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Review Article

Ethnobotanical Survey of Plants Traditionally Used to Treat Lymphatic Filariasis in Southern, Western and Northwestern Provinces of Zambia

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ABSTRACT

Lymphatic Filariasis (LF) is caused by three thread-like parasitic worms, called filariae. The infection damages the lymphatic system, increasing the risk for secondary infections and complications. Folks rely on Traditional healers as first line of care for most LF patients living in the community, most patients only go to the health facility once the symptoms have progressed and the pain worsened. This present review discuses some of medicinal plants that are used to treat LF in Southern, Western and Northwestern provinces of Zambia. The results of the survey found 17 plants from 15 different families were being used to treat LF, with the oral and topical route being the most common routes administration.

Keywords: Lymphatic filariasis, Medicinal plant, Traditional medicine

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INTRODUCTION

Lymphatic filariasis is caused by three thread-like parasitic worms, called filariae. The species Wuchereria bancrofti is the most prevalent worldwide, *Brugia malayi* is found mostly in eastern Asia, and Brugia timori is confined to East Timor and adjacent islands. Filarial parasites in their adult stage live in the lymphatic system. The worms have an estimated active reproductive span of 4-6 years, producing millions of small immature larvae, microfilariae, which circulate in the peripheral blood. They are transmitted from person to person by several species of mosquito (WHO, 2013).

Approximately 15 million people globally are affected by lymphatic filariasis related lymphedema (or elephantiasis), which includes swelling of the limbs, breasts or genitals, and almost 25 million men are affected by urogenital swelling, primarily scrotal hydrocoele (Simonsen PE, *et al.*, 1996). Although these clinical manifestations are not often fatal, they lead to the ranking of lymphatic filariasis as one of the world's leading causes of permanent and long-term disability (WHO, 1995).

Lymphatic filariasis infection can occur early in life. In some areas, about 30% of children are infected before the age of 4 years (Simonsen PE, *et al.*, 1996, Lammie PJ, *et al*, 1998), and, while the clinical disease usually appears later in life, subclinical damage starts at an early age (WHO, 2010).

The World Health Organization (WHO) baseline data in the year 2000 indicated that more than 120 million people were infected globally, and approximately 40 million suffered from the stigmatizing and disabling clinical manifestations of the disease, including 15 million who have lymphedema and 25 million men who have urogenital swelling, principally scrotal hydrocele (WHO, 2019). In 2000, about 40% of LF infected people were from Sub Sahara Africa, with cases ranging from 46 to 51 million, and an estimated at-risk population of 432 million people (Ichimori, *et al.*, 2014) and in 2018, the total estimated at-risk population requiring intervention in Africa was 341 million.

One hundred and twenty million people in at least eighty countries are infected with the parasites associated with lymphatic filariasis. 90% of this infection is caused by W. bancrofti. Most of the remaining cases are due to *Brugia malayi* (B. malayi). In addition, one billion people (20% of the world's population) are estimated to be at risk for infection (Leite AB, *et al.*, 2010; Addiss, *et al.*, 2010).

Although 80 countries are known to be endemic areas, about 70% of infected cases are in India, Nigeria (Okon OE, *et al.*, 2010), Bangladesh and Indonesia. Lymphatic filariasis is endemic in 32 of the world's 38 least developed countries (Chu, *et al.*, 2010).

A significant proportion of the public health problem represented by lymphatic filariasis is due to impairment and disability related to lymphedema (elephantiasis) and hydrocoele. Therefore, national programmes focus on managing morbidity and preventing disability. These activities will not only help lymphatic filariasis patients but can improve coverage with drugs.

Management of morbidity and disability in lymphatic filariasis require a broad strategy involving both secondary and tertiary prevention. Secondary prevention includes simple hygiene measures, such as basic skin care, to prevent ADLA (Acute Dermato Lymphangio Adenitis) and progression of lymphedema to elephantiasis (Dreyer G, 2002; WHO, 2010).

Lymphatic filariasis infection damages the lymphatic system, increasing the risk for secondary infections and complications. An estimated 40 million people globally have clinically significant manifestations of lymphatic filariasis-predominantly lymphedema and hydrocoele-accounting for 5.9 million disability-adjusted life years (WHO, 1995).

In Zambia, LF is also a public health concern, as 87 of 118 districts are considered endemic with the prevalence of the circulating filarial antigen above 1.5% (MOH, 2019). Results from the LF mapping exercise showed that there were many cases of hydrocele and lymphedema spread across all ten provinces in Zambia (MOH, 2019).

Folks rely on Traditional healers as first line of care for most LF patients living in the community (Adhikari, *et al.*, 2015). Most patients only go to the health facility once the symptoms have progressed and the pain worsened.

Unavailability of vaccines as well as the pressure of increased risk of development of drug resistant worms urge for an urgent need of a cheap, non-toxic and novel antifilarial drug with long term antimicrofilarial or macrofilaricidal activity (Dhananjeyan MR, *et al.*, 2005).

The drugs that are currently used for MDA implementation by national programmes include ivermectin, Albendazole and Diethylcarbamazine (Gayen P, *et al.*, 2013). These drugs used for controlling filariasis exhibit numerous side effects. Current strategies to control filariasis are not thought to be completely safe and successful. This warrants an effective and safe drug targeted against the adult filarial worm. Some lead has been made by researchers to investigate the effect of several medicinal plants on filarial worm and many of them have been reported to have antifilarial activity (Maurya SK, *et al.*, 2014).

This review discusses some of the medicinal plants that are being used to treat lymphatic filariasis in Southern, Western and Northwestern provinces of Zambia; these medicinal plants have the potential of becoming drug of choice for treating LF if they undergo further scientific analysis and clinical development.

LITERATURE REVIEW

Study area

This ethno botanical survey was conducted in the three provinces of Zambia namely Southern, Western and Northwestern.

Data collection

Personal interviews were used to gather data on the local plants used to treat LF; these interviews were conducted from November 2020 to May 2021 (Mundia N, 2020; Kulutwe E, 2021, Mwemba, 2021). The other information was obtained through a comprehensive literature search in the Google Scholar and PubMed database using the key word "medicinal plant for treat LF" and "filariasis herbal drugs."

RESULTS

After conducting interviews with some local herbalist several plants were identified and tabulated as shown below *(Table 1)*.

Table 1: Plant survey and its medical treatment

Family name	Scientific name	Plant part used	Method of preparation
Alliaceae	*Tulbaghia alliacea (wild garlic)*	Bulb	Decoction and infusion used to treat swelling and wounds associated with LF
Amaranthaceae	*Achyropsis avicularis*	Leaves	Leaves are used to clean wounds
Asteraceae	*Aster bakerianus*	Roots	Decoction and infusion taken internally as an anthelmintic.
Asteraceae	*Dicoma anomala*	Roots, leaves	Poultice is prepared with leaves to treat wounds. Root decoction is taken internally for infection
Bignoniaceae	*Kigelia africana*	Bark	Infusion is used to treat skin infections
Capparaceae	*Capparis tomentosa*	Leaves and roots	Decoction used to treat wounds and skin problems
Caricaceae	*Carica papaya*	latex	Applied topically
Euphorbiaceae	*Croton sylvaticus*	Leaves	Leaves are made into a poultice to treat sore legs
		Whole plant	Infusion and decoction used for easing inflammation
Euphorbiaceae	*Ricinus communis var communis*	Leaves and young roots	Leaves and roots used to treat headaches, pains and relieving clots from the body
Fabaceae	*Albizia anthelmintica*	Stem	Pulverized to powder which is then diluted with water is taken orally as an anthelmintic
Hyacinthaceae	*Eucomis autumnalis*	Bulb	Decoctions of the bulb in water or milk are usually administered as enemas
Hypericaceae	*Psoraspermum baumii*	roots or leaves	fresh roots or leaves mixed with water or oil-massage of the leg is repeated several times
Meliaceae	*Azadirachta indica (neem tree)*	Flower extract	Infusion taken orally
Moringaceae	*Moringa oleifera Lam*	seed extract	Seed crushed and resulting solution is taken orally
Sapindaceae	*Cardiospermum halicacabum Linn.*	Leaves and roots	Poultice is prepared with leaves to treat wounds. Root decoction is taken internally for infection
Verbenaceae	*Lantana camara Linn*	Stem	Decoction that is taken orally
Zingeberaceae	*Zingiber officinale*	Rhizome	Taken orally

The article selection process will follow the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extensions for Scoping Reviews (PRISMA-ScR) checklist and mapping will be done using the PRISMA-P chart. The scoping review is expected to be completed within eight to twelve weeks from commencement. This timeline will be affected by the volume of literature that would be reviewed.

DISCUSSION

From the survey it was found that plants from 15 different families are being used to treat LF in Zambia, from which 17 plants were identified and found to be used in the management of this neglected tropical disease, these plants are *Carica papaya, Tulbaghia alliacea (wild garlic), Achyropsis avicularis, Aster bakerianus, Dicoma anomala, Kigelia africana, Capparis tomentosa, Croton sylvaticus, Ricinus communis var communis, Albizia anthelmintica, Eucomis autumnalis, psoraspermum baumii, Azadirachta indica (neem tree), Moringa oleifera Lam, Cardiospermum halicacabum Linn, Lantana camara Linn* and *Zingiber officinale*.

The pant of the plants used included roots, leaves, flowers, rhizomes and gum. The commonest method of preparing these herbs for use were decoction, infusion and poultices, which are being taken mostly by the oral and topical route, the rectal route is not often used.

Through literature it was discovered that studies have been conducted on some of these plants in trying to determine their effectiveness against LF. The findings from these studies have shown that truly these medicinal plants do have some medicinal value against LF (*Table 2*) and if more studies can be done, such plants can be developed into potent drugs.

Table 2: Findings of the medicinal treatment of plant species

Medicinal plant	Findings	Author and year
Albizia anthelmintica	The aqueous extract of *Albizzia anthelmintica* bark showed high anthelmintic activity (68%-100%) against experimental *H. diminuta* infection in albino rats.	Galal *et al.*, 1991
Cardiospermum halicacabum	*Antifilarial* activity of the plant ethanolic and aqueous extracts has been reported against *B. pahangi*. There was a concentration and time dependent reduction in motility of adult worms and the pattern of release of microfilariae from the female worms.	Khunkitti *et al.*, 2000
Carica papaya	Papaya latex (*Carica papaya*) showed an antiparasitic efficacy against *Heligmosomoides polygyrus* in a mice model.	Satrija, 1995
Lantana camara Linn	*L. camara* stem extract administered at the dose of 1 g/kg for 5 days killed 43% of adults and sterilized 76% of the surviving female worms.	Misra *et al.*, 2007
Ricinus communis	Methanolic extract of the seed revealed antifilarial activity in a dose dependent manner as evident from induction of death in the embryogenesis of filarial parasite *B. malayi*. The extract also shows dose dependent inhibition of microfilariae motility.	Shanmugapriya and Ramanathan, 2012
Zingiber officinale	Alcoholic extracts of *Z. officinale* rhizomes at 100 mg/kg reduced microfilarial concentration in blood by a maximum of 98% in dogs naturally infected with *D. immitis*.	Datta and Sukul, 1987

The extensive use of traditional medicine in Africa, composed mainly of medicinal plants, has been argued to be linked to cultural and economic reasons. This is why the WHO encourages African member states to promote and integrate traditional medical practices in their health system (WHO, 2008). For instance, in Ghana, Mali, Nigeria and Zambia, herbal medicines are the first line treatment for more than 60% of children with high fever. Studies in Africa and North America have shown that up to 75% of people living with HIV/AIDS use traditional medicine alone or in combination with other medicines for various symptoms or conditions (WHO, 2003).

Medicinal plants are widely accepted as an alternative to modern medicine in rural, peri-urban and urban areas. Beneficiaries of the practice cut across the gender, age, education and social status. Over 75% of all Zambians and about 80% of all Zimbabweans have benefited from traditional medicinal plant practice voluntarily or involuntarily. The needs of patients range from receiving simple herbal preparations to casting evil spirits. Remedies are taken orally; through steaming; by anal insertion for powders and liquids; by inhalation of smoke and fumes; by wearing and carrying on the body; by rubbing on the affected part; and by taking in a drink, porridge and solid food (Duri JZ; and Mwitwa J, 2009).

The Zambia Elimination of Neglected Tropical Diseases National Masterplan (2019-2023) places huge emphasis on delivery of Management of Morbidity and Prevention of Disability (MMDP) services in endemic districts. However, Zambia currently lacks a comprehensive national MMDP strategy for LF or suitable indicators to monitor progress in service provision (MOH, 2019); as a result of this people especially in rural areas are relying on the use of herbal medicine in trying to manage LF.

Some people in rural parts of Zambia stay very far from health facility, for example there are some people that live in Luangwa District which is a very remote and a portion of the district is covered by the Luangwa National Park. As a result, some communities in the district have to travel long distances of up to 20 kilometers and more to the nearest health facility and their access may be inhibited by wildlife attacks such as elephants from the Luangwa national park. In addition, roads to the health facilities are sometimes impassable and the most common means of transport is bicycles which are inappropriate to transport lymphedema and hydrocele patients. With these challenges people rely mainly on herbal medicine to treat LF and other conditions that are affecting their health.

CONCLUSION

This study documented some plants that are used traditionally to treat LF in Southern, Western and Northwestern province of Zambia. 17 Plants from 15 different families were recorded and found to be used traditionally to treat LF in Zambia. The plant parts that are being used include roots, stem, leaves, rhizomes, flowers and gum, with the oral and topical route being the most commonly used routes.

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