and geographical distribution of guinea worm disease and consequently passed a resolution for its global eradication (Edungbola et al., 1987; Olujide, 2008). In response to this declaration, specialists from 14 of the 19 seriously affected African countries met in Niamey, Niger Republic in July 1986.

2004 –The efforts of the various countries to eradicate guinea worm assisted by the Carter Centre, CDC, WHO and UNICEF resulted in the significant reduction in guinea worm disease. Consequently, at the World Health Assembly in 2004, ministers of the remaining endemic countries set a target to stop transmission of dracunculiasis by the end of 2009 (Donald et al., 2008; CDC, 2012).

2005 – 2008: The Global Dracunculus Eradication Campaign (GDEC) Programme has continued to convene an annual meeting of all endemic countries (Figure 1) in March or April of each year as follows : 2005 – Accra, Ghana; 2006 – Ouagadougou, Burkina Faso; 2007 – Niamey, Niger Republic; 2008 – Abuja, Nigeria. The three senior international advocates for Dracunculiasis eradication – President Carter (US), President Amadou Toure (Mali), Gen. (Dr.) Yakubu Gowon (Nigerian former Head of State) participated in the same meeting (for the first time) at Abuja in April 2008. The WHO Collaborating Centre for Research, Training and Eradication of Dracunculiasis at CDC undertakes research to provide molecular tools to distinguish *D. medinensis* from other *Dracunculus* spp that infect animals (Ruiz-Tibet and Hopkins, 2006; Donald et al., 2008; Carter Center, 2013a).

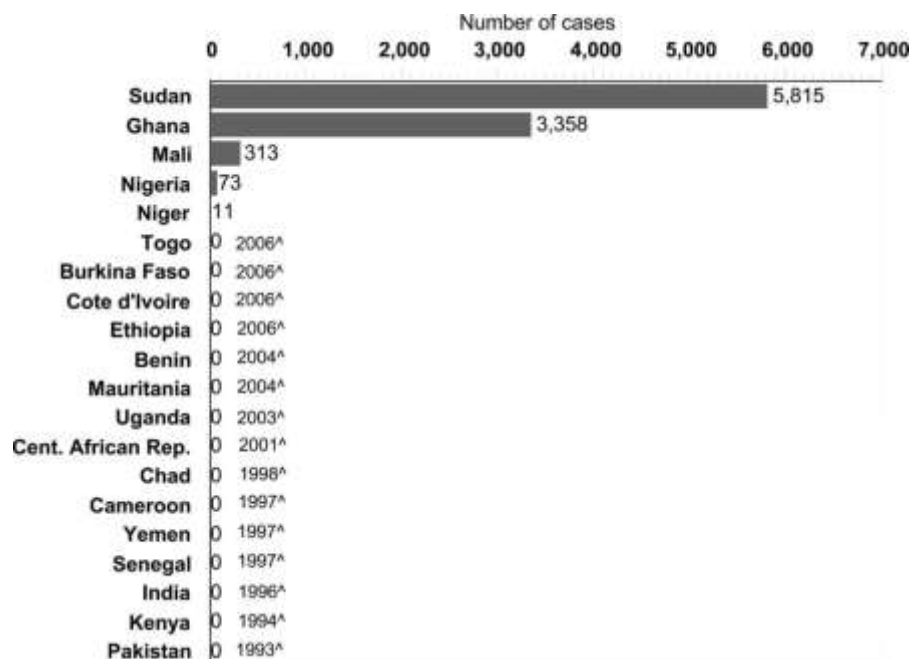


Fig.2: Distribution of 9570 indigenous cases of Dracunculiasis reported during 2007 and year of last indigenous case in other countries. [^]Year last indigenous case reported. Pakistan and India certified free of disease in 1996 and 2000, respectively, Senegal and Yemen in 2004, and Cameroon and Central African Republic in 2007 (Donald, 2008)

2013: The GDEC Programme teams have continued eradication-orientated activities since their last meeting at Abuja in 2008. Between June 24 and July 12, 2013, the International Commission for Certification of Dracunculiasis (ICCDE) team visited Nigeria for assessment of Nigeria's report on zero case of Guinea worm. On 12th December 2013, WHO certified Nigeria, Niger and Cote d'Ivoire free of Dracunculiasis. Also Somalia and South Africa that never had Dracunculiasis were certified (Alao, 2013)

2014: On 17th February 2014 and 17th March 2014, Niger and Nigeria were respectively presented with Certificates by WHO to declare them Guinea worm-free nations. (www.who.int/.../nigeria.../guinea-worm/e-).

Present (Current) Global Status

In **1986**, there were 3.5 million GWD cases globally confined to parts of Africa, Asia and the Middle East.

In **2013**, there were only 148 cases worldwide found in South Sudan (76% of the cases) and the remaining cases in Chad, Ethiopia and Mali (WHO, 2013).

In **2014**, it is hoped that the various eradication efforts of the remaining 4 countries (above) assisted by the Carter Centre, UNICEF, GDEC programme and WHO will bring the global eradication dream to reality in the near future e.g. by 2017.

NIGERIA GUINEA WORM ERADICATION EFFORTS

1961: A report from University College Hospital, Ibadan that tetanus was the leading cause of death and that guinea worm ulcers were the third most important portal of entry of tetanus spore raised an alarm and attention to guinea worm (Lauckner et al., 1961, Edungbola et al., 1987). In spite of this, guinea worm infection was increasing in prevalence, distribution, intensity and public health importance.

1986: By 1986, about 2.5 million Nigerians were infected every year of which 1 million are essentially farmers. (Edungbola et al., 1987). In March 1986, the National Council of Health in Nigeria adopted a resolution identifying dracunculiasis as a leading Nigerian health problem that should receive a high priority for control. The Carter Centre, CDC, WHO and UNICEF alerts created more awareness and

attention to the Federal Government, State Governments and Ministries of Health (Edungbola et al., 1987; Tayo, 1989).

1988: Nigeria topped the list of guinea worm endemic countries by 1988, recording 653,620 cases at a time when the global total was 3.5 million and reported from 21 countries. Nigerian Guinea Worm Eradication Programme (NIGEP) was established by the Federal Military Government. A branch of the Global Dracunculiasis Eradication Campaign (GDEC) programme was established in Nigeria (Olujide, 2008; Alao, 2013).

2004-2012: Global 2000, an outfit of the Carter Presidential Centre, was playing the major pivotal role in the GDEC programme. The NIGEP in conjunction with some private organizations in Nigeria (eg. Yakubu Gowon Centre) continued to work consistently to eradicate the disease. Their efforts resulted in the visit of the International Commission for Certification of Dracunculiasis (ICCDE) in 2013 to assess the Nigerian situation on guinea worm disease (Tayo, 1992; Alao, 2013).

Awaiting the Certification from WHO

2013: The International Commission for Certification of Dracunculiasis Eradication (ICCDE) team visited Nigeria between June 24 – July 12, 2013 to do the field work (Alao, 2013). Prof. David Molynox was the chairman of the team and said: "I'm leading a team of nine external consultants and nine Nigerian consultants. We are operating on the basis of strict independence, because the team must be totally independent in its review of documentation provided by the NIGEP. Nine groups of the ICCDE members were distributed all over the country examining the information and documentation which government/NIGEP at state levels provided. The effort was to bring evidence to bare that guinea worm transmission no longer exists in Nigeria". On September 3, 2013, Prof. Onyebuchi Chukwu, Nigerian's Minister of Health, during a symposium in Ibadan announced that Nigeria has been certified free from guinea worm disease (Alao, 2013). Prof. Chukwu relied however on the briefing by the visiting verification team before leaving Nigeria. On 13th December, 2013, WHO officially certified Nigeria as guinea worm – free country.

Presentation of Certificate

2014: On 15th January 2014, Prof. C.O. Chukwu, Nigeria's Minister of Health presented a formal notification letter from WHO about Nigeria's Certification as a guinea worm-disease-free country to President Goodluck Jonathan. On 17th March 2014, in Brazzaville, WHO presented the official Certificate to Nigeria as a guinea worm disease-free country (www.who.int/.../nigeria.../guinea-worm/e-)

CONCLUSION

Nigerian Situation

Nigeria is now free of Guinea Worm Disease.

Global Situation

The Carter Center, which has spearheaded the global eradication effort with such partners as the World Health Organization and the Center for Disease Control and Prevention, has predicted that guinea worm disease "will be the first parasitic disease to be eradicated and the first disease to be eradicated without the use of vaccines or medical treatment" (Nelson, 2012; Carter Center, 2013a). Former U.S. President Jimmy Carter has been quoted as saying "We are approaching the demise of the last guinea worm which will ever live on earth" (Nelson, 2012). Only 4 African countries harbour guinea worm in the world presently (with 143 cases), the battle is still on for global Guinea worm eradication now focused on 4 countries— South Sudan, Mali, Ethiopia and Chad. It will come to pass and others (like Schistosomiasis) will follow.

WAY FORWARD

Guinea worm is a water-borne disease that can be vectored from place to place by humans who are the definitive hosts of the parasite *Dracunculus medinensis*. Humans move about a lot and with the porous nature of Nigerian borders, particularly in the Northeast, infected persons can transport the disease back to Nigeria (as was the case of Niger Republic from Mali (Donald et al., 2008). It is imperative that continuous surveillance by the Federal Ministry of Health and the Security Agencies at the borders be strengthened or put in place to check emigrants for guinea worm so as to maintain the guinea worm-free status permanently. The global efforts should continue and all hands should be on deck to free the 4 remaining countries.

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