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Ethnobotanical survey of medicinal plants used by traditional healers in managing Gonorrhoea and Syphilis in Urambo District, Tabora Region, Tanzania

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ABSTRACT

Medicinal plants used by traditional healers (THs) in managing gonorrhea and syphilis in Urambo District, Tabora Region, Tanzania, were documented. A semi-structured questionnaire was used to gather information on the use of medicinal plants. The findings revealed that 33 medicinal plants belonging to 18 families were used by the THs to manage gonorrhea and/or syphilis in Urambo District. Among the listed plants, *Ximenia caffra, Friesodielsia obovata* and *Clerodendrum myricoides* were frequently used by THs to manage gonorrhea while *Ozoroa reticulata, Catunaregam spinosa, Annona senegalensis* and *Aloe vera* were used to manage syphilis. *Cassia abreviata, Strychnos spinosa, Strychnos potatorum* and *Entanda abyssinica* were frequently used for the management of both ailments. Five species namely *Oldfieldia dactylophylla, Flaucortia indica, Strophanthus eminii, Musa sapeintum and Phyllanthus engleri* were recorded for the first time in the country's ethnobotanical literature as a treatment of STIs. Many of the recorded plants also possessed antimicrobial properties.

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KEYWORDS
Ethnomedicine; gonorrhoea; indigenous knowledge; syphilis; Tanzania; traditional medicine use

Introduction

About 80% of the unindustrialized world depends on medicinal plants for their primary health care needs.[1] The dependence is due to inadequate contemporary health facilities and inability to pay for modern drugs and health services by the rural people.[2,3] Medicinal plants have been substantiated to be vastly effective in treating an extensive range of ailments,[4,5] including sexually transmitted infections (STIs).[6]

Globally, STIs pose a public health challenge with half a billion cases reported annually. Of these, nearly 25% are from sub-Saharan countries, Tanzania included.[7] The STI prevalence is progressively becoming a major public health concern in Tanzania. For instance, studies conducted in different regions of Tanzania reported the prevalence of 4–22% for gonorrhea and 8–24% for syphilis.[8,9] The syphilis and gonorrhea prevalence among pregnant

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women in Tabora region is 32% and 27%, respectively,[10] which is high. The two diseases are known to cause considerable morbidity and may seldom cause mortality through genital impediments. For instance, *Neisseria gonorrhoeae*, a bacteria that causes gonorrhea, causes rupture of ectopic pregnancy[11] while *Treponema pallidum*, a bacteria causing syphilis, causes fetal demise, prematurity, miscarriage, low birth weight, neonatal and infant mortality, and congenital disorders.[12]

The major contributing factors for the occurrence of STIs in rural areas are poverty, absence/scarce modern health facilities and lack of awareness of STIs and allied symptoms.[3] Rural people opt to use traditional healing practices as their first line of health care for STIs due to cultural barriers, traditional beliefs, low income and absence of privacy.[13] Other challenges include distance to hospitals, long lines, shortage of modern drugs, lack of equipped laboratories and poor workers' altitudes to the STI infected people. The hesitancy to reveal information regarding genitalia is yet another reason for rural people to depend on traditional therapists.[14]

Like many other African countries, traditional medicine in Tanzania plays a great role in managing human ailments. Information collected by various investigators endorses this fact.[15–17] Also, it is well-known that traditional healers, locally known as *Mganga* (singular) or *Waganga* (Plural) use plants to manage STIs including gonorrhea and syphilis. Various ethnobotanical studies showed that nearly 80% of the rural population in Tanzania do not habitually access public health facilities and tend to rely on THs for medications.[2,16,18] The medicinal plants of Urambo District, especially those used by THs to treat gonorrhea and syphilis have not been documented. Most of the information on names of medicinal plants, parts used, ailment cured, preparation and administration are owned by the THs. Therefore, the objective of this study was to probe the indigenous knowledge used by THs in managing gonorrhea and syphilis in Urambo District in Tabora Region, Tanzania.

Methodology

Study Area

This survey was conducted in Urambo District located within latitudes of 04° 41' and 05°44′S and longitudes 31°51' to 32°26' E in the western side of Tabora Region, Tanzania (Fig. 1). The Urambo District is one of the seven Districts in the Region, bordered in the east by the Uyui District, north by the Kaliua District, southwest by the Mlele District in Katavi Region and southeast by the Sikonge District. The District has a population of 192,781 with an average household size of 5.9.[19] The climate of the District is bimodal where the rainy season starts in November and ends in April while the dry season starts in May

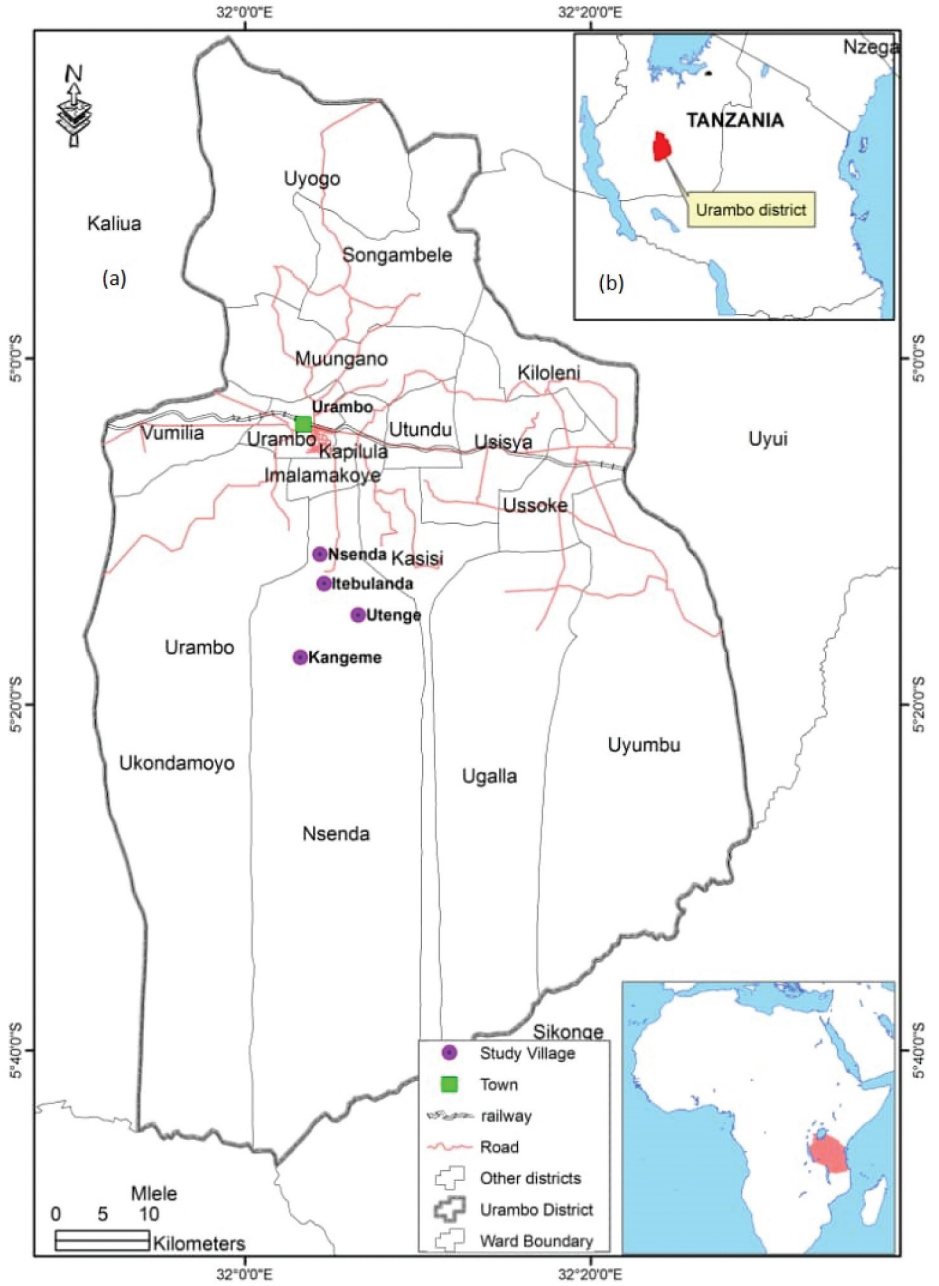


Figure 1. Map showing location of study areas (a), position of the Urambo District in Tanzania (b) and position of the country in Africa (c).

and ends in October. The rainy season is humid and overcast while the dry season is windy and partly cloudy. The Urambo District receives a mean total rainfall of 1370 mm per annum. It also experiences a mean maximum and minimum temperature of 29°C and 17°C, respectively (Fig. 2) and a mean

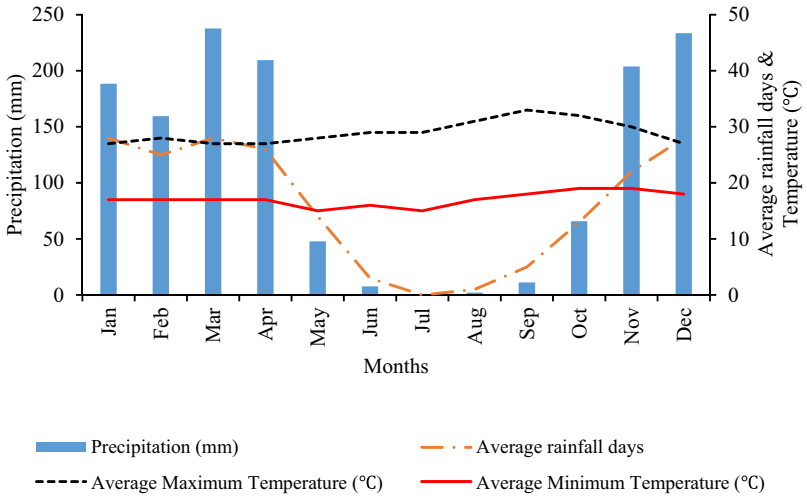


Figure 2. Monthly average precipitation, rainfall days and average temperature for Urambo District.

relative humidity of 75% per annum. The principal inhabitants of the Urambo District are the Nyamwezi tribe, who depend solely on agriculture for their survival. Tobacco and rice are the major cash and food crops grown in the District, respectively. The vegetation in the District is mainly Miombo woodland dominated by *Brachystegia species, Julbernadia globiflora and Pterocarpus angolensis*.

Ethnobotanical Survey

The survey was conducted between August – October 2020 in Urambo District, Tabora Region. Research clearance was obtained from the University of Dar es Salaam before the inception of the study. A total of 21 THs from four villages, namely Nsenda (5), Itebulanda (4), Kangeme (3) and Utenge (9) were involved in the study. Before interviewing the healers, an overview of the study and its significance were communicated to THs and their consent requested. The semi-structured questionnaire was used to gather information on informant characteristics (gender, age, education level, experience and residence) and medicinal plants used (plant name, cured ailment, parts used, accessibility, preparation and administration methods). All dialogs were conducted in Swahili language. Plant identification was done in the field by experienced botanist, except for taxonomically challenging plants, which had to be collected and pressed for further identification in the University Herbarium. Scientific names were verified using websites Useful Tropical Plants Database (www.tropical.theferns.info), and Global Plants Database (www.jstor.org).

Data Analysis

Data were organized and analyzed using Microsoft Excel 2013 version, Statistical Package for Social Sciences (SPSS) version 16 and QED Statistics software. The t-test was used to check for differences in plants knowledge within gender. The one-way analysis of variance (ANOVA) followed by multiple comparisons using Bonferroni *post-hoc* test ($p < 0.05$) was employed to investigate differences in ethnomedicine knowledge within the studied social groups (age, education level, experience and residence). The association between age and experience social groups on medicinal plant knowledge was determined using the Pearson correlation coefficient (r). The quantitative data analysis was by computing the familiarity index (F_i), denoting the occurrence of a plant cited as ethnomedicine divided by the total number of THs engaged in the study. The Fi was calculated as follows.

$$F_i = \frac{N_a}{N_b} x100$$

Where N_a is the number of THs that cited a plant as an ethnomedicine and N_b is the total number of THs interviewed.

Results

Traditional Healer's Profiles

A total of 21 THs from four villages were interviewed, of which 76.3% were males and 23.8% were females. Of these, 42.9% were from Utenge village, 23.8% Nsenda village, 19.0% and 14.3% were from Itebulanda and Kangeme village, respectively (Table 1). In terms of age, the sector was dominated by participants in the age range between 41 and 60 y (38.1%) followed by those

Table 1. Informant sociological profiles and mean (±SD) number of cited species.

Factor	Category	No. of TH's	% TH's	No. of species
Gender	Male	16	76.3	3.3 ± 0.8
	Female	5	23.8	2.2 ± 0.6
Age groups (Y)	< 20	2	9.5	1.5 ± 0.5
	21–40	5	23.8	2.3 ± 0.4
	41–60	8	38.1	2.9 ± 0.9
	> 60	6	28.6	3.3 ± 0.8
Education level	Illiterate	4	19.0	1.8 ± 0.5
	Primary	14	76.2	3.5 ± 1.8
	Secondary	3	4.8	4.0 ± 1.0
Experience (Y)	< 5	2	9.5	1.5 ± 0.7[a]
	5–10	4	19.0	2.0 ± 0.8[a]
	11–15	5	23.8	3.8 ± 2.3[ab]
	> 15	10	47.6	4.8 ± 1.4[bc]
Residence (Villages)	Nsenda	5	23.8	3.6 ± 2.3
	Itebulanda	4	19.0	2.0 ± 0.8
	Kangeme	3	14.3	4.3 ± 3.1
	Utenge	9	42.9	4.3 ± 1.5

Note: The superscript letters along a column indicate differences among the two values (P < 5%).

with age greater than 60 y (28.6%). The educational level of the THs showed that 76.2% had primary education, 4.8% had secondary education and 19.0% did not have an opportunity to access the formal education system. None of the cross-examined THs had access to the tertiary education level. Majority of the healers had >15 y of experience (47.6%) in ethnomedicine followed by those with 11–15 y (23.8%) of experience (Table 1).

Medicinal Plants Knowledge

The Bonferroni *post hoc* test revealed that THs with experience of >15 y had considerably higher knowledge of medicinal plants than those with <5 y and 5–15 y of experience in the sector while the remaining pairs were not statistically different (Table 1). The average number of cited species within gender, age groups, education level, and residence were not different. The knowledge of medicinal plants by age and experience revealed a strong positive correlation (r = 0.95). Among the THs, 52.4% learnt their ethnomedicine knowledge from family members while others gained their knowledge from THs (19.0%), friends (14.3%), ancestor spirits (9.5%) and 4.8% reported to have self-trained.

Taxonomic Diversity

A total of 33 medicinal plants belonging to 18 families and 31 genera were inventoried by the THs as being used in managing gonorrhea and/or syphilis in Urambo District (Table 2). The largest number of species being used were from the family Fabaceae (8 species, 24% of all species) followed by Euphorbiaceae and Anacardiaceae (each with 3 species, 9%) and Annonaceae, Combretaceae, Liliaceae and Loganiaceae (each with 2 species, 6%). Other 11 families were represented by one species each.

Growth Forms, Used Plant Parts, Preparation and Administration

Among the 33 listed medicinal plants, trees (42.4%) and shrub (33.3%) formed the highest growth forms whereas woodlands (35.3%), forests (32.4%) and farmlands (17.6%) were the common locations accessed by the THs for medicinal plants (Fig. 3a & b). The root (69.7%) and leaves (24.2%) were the most frequently used plant organs (Fig. 3c), decoction (47.6%) was the most used preparation technique (Fig. 3d) and oral intake (90.9%) was the frequently used administration method followed by topical applications (9.1%). Of the listed medicinal plants, 40% and 33% were solely used in managing gonorrhea and syphilis, respectively,

Table 2. Medicinal plants used by traditional healers in managing gonorrhoea and syphilis in Urambo District.

Family Name	Scientific name	Local Name	Growth form	Part used	Habitat	Ailment cured; familiarity index (%)	Preparation and administration
Amaryllidaceae	*Allium sativum* L.	Kitunguu pori	Bulb	Roots	Fa	Syphilis; 10	Dry, create powder, mix with vaseline, apply on affected parts
Anacardiaceae	*Lannea schimperi* (Hochst. ex A. Rich.) Engl.	Mugumbu	Tree	Roots	Wl	Gonorrhoea, syphilis; 10	Dry make powder, soak in warm water, drink decoction
	Ozoroa insignis Del.	Mwembe pori	Tree	Roots	Wl	Gonorrhoea; 19	Create powder, infuse in warm water, drink a cup twice a day
	Ozoroa reticulata (Baker f.) R. Fern. & A. Fern.	Mukalakala	Shrub	Bark, leaves	Wl	Gonorrhoea; 24	Dry, make powder, soak in warm water, drink solution, a cup twice a day
Annonaceae	*Friesodielsia obovata* (Benth.) Verdc.	Msalasi	Shrub	Roots	Wl	Gonorrhoea; 43	Boil in water, drink a cup of decoction thrice a day
	Annona senegalensis Pers.	Mutopetope	Shrub	Leaves	Wl	Syphilis; 19	Crush fresh roots, boil, drink decoction
Apocinaceae	*Holarrhena pubescens* Wall. ex G. Don	Musongalukuga	Tree	Leaves	Fo	Gonorrhoea; 10	Boil in water, drink decoction
	Strophanthus eminii Asch. ex Pax	Musungululu	Shrub	Bark	Wl	Syphilis; 5	Crush the roots, soak in fresh water, drink solution
Combretaceae	*Combretum obovatum* F. Hoffm.	Mvugoveko	Shrub	Roots, leaves	Rt	Gonorrhoea; 10	Boil leaves in water, drink warm decoction; Macerate roots, boil, drink solution
	Terminalia kaiserana F. Hoffm.	Muzima	Tree	Roots	Wl	Gonorrhoea; 5	Boil in water, drink decoction
Asteraceae	*Vernonia glabra* (Steetz) Vatke	Mukalinkali	Herb	Roots	Rt	Gonorrhoea, syphilis; 5	Boil in water, drink decoction
Euphorbiaceae	*Oldfieldia dactylophylla* (Welw. ex Oliv.) J.Léonard	Muliwanfywengi	Tree	Roots	Wl	Gonorrhoea; 14	Boil in water, drink decoction
	Jatropha gossypiifolia L.	Mbono	Shrub	Bark	Fo, Wl	Syphilis; 10	Extract sap, mix with oil, apply to genital parts
	Phyllanthus engleri Pax	Mgogondi	Shrub	Roots	Bl	Syphilis; 10	Boil in water, drink decoction

(*Continued*)

Table 2. (Continued).

Family Name	Scientific name	Local Name	Growth form	Part used	Habitat	Ailment cured; familiarity index (%)	Preparation and administration
Fabaceae	*Entanda abyssinica* A.Rich.	Mufutwambula	Tree	Roots	Gl	Gonorrhoea, syphilis; 19	Crush fresh roots, boil, drink decoction
	Cassia abreviata Oliv.	Muzoka/ Mulundalunda	Tree	Roots	Bl	Gonorrhoea, syphilis; 33	Macerate, boil, drink solution
	Boscia salicifolia Oliv.	Muguluka	Tree	Roots	Wl	Gonorrhoea; 10	Boil in water, drink decoction
	Senna siamea (Lam.) H.S.Irwin & Barneby	Mjoholo	Tree	Roots	Fo	Gonorrhoea; 5	Crush fresh roots, boil, drink decoction
	Vigna unguiculata (L.) Walp.	Mkunde pori	Herb	Roots	Fa	Syphilis; 10	Boil in water, drink decoction
	Pericopsis angolensis (Baker) Meeuwen	Muvanga	Shrub	Roots	Wl	Gonorrhoea; 5	Crush fresh roots, boil, drink decoction
	Pterocarpus angolensis DC.	Muninga	Tree	Bark, Roots	Fo	Gonorrhoea; 5	Boil in water, drink decoction
	Abrus precatorius L.	Muchichi	Climber	Leaves, Bark	Fo	Gonorrhoea; 19	Slice roots, boil in water, drink decoction
Flacourtiaceae	*Flaucortia indica* (Burm.f.) Merr.	Mupukuswa	Tree	Roots	Fo	Gonorrhoea, syphilis; 10	Make powder, soak in warm water, mix, drink solution
Liliaceae	*Asparagus falcatus* (L.) Druce	Kasolanhanga	Climber	Whole plant	Fo	Gonorrhoea; 10	Boil in water, drink decoction, two tea spoons thrice a day
	Aloe vera (L.) Burm.f.	Mlovera	Succulent	Whole plant	Fa	Syphilis; 14	Boil in water, drink a cup of decoction thrice a day
Loganiaceae	*Strychnos potatorum* Linn.	Mugwegwe	Tree	Roots, leaves	Fo	Gonorrhoea, syphilis; 19	Boil in water, drink decoction
	Strychnos spinosa Lam.	Mwage	Tree	Roots, leaves	Fo	Gonorrhoea, syphilis; 29	Macerate, boil in water, drink decoction
Musaceae	*Musa sapeintum* L.	Mugomba	Herb	Roots	Fa	Syphilis; 5	Boil in water, drink decoction
Myrtaceae	*Psidium guajava* L.	Mpera	Tree	Leaves	Fa	Syphilis; 14	Boil in water, drink decoction, two tea spoons thrice a day
Olacaceae	*Ximenia caffra* Sond.	Munembwa	Shrub	Roots	Wl	Gonorrhoea; 48	Slice roots, mix with water, boil, drink decoction, two tea spoons thrice a day
Rubiaceae	*Catunaregam spinosa* (Thunb.) Tirveng.	Msazi/ Mochangoko	Shrub	Roots	Fo	Syphilis; 24	Dry, make powder, mix with warm water, drink solution, two tea spoons thrice a day
Solanaceae	*Solanum incanum* L.	Ntalantu	Herb	Fruits	Fa	Syphilis; 5	Burn, add oil, disinfect wounds
Verbenaceae	*Clerodendrum myricoides* (Hochst.) R.Br. ex Vatke.	Mpugambu	Shrub	Roots	Fo	Gonorrhoea; 24	Boil in water, drink decoction, two tea spoons thrice a day

NB: Bl - Bushland, Fo - Forest, Fa - Farmland, Gl - Grassland, Rt – Riverine thicket and Wl - Woodland

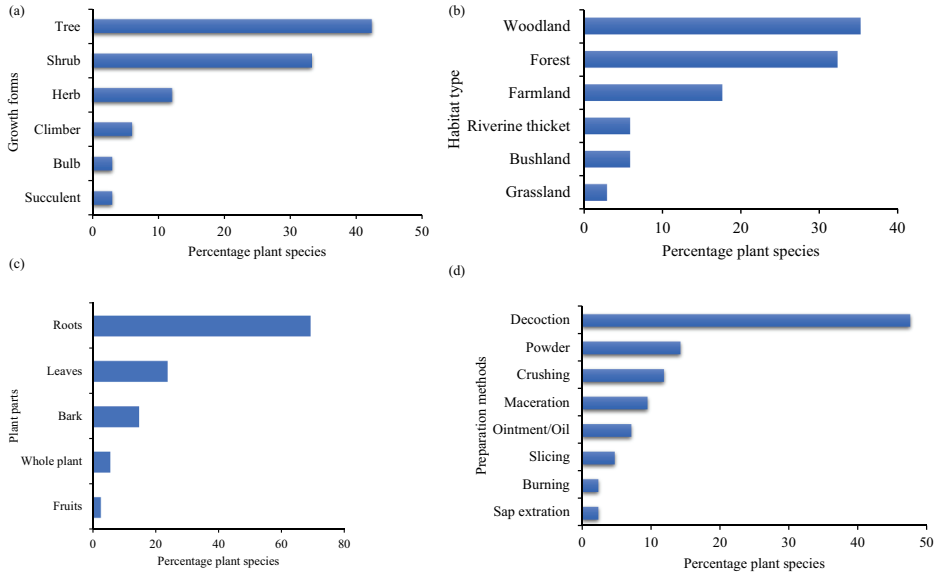


Figure 3. Share percent (%) use reports of (a) growth forms, (b) habitat type, (c) plant parts used, and (d) preparation methods.

while 27% of the plants were used to treat both illnesses. Most of the collected plant materials were used in the fresh state and obtainable all over the year.

Familiarity Index

The three medicinal plants with high familiarity index in treating gonorrhea were *Ximenia caffra* (48%) followed by *Friesodielsia obovata* (43%) and *Clerodendrum myricoides* and *Ozoroa reticulata* (each with 24%) whereas *Catunaregam spinosa* (24%), *Annona senegalensis* (19%) and *Aloe vera* (14%) had high familiarity index in treating syphilis. *Cassia abreviata* (33%), *Strychnos spinosa* (29%) and *Strychnos potatorum* and *Entanda abyssinica* (each with 19%) had high familiarity index in managing both illnesses.

Discussion

Traditional Healers

The study findings presented the domination of male THs in the sector which is similar to other reports from Zambia and Kenya.[20,21] This gender disproportion may be due to the fact that male THs are more comfortable to talk about issues allied to sex and STIs compared to females who face cultural barriers. The difference in gender, age and education had no limitation of

traditional healing practice in the District. The great majority of the THs were mature adults (> 42 y) with experience of >11 y in ethnomedicine. The aged and experienced THs had more knowledge of medicinal plants used in the management of the studied ailments. Moreover, the acquisition of ethnomedicine knowledge was mainly from family members, herbalists as well as spiritual and supernatural powers, similar to reports in Kenya.[21]

Taxonomic Diversity

Medicinal plants remain the most low-cost and practical source of treatment in the primary healthcare systems for many rural settings in Africa. In Urambo District, 33 medicinal plants were cited by THs as being used for the treatment of gonorrhea and syphilis. Compared to other ethnobotanical studies done in other sub-Saharan countries, this study recorded a larger number of medicinal plants used for the management of the two diseases. For instance, in Rwanda, 25 medicinal plants were reported to be used in managing gonorrhea,[22] whereas in Zimbabwe and Zambia, 15 and 19 medicinal plants were reported as being used,[6,23] respectively. In Kenya[21] and South Africa,[3] 16 and 17 medicinal plants were reported as being used for the treatment of STIs. The observed large number of medicinal plants in the present study may be a sign of ethnobotanical wealth in the Nyamwezi land.

The study results showed that Fabaceae was the most dominant family used in managing gonorrhea and syphilis, which is similar to the reports in Zambia,[20] South Africa,[3] and Zimbabwe.[5] Fabaceae is also the richest in medicinal plants in the Morogoro Region, Tanzania.[2] The dominance of Fabaceae may be due to its wide distribution and high species richness.[24] Euphorbiaceae and Anacardiaceae were also reported in South Africa[25] and Kenya,[21] being the most used families for treatment of STIs.

Growth Forms and Plant Used Parts

Trees and shrubs were the most used growth forms in managing the two studied STIs, as also reported in Zambia.[20] The commonness of trees and shrubs in recipes is a sign that possibly the locals are knowledgeable about the use of higher plants in prescriptions. Trees and shrubs are favored for medications due to the fact that they are not affected by seasonality and accessible throughout the year.[3] The THs in Urambo use growth forms that are obtainable all over the year for guaranteeing sustainable management of the diseases.

The study results revealed that the roots were the most preferred plant organ in Urambo District, as also reported in South Africa[3,26] and Zimbabwe.[6] Roots are mostly used because they are traditionally perceived

to have extra therapeutic power compared to other plant parts,[20,26] but their haphazard exploitation can destroy the plants and threaten their survival. Thus, education for THs and other stakeholders who collect plant roots for medicinal purposes is key to the sustainability of the medicinal plants species.

Preparation and Administration of Medicines

The THs in Urambo District used decoction as the principal method of preparing the remedies. Decoction involves abstraction by boiling plant materials and this method of preparation has been reported in the past.[25,27] It is assumed that the boiling or steaming of plant materials helps in extracting useful active ingredients.[27] The findings showed that oral was the main route of administration as also reported by other studies[3,6]

Antimicrobial Activity Reported Elsewhere

A review of literature on medicinal plants revealed that some of the plants in this study have been reported elsewhere as being antimicrobial. For instance, *X. caffra* has been reported to treat gonorrhea and other STIs in several countries.[6,20] The *X. caffra* plant extract was reported to have anti-gonococcal activity.[28] *C. abbreviata, C. myricoides*, and *S. potatorum* were used in the management of the STIs including gonorrhea and syphilis in Zimbabwe and Zambia.[5,22] A. *sativum* and *A. vera* were reported in Uganda as being used in management of STIs.[14] The THs in Zambia[20] and Kenya[21] reported the use *A. prectatorius* and to manage of gonorrhea.

The extracts of *T. kaiserana*,[29] *C. myricoides*,[30] *L. schimperi*,[31] *B. salicifolia*,[32] *V. glabra*,[33] as well as O. *spinosa, O. insignis* and *P. guajava*[5] were reported to be antimicrobial. The decoction of *T. kaiserana* was reported to possess strong component (ellagi-tannins) that were effective against *N. gonorrhoeae*.[28] However, some studies reported that the safety and efficiency of the medicinal were not guaranteed.[34]

Comparison within the Country

An analysis of literature of other settings within the country showed that most of the observed plants in the present study were also reported in other regions to be used for treatment of gonorrhea and syphilis. For instance, *C. abbreviate* and *S. spinosa*,[2] *C. abreviata, X. caffra* and *F. obovata*,[18] were used by the Luguru tribe for treating gonorrhea and syphilis in Morogoro Region. In the Coast Region, the locals used *A. falcatus* and *A. senegalensis*[4] in managing syphilis and gonorrhea, respectively, whereas, in Iringa Region, the Hehe tribe

used *P. angolensis, F. obovata* and *A. falcatus*[18] as remedies for both of the studied ailments. In Ngara District, it is reported that the locals and the Rwandese refugees used the entire *S. incanum* plant to treat syphilis and gonorrhea.[35] Of the observed plants in this study, five species *(O. dactylophylla, F. indica, S. eminii, S. sapeintum and P. engleri)* have not been mentioned in any other study within the country as being used for the treatment of STIs. This calls for further research to study their special bioactivity against the ailments.

Globally, many studies on ethnomedicinal survey of plants with therapeutic values in diseases are continuing increasing due to the predominance of infectious diseases and resistance of drugs.[14,25] This study supported these initiatives by documenting the indigenous knowledge in the Urambo District, Tabora Region, Tanzania.

Disclosure Statement

Authors declare that there is no competing interests.

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