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ORIGINAL ARTICLE

Medicinal Plants Used by Traditional Healers in Sangurur, Elgeyo Marakwet County, Kenya

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ABSTRACT

Background: Although herbal medical products are still widely used in Kenya, many of the medicinal plants used by traditional medical practitioners (TMPs) have not been documented, despite several challenges that are now threatening the sustainability of the practice. **Objective:** To document the medicinal plants and healing methods used by TMPs in a region of Kenya with several recognized herbalists for potential research. **Materials and Methods:** Semi-structured interviews, group discussions, and direct observations were used to collect ethnopharmacological information. The participant's bio-data, clinical conditions treated, methods of treatment, medicinal plants used, methods of preparation and administration, and dosage forms were recorded. **Results:** A total of 99 medicinal plants and 12 complementary preparations employed in the treatment of 64 medical conditions were identified. The most widely used plant was *Rotala tenella* which was used to treat nine medicinal conditions; seven each for *Aloe tweediae* and *Dovyalis abyssinica*; and six each for *Basella alba* and *Euclea divinorum*. The plants belonged to 55 families with Fabaceae family being the most frequently used (10), followed by Apocynaceae and Solanaceae, each with six species, respectively. We identified plants used to determine the sex of an unborn baby and those used to treat several conditions including anthrax and cerebral malaria and herbs used to detoxify meat from an animal that has died from anthrax. Of special interest was *R. tenella* which is used to prevent muscle injury. **Conclusions:** We have documented several plants with potential therapeutic effects. Further research may be conducted to determine their efficacy.

Key words: Ethnopharmacology, Marakwet, medicinal plants, research, traditional medicine

SUMMARY

- The medicinal plants used by traditional healers in a community which still practices herbal medicine in Kenya were documented. A total of 99 medicinal plants and 12 complementary preparations employed in the treatment of 64 medical conditions were identified. Further research may be carried out in order to determine their therapeutic efficacies.

Abbreviations Used: F_{ic}: Informant consensus factor, N_{ur}: Number of use reports in each category, N_s: Number of reported species, TMPs: Traditional medical practitioners.

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INTRODUCTION

Like many other countries in Sub-Saharan Africa, traditional medical practice is still an important part of healthcare in Kenya, and herbal products are widely used especially in the rural areas.[1,2] Despite this, many of the traditional medicine products have not been documented.[3] The practice is currently facing a myriad of challenges arising mainly from lack of regulatory framework and wanton destruction of forests. In addition, the advent of modern medicine has largely relegated the practice so that young people now consider it primitive.[1] This further complicates the situation since knowledge on the practice is considered a family affair, which can only be passed to a close family member from the next generation who might not be interested. The practice has also been infiltrated by quacks who take advantage of the confusion to address the demands by the populace, especially in urban areas. In fact, most of the authentic herbalists are now of old age, mainly practicing within their localities whereby they are well known. Attempts should therefore be made to document these medicinal products before the knowledge on traditional medical practice is lost.[3] Marakwet district is one region in Kenya, whereby the practice of herbal medicine is still widespread, with several recognized practicing traditional medical practitioners (TMPs).

This study is a follow-up of the initial survey that we conducted in the whole district[4] and in the neighboring districts within the County.[5] In both studies, we found out that even in the same locality, TMPs use similar plants to treat different conditions. In addition, there were some medical conditions of interest, in which the TMPs were not willing to

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divulge the modes of treatment to us. Chief among these was herbs used to determine the sex of an unborn baby and those used to treat male infertility. This is mainly due to the fact that the practice is by and large a guarded family secret.[3,4] We therefore sought to conduct detailed research in two locations, whereby we had earlier identified TMPs who were willing to provide us with the information. Our lead TMP in Sangurur Mr. Josphat Kandie Simbolei is the father of JK, one of the authors who is a registered nurse who also practices as a TMP in her own right since she has been nominated to be her family's heir of the art as per tradition.[3] Her mother is also a renowned herbalist, and both of her parents are registered TMPs.

MATERIALS AND METHODS

Study area

The study was conducted in Sangurur Sublocation (0°54'0" N, 35°34'0" E), Koibarak Location, Marakwet District, Elgeyo Marakwet County, which lies at an altitude of approximately 2252 m above sea level [Figure 1].

Like many other parts of the County, the land mass stretches along the escarpment down to the valley with steep slopes separating the escarpment and lower region.[6] The area is largely inhabited by the Marakwet, a Kalenjin subtribe. The Kalenjins who are internationally renowned for their athletic prowess also reside in the neighboring Uasin Gishu, Nandi, Kericho, West Pokot, and Baringo Counties along the Rift Valley.[7-9]

Data collection

Ethnobotanical field survey was conducted between July 2014 and March 2015. The research team composed of professionals from the medical field and botany, including a clinical pharmacologist (GK), a nurse (JK), plant specialist (WK), taxonomist (BW), and a postgraduate student (BH) at the Department of Wildlife, School of Natural Resource Management. The lead TMP Mr. Simbolei always accompanied the team alone or with his spouse. This was either during the visit to his fellow colleagues or during the identification of the medicinal plants. His presence was crucial as he is a well-known and respected TMP in the location and therefore interacted easily with his colleagues, who in turn provided us the required information without hesitation. This was unlike the initial study whereby we did not have a lead TMP and had to conduct several reconnaissance visits across the districts to identify the herbalists and convince them to provide the necessary information.[4]

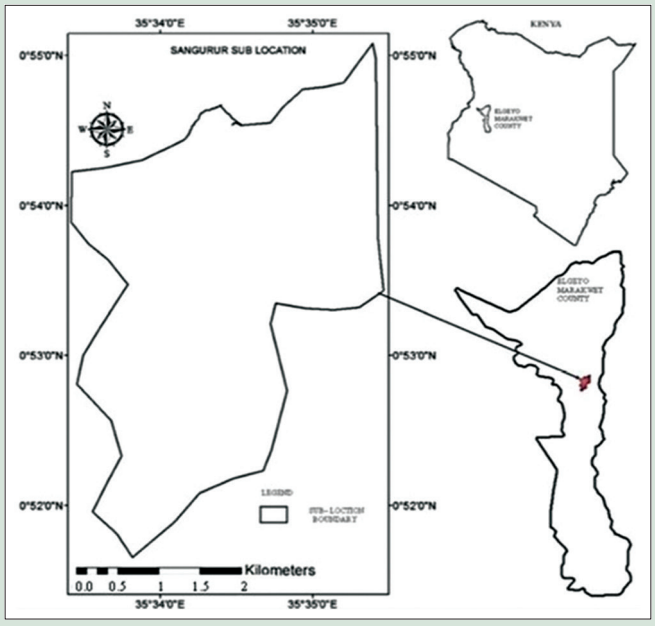

Figure 1: Map showing the position of Sangurur in Elgeyo Marakwet County and Kenya

We used semi-structured interviews, group discussions, and direct observations to collect ethnopharmacological information.[10-12] The participant's bio-data, clinical conditions treated, methods of treatment, medicinal plants used, methods of preparation and administration, and dosage forms were recorded. They were also asked to explain how they made diagnosis, type of illnesses that they treated, and how they acquired the knowledge. At the end of each interview, the informants were requested to accompany the research team to the sites where they usually collected the plants and to assist in identification. Preliminary identification of the plants was then done by the team (WK and BW), and the plants and surrounding habitat were photographed. The voucher specimens were then collected using standard botanical procedures, and further identification and confirmation were done using the relevant taxonomic keys at the University of Eldoret Herbarium.[13,14] The specimen was then deposited at the same herbarium.

Data analysis

Descriptive statistics was used for statistical analysis. The data were summarized in means and frequencies, and prioritization of the medicinal plants was based on the frequency of its use. We used the number of medicinal plants as dependent variable and age, gender, and level of education as explanatory variables. Chi-square was used to test for significant difference between the responses, and multiple regression was employed to establish demographic factors that influenced TMPs.[15]

Informant consensus factor (F_{ic}) was used to identify potentially effective plants according to the number of uses attributed each specific plant based on the information provided by the TMPs.[16-18] The medical conditions treated were categorized, and plants used for each condition as well as the number of use reports (citations) for each plant species were then recorded. F_{ic} was determined by calculating the difference between the number of use reports in each category (N_{ur}) and the number of reported species (N_s) divided by the number of use reports in each category minus one as per the following equation:

$$F_{ic} = \frac{N_{ur} - N_s}{N_{ur} - 1}$$

The F_{ic} values vary between 0 and 1, whereby a high value implies that few plant species are used by a high proportion of TMPs to treat a particular ailment, whereas a low F_{ic} suggests that the TMPs are not in agreement of the plant to be used for a specific condition. We included the identified extemporaneous preparations among the plant species as they were used concurrently.

RESULTS

Sociodemographic and practice details of the respondents

We interviewed 30 TMPs comprising 16 (53%) women and 14 (47%) men aged between 45 and 85 years. Most of them (90%) had no formal education or those who had gone to school had primary level education. The majority of the practitioners were over 55 years [Table 1]. There was a significant association between traditional medicine practice with gender ($R^2 = 2.32666$, $\beta = 32.099$, $P < 0.05$) and age group ($R^2 = 29.2734$, $\beta = 13.86$, $P < 0.05$). They all had acquired the knowledge from their parents or grandparents. Most of them conducted their practice from either their residence (23) or in nearby markets (7). Three of them regularly visited major centers within the county at least once in 3 months

Table 1: Sociodemographic characteristics of the respondents

	Frequency (%)	χ^2	*P*
Gender			
Male	14 (47)	0.36	0.5485
Female	16 (53)		
Age group			
45-55	5 (17)	9.48	0.0235
55-65	8 (27)		
65-75	11 (37)		
75-85	6 (20)		
Level of education			
None	27 (90)	64.0	<0.01
Primary education	3 (10)		

to sell their herbs to clients or fellow practitioners from other districts.

They tended to specialize in the treatment of specific medical conditions, including infertility, infectious diseases, respiratory disorders, pediatric diseases, gynecologic disorders, arthritis, cancer, and psychotic disorders [Tables 2 and 3]. They were also more knowledgeable of the presenting symptoms and diagnosis of the conditions which they specialized in as compared to the TMPs we had met in our earlier studies.[3-5] In most cases, they used similar plants to treat the same conditions, hence the high F_{ic} values [Table 3]. However, we also found out that they, in some instances, used similar plants to treat different conditions, and some even knew what ailments their counterparts treated using the same plant that they used for an unrelated condition. There were also those who highly specialized in their treatments, whereby the plants that they used were very secretive, an example being the herbs used for determination of an unborn baby's sex. The TMP who volunteered to reveal the plants provided with only two plants, thus giving an F_{ic} value of 0.

Diversity of medicinal plants and uses

A total of 99 medicinal plants and 12 extemporaneous preparations were identified which were used in the treatment of 64 medical conditions [Tables 2 and 3]. The most widely used plant was *Rotala tenella* which was used to treat nine medicinal conditions; seven each for Aloe *tweediae* and *Dovyalis abyssinica*; and six each for *Basella alba* and *Euclea divinorum*. The most widely used medicinal preparations were honey (9) and oil from sheep tallow (4). The plants belonged to a total of 55 families with plants from Fabaceae family being the most frequently used (10), followed by Apocynaceae and Solanaceae each with six species, respectively.

Modes of preparation and administration

The parts used included bark, roots, leaves, sap, twigs, and stem. They also included higher parasites which the TMPs referred to as "Torwo." These parasites usually grow on the twigs of trees, an example being those from *Acacia etbaica*, *Acokanthera oppositifolia*, and *Ficus wakefieldii.* Other preparations include fruit bodies, referred to as "Mondoiwo" or "Lobchon" in the lowland (valley) region, an example being those of *Engleromyces goetzei*, a parasitic fungus that grows on bamboo. The preparations used were by and large similar to those that we encountered in our earlier study within the county.[4,5] These included decoctions and concoctions mainly from boiled bark, roots, twigs, or even leaves in some instances. They could also be dried and pound to powder before administration and sometimes mixed with soup, especially for bitter plants. Other preparations include soot mainly from burnt twigs and leaves or flowers ("Tusan"), which is normally licked and natural gum ("Manget") that is chewed. Underground honey ("Kusumia"), or honey from insects living in dry trees other than bees ("Kipchom"), as well as dried/preserved meat ("Sirgen"), was also used. Oil obtained from sheep's tallow ("Mwaitabkejo") was also widely used. Combinations of several herbs were also used in many instances, and some plants were also used to provide additive or synergistic effects. Several plants were also used to cleanse or detoxify the blood. However, in this study, the TMPs had herbs used for prophylaxis of diseases including *A. oppositifolia*, *E. divinorum*, and *Syzygium guineense* used for prophylaxis of cancer and *E. divinorum* and *Physalis peruviana* for respiratory diseases.

Traditional fermented milk ("Mursik")

Sour milk is part and parcel of Kalenjin culture and is usually drunk after every meal. Some have even hypothesized that their athletic prowess is associated with the use of "Mursik."[19] In this study, we found out that the milk is used to treat genital ulcers and vaginal candidiasis. Its preparation involves the use of a gourd ("Sotet"), bow-shaped stick/s ("Sosiot"/"Sosik") usually from palm trees, and charcoal from selected trees and shrubs ("Suteiywo"), the most common being *Senna didymobotrya* (Senetwo), *Juniperus procera* (Torokwo), *Plectranthus barbatus* (An'gurwet), *Olea europaea* (Emtit), and wattle trees. The sticks are used to grind embers of the charcoal by pressing against the walls of a gourd in a methodical, circular in and out movement of the hand until the inside of the gourd is evenly covered with fine dust. Boiled milk is then poured into the gourd and allowed to ferment in cool dry conditions. If a new gourd is used, then it has to be first "sweetened" to remove the bitter taste. This is done by the use of fresh bark from either *Ozoroa insignis* (Mutung'wo), *Pappea capensis* (Kibiryokwo), or *Ficus thonningii* (Simotwo). The bark is placed inside the gourd which is then filled with water and left to cure for 3 days.[20]

Treatment practices and plant uses

Synergistic herbs

The bark and natural gum of *Acacia lahai* are both chewed. Other preparations include boiled leaves of *B. alba* and stem or roots of *Dovyalis macrocalyx* mixed with those of *D. abyssinica*. The fruits of both plants are chewed.

Emetics

A decoction made from the boiled bark of *Clausena anisata* is used to induce vomiting. Boiled fruit bodies of *E. goetzei* (parasitic fungi growing on bamboo) and roots of *Momordica friesiorum* are also used.

Purgative

A decoction made from the boiled fruit bodies of *E. goetzei* is administered to evacuate the bowels.

Oral candidiasis

Several plants are used in the treatment of oral thrush. Fleshy leaves of *Opuntia monacantha* are burnt to soot ("Tusan") and licked. The fruits *Solanum incanum* are also burnt and the soot applied on the lesions. Alternatively, the bark and roots of *Trichocladus ellipticus* or bark and fruits of *Zanthoxylum chalybeum* are boiled or dried and pound to powder before administration. A decoction made from the boiled bark of *Olinia rochetiana* is also used. Underground honey ("Kusumia") or honey from insects living in dry trees ("Kipchom") is also used. It is mixed with water and drunk and also smeared on the lesions.

Halitosis

The leaves of *Acmella calirhiza* are chewed to eliminate bad breath.

Colic pain/abdominal upsets in infants

A decoction made from the whole of *Chenopodium album* plant is used. Alternatively, the boiled leaves and roots of *Amaranthus hybridus* or

Table 2: Medicinal plant uses

Botanical name	Voucher number	Marakwet name	Family name	Parts used	Methods of preparation	Diseases treated
Acacia etbaica Schweinf.	EH/12/15/063	Sepet	Fabaceae	Bark, flowers, higher parasites ("Torwo")	Bark boiled, flowers/"Torwo" burnt to soot, "Tusan"	Respiratory disorders
Acacia hockii De Wild	EH/12/15/028	Chuiya	Fabaceae	Bark, roots	Boiled or dried and pound to powder	Cancer
Acacia lahai (Steud. And Hochst ex Benth.)	EH/12/15/007	Tilatil	Fabaceae	Bark, natural gum ("Manget")	Chewed	Synergetic herb
Acanthus eminens C.B. Clarke	EH/12/15/066	Tekelte	Acanthaceae	Whole shrub	Boiled or dried and pound to powder or burnt to soot	Abdominal cramps, joint pains
Acmella caulirhiza Del.	EH/12/15/062	Kibutgut	Asteraceae	Leaves	Chewed	Halitosis
Acokanthera oppositifolia (Lam.) Codd	EH/12/12/057	Kelwo/Ng'wono	Apocynaceae	Bark, roots, higher parasites, fruits	Boiled, burnt to soot, chewed	Cancer, liver disease, arrow poison
Acokanthera schimperi (A.D.C) Schweinf	EH/12/15/030	Kelwo/Ng'wono	Apocynaceae	Bark	Powder	Antivenom
Albizia gummifera (J.F.Gmel) C.A. SM	EH/12/15/090	Seah	Fabaceae	Bark, roots	Boiled, pound and dried to powder	Liver diseases, abdominal ulcers
Allophylus abyssinicus (Hochst) Radlk	EH/12/15/020	Losin	Sapindaceae	Fruits	Chew	Skin problems, fatigue, boost immunity
Aloe tweediae Christian	EH/12/15/073	Cheretwo	Aloaceae	Leaves	Sap	Peptic ulcers, blood cleanser, infertility, arthritis, respiratory disorders, allergies, obesity, wounds
Amaranthus hybridus L.	EH/12/15/012	Chepkerta	Amaranthaceae	Leaves, roots	Boiled	Colic pain (infants) vitamin/mineral deficiency in pregnancy
Balanites aegyptiaca (L.) Delile	EH/12/15/047	Tuyunwo, N'goswo (Keiyo)	Balanitaceae	Seed	Pound and mixed with soda ash	Respiratory disorders
Basella alba L.	EH/12/15/077	Kiraita	Basellaceae	Leaves	Boiled	Synergistic, abdominal upsets, joint pains, lumbago, anemia, blood cleanser
Bersama abyssinica Fresen	EH/12/15031	Kipsagas	Melianthaceae	Roots	Boiled	Infertility in men
Bidens pilosa L. (blackjack)	EH/12/15/009	Chepkotiwot	Asteraceae	Leaves	Squeezed to produce sap	Hemorrhage
Calotropis procera (Aiton) W.T Aiton	EH/12/15/048	Wopi/Kibou Poli (nickname)	Asclepiadaceae	Roots	Boiled	Determination of unborn baby's sex
Capparis tomentosa Lam.	EH/12/15/026	Tiboiyo/Kiboroi	Capparaceae	Roots	Boiled	Determination of unborn baby's sex
Caralluma acutangula (Decne) N.E. Br.	EH/12/15/055	Mobchondo Chepokamugon	Apocynaceae	Whole plant	Boiled	Infertility in both men and women
Carissa edulis Vahl	EH/12/15/098	Legetet	Apocynaceae	Roots, fruits	Boiled or chewed (fruits)	Skin allergies, seizures, fever, herpes zoster (shingles)
Casearia battiscombei R.E. Fr.	EH/12/15/027	Liss	Salicaceae	Bark and roots	Boiled or dried and pound to powder	Joint, abdominal pains and infertility
Chenopodium album L.	EH/12/15/010	Montrichot	Chenopodiaceae	Whole plant	Boiled	Abdominal upsets in infants, blood detoxifier in pregnancy
Cissus rotundifolia (Forssk.) Vahl	EH/12/15/061	Kipsagan chi sindar/ Kiroroswa	Vitaceae	Whole plant	Pressed to produce sap	Allergies
Clausena anisata (Willd.) Hook f.	EH/12/15/023	Chebunoiwo	Rutaceae	Bark	Boiled	Emetic, blood cleanser

Contd...

Table 2: Contd...

Botanical name	Voucher number	Marakwet name	Family name	Parts used	Methods of preparation	Diseases treated
Cleome gynandra L.	EH/12/15/011	Sakiat	Capparidaceae	Leaves and roots	Chewed, boiled	Colic pain in infants, ear infection, blood cleanser
Clerodendrum johnstonii Oliv.	EH/12/15/041	Chesikau	Lamiaceae	Twigs, roots	Boiled	Joint pains, toothache
Cordia africana Lam.	EH/12/15/086	Bonbonwa	Boraginaceae	Bark	Boiled	Respiratory disorders - including pneumonia
Crotalaria incana L.	EH/12/15/052	Kipkurguryet	Fabaceae	Whole plant	Boiled	Stomach upsets (constipation, dyspepsia)
Croton macrostachyus Hochst	EH/12/15/050	Taboswo	Euphorbiaceae	Bark	Boiled	Respiratory disorders, allergies
Cussonia spicata Thunb.	EH/12/15/058	Chelikta	Araliaceae	Bark	Chew, boiled	Abdominal upsets
Cyperus esculentus L.	EH/12/15/015	Moigut	Cyperaceae	Leaves, roots	Chew	Abdominal upsets
Datura stramonium L.	EH/12/15/081	Arap bataa	Solanaceae	Seeds, leaves	Fry and crush (seeds), leaves are smoked	Toothache (apply), asthma (inhale smoked leaves)
Dodonaea viscosa (L.) Jacq.	EH/12/15/013	Tabulukwo	Sapindaceae	Bark, twigs, leaves and roots	Boiled	Respiratory disorders
Dombeya torrida (J.f. Gmel) Bamps	EH/12/15/087	Borowo	Sterculiaceae	Bark, roots	Boiled	Pre- and post-menopausal syndrome, allergies, joint pains
Dovyalis abyssinica (A. Rich) Warb.	EH/12/15/016	Mindililwo	Flacourtiaceae	Bark, roots, fruits	Boiled, dried and pound to powder, chewed (fruits)	Seizures (epilepsy), muscle pains, joint pains, invigorant, blood cleanser, synergistic plant, skin rashes
Dovyalis macrocalyx (Oliv.) Warb.	EH/12/15/044	Kapchebinin	Flacourtiaceae	Stem, roots, fruits	Boiled, chewed	Seizures (epilepsy), skin rashes, synergistic plant
Ehretia cymosa Thonn.	EH/12/15/024	Morich	Boraginaceae	Bark	Boiled	Abdominal ulcers
Ekebergia capensis Sparrm.	EH/12/15/054	Arar	Meliaceae	Bark	Boiled or chewed	Skin allergies
Engleromyces goetzei P.Henn. (parasitic fungi on bamboo)	EH/12/15/004	Jeptegaa (Mandoiwetabtega)	Xylariaceae	Fruit body	Boiled	Emetic, purgative, respiratory disorders, joint pains, kidney disease
Entada abyssinica A. Rich.	EH/12/15/034	Masembaa	Fabaceae	Bark	Boiled	Edema
Euclea divinorum Hiern	EH/12/15/070	Kapcheptuin	Ebernaceae	Fruits	Chewed	Abdominal upsets, skin disorders, blood cleanser, invigorant, prophylaxis of cancer and respiratory disorders
Ficus thonningii Blume	EH/12/15/036	Simotwo	Moraceae	Bark, roots	Boiled, powder	Arthritis, liver disease, edema
Ficus wakefieldii Hutch.	EH/12/15/021	Payatwo	Moraceae	Bark, roots and higher parasites	Boiled (bark, roots) burnt to soot (higher parasites)	Liver disease, edema
Fuerstia africana T.C.E. Fr.	EH/12/15/059	Birirwo	Lamiaceae	Whole shrub	Boiled, burnt to soot	Respiratory disorders
Helinus mystacinus (Aiton) E. Mey	EH/12/15/092	Bingwoo	Rhamnaceae	Bark	Boiled, chewed	Respiratory disorders
Indigofera arrecta Hochst ex A. Rich	EH/12/15/095	Bergeletwo	Fabaceae	Whole plant-twigs, roots, leaves	Boiled	Abdominal cramps. Twigs are used as broom and toothbrush

Contd...

Table 2: Contd...

Botanical name	Voucher number	Marakwet name	Family name	Parts used	Methods of preparation	Diseases treated
Ipomoea lapidosa Wilhelm Vatke	EH/12/15/088	Sindar chepokamugon/ Ndaria	Convolvulaceae	Twigs, roots, leaves	Boiled	Ocular disorders, toothache, paresthesia, blood cleanser
Juniperus procera Hochst.	EH/12/15/051	Torokwo	Cupressaceae	Bark, roots	Boiled	Cancer
Kalanchoe lanceolata (Forssk.) Pers	EH/12/15/094	Kipchebes	Crassulaceae	Flowers	Burn to soot	Splenomegaly, hepatomegaly, blood cleanser
Kigelia africana D.C.	EH/12/15/018	Rotio	Bignoniaceae	Bark	Boiled	Liver disease, edema
Maerua subcordata (Gig.) DeWolf.	EH/12/15/099	Chepan'yiny	Capparidaceae	Roots	Chewed	Colic pain in adults, anorexia, blood cleanser
Maesa lanceolata Forssk.	EH/12/15/085	Rubotio	Myrsinaceae	Bark	Boiled	Skin allergies
Maytenus senegalensis (Lam.) Exell	EH/12/15/049	Jirgelwo	Celastraceae	Bark, roots	Boiled	Lumbago, blood cleanser
Meyna tetraphylla (Schweinf. Ex Hiern) Robyns	EH/12/15/056	Tiling'wo	Rubiaceae	Fruits	Chewed	Chest congestion, skin disorders
Momordica foetida Schumach.	EH/12/15/079	Cheserya	Cucurbitaceae	Leaves	Chewed	Abdominal pains, amoebiasis, fever
Momordica friesiorum (Harms) C. Jeffrey	EH/12/15/084	Chepkin'guny	Cucurbitaceae	Roots	Boiled	Emetic, malaria, spleen and liver disease
Myrsine africana L.	EH/12/15/071	Seketetwa	Myrsinaceae	Bark, roots, fruits	Boiled, dried and pound to powder, chewed (fruits)	Respiratory disorders
Nasturtium officinale W.T. Aiton	EH/12/15/001	Kibira (N'giyondo kop Elijah)	Brassicaceae	Leaves	Boiled	Peptic ulcers, anemia, allergies, blood cleanser
Nicotiana tabacum L.	EH/12/15/089	Tomotet	Solanaceae	Fruits, leaves	Chew fruits, dry, and crush leaves	Malnutrition (fruits), insecticide (leaves)
Nuxia congesta R.Br. ex Fresen	EH/12/15/069	Chorwa	Loganiaceae	Bark	Boiled	Respiratory disorders
Olea capensis L.	EH/12/15/083	Masat	Oleaceae	Bark	Boiled, dried, and pound to powder	Dewormer, blood cleanser
Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.	EH/12/15/017	Emtit	Oleaceae	Bark, roots, fruits	Boiled, dried and pound to powder, fruits crushed	Fever, seizure disorders, ringworms
Olinia rochetiana A. Juss	EH/12/15/035	Nerkwo	Penaeaceae	Bark	Boiled	Oral candidiasis, urinary tract infections
Opuntia monacantha Haw.	EH/12/15/037	Makatar	Cactaceae	Roots, leaves and fruits	Boiled, burnt to soot. Chewed (fruits)	Oral candidiasis, diabetes, pancreatitis, blood cleanser
Pennisetum clandestinum Hochst ex Chiov.	EH/12/15/019	Suswo (Kiptany/ Kipkanerwa)	Poaceae	Leaves, roots	Chewed	Heartburns
Periploca linearifolia Quart-Dill	EH/12/15/005	Sinendet	Apocynaceae	Roots, stem	Boiled	Pre- and post-menopausal symptoms, infertility and lumbago in women
Persea americana Mill.	EH/12/15/022	Avocado	Lauraceae	Leaves, fruits	Boiled, chewed	Anemia, invigorant
Physalis peruviana L.	EH/12/15/065	Cheptolong (Mboni)	Solanaceae	Fruits	Chewed	Skin allergies, prophylaxis of respiratory disorders
Plectranthus barbatus Andrews	EH/12/15/075	An'gurwo	Lamiaceae	Leaves, roots, higher parasites	Boiled, burnt to soot	Liver disease, skin rashes, soap
Podocarpus falcatus Mirb	EH/12/15/038	Been	Podocarpaceae	Bark, roots, higher parasites	Boiled, dried and pound to powder, burnt to soot	Liver and spleen diseases, peptic ulcers

Contd...

Table 2: Contd...

Botanical name	Voucher number	Marakwet name	Family name	Parts used	Methods of preparation	Diseases treated
Podocarpus latifolius (Thunb) R.E.Br.	EH/12/15/053	Serti	Podocarpaceae	Bark	Boiled	Dysmenorrhea
Polyscias kikuyuensis Summer	EH/12/15/076	Aoon	Araliaceae	Bark	Boiled	Arthritis
Prunus africana (Hook f) Kalkm.	EH/12/15/039	Tendwo	Rosaceae	Roots, bark	Boiled, dried and pound to powder	Postmenopausal syndrome, allergies, arthritis
Psidium guajava L.	EH/12/15/032	Mapera	Myrtaceae	Tender leaves	Chewed	Colic pains, constipation
Rapanea melanophloeos (L.) Mez	EH/12/15/060	Sitotwa	Primulaceae	Bark, seeds	Boiled, chewed, dried and pound to powder	Dysmenorrhea
Rotala tenella (Guill and Per) Hiern	EH/12/15/093	Chepkitiot/Kitonde	Lythraceae	Whole plant	Boiled or consumed while raw	Blood cleanser, lumbago, peripheral neuropathy, muscle cramps, joint pains, pre- and post-menopausal syndromes, obesity, cardiovascular/ cerebrovascular disorders, hyperlipidemia
Rhamnus prinoides L'Her	EH/12/15/097	Kosisityo	Rhamnaceae	Twigs, bark, roots, leaves	Boiled	Abdominal cramps, joint pains
Rhus natalensis Bernh ex Krauss	EH/12/15/072	Siria	Anacardiaceae	Leaves, roots, higher parasites, fruits	Boiled, chewed, burnt to soot	Liver and spleen diseases, peptic ulcers, invigorant
Rubus apetalus Poir.	EH/12/15/064	Momonio	Rosaceae	Fruits	Chewed	Blood cleanser, malnutrition, prophylaxis of cancer prophylaxis
Salvadora persica L.	EH/12/15/014	Chechaat	Salvadoraceae	Roots, bark	Boiled or chew	Abdominal pain, colic pain including constipation
Scutia myrtina Burm f.	EH/12/15/067	Simboiywo	Rhamnaceae	Bark	Boiled	Respiratory disorders
Senecio hadiensis Forsk.	EH/12/15/046	Chepchirmitit	Asteraceae	Stem, roots, leaves	Boiled	Myalgia, kidney disease, blood cleanser, soap
Sida tenuicarpa K. Vollesen	EH/12/15/006	Kargorwo	Malvaceae	Whole plant	Boiled, burnt to soot	Respiratory disorders, peptic ulcers
Solanum incanum L.	EH/12/15/045	Kaplobotwo	Solanaceae	Leaves, roots, fruits	Boiled, burnt to soot	Respiratory disorders, oral thrush
Solanum nigrum L.	EH/12/15/080	Kisoiyo	Solanaceae	Leaves, roots	Boiled	Colic pain in infants, vitamin/ mineral deficiency in pregnancy
Sorghum bicolor (L.) Moench	EH/12/15/096	Mosong	Poaceae	Seeds	Powdered	Measles
Syzygium guineense Wall	EH/12/15091	Lamaiwo	Myrtaceae	Bark, fruits, roots	Boiled	Infertility, paresthesia, cancer treatment, and prophylaxis, invigorant
Tabernaemontana stapfiana Britten.	EH/12/15/008	Kaparar	Apocynaceae	Bark and roots, fruits	Boiled, dried and pound to powder, burnt to soot and licked	Respiratory disorders and cancer
Tamarindus indica L.	EH/12/15/082	Aron/Aryek (Keiyo)	Fabaceae	Fruits	Chewed	Allergies, pimples
Toddalia asiatica (Linn) Lam	EH/12/15/043	Kipsomberwo	Rutaceae	Fruits	Chew	Respiratory disorders
Tragia brevipes Pax	EH/12/15/025	Kimelei	Euphorbiaceae	Roots, leaves	Boiled, pressed	Peptic ulcers, diabetes, topical local anesthetic agent

Contd...

Table 2: Contd...

Botanical name	Voucher number	Marakwet name	Family name	Parts used	Methods of preparation	Diseases treated
Trichocladus ellipticus Eckl and Zeyh	EH/12/15/074	Beregeiwo	Hamamelidaceae	Bark and roots	Boiled, dried and pound to powder	Oral candidiasis
Vachellia seyal (Delile) P.J.H. Hurter.	EH/12/15/042	Len'gnet	Fabaceae	Bark	Boiled	Blood cleanser
Vepris nobilis (Delile) Mziray	EH/12/15/078	Kuryot	Rutaceae	Bark and roots	Boiled	Arthritis, backache, blood cleanser, invigorant, immunostimulant
Vernonia auriculifera Hiern.	EH/12/15/040	Taban'gwo	Asteraceae	Leaves	Chewed	Heartburn, peptic ulcers
Warburgia ugandensis Sprague	EH/12/15/002	Sokwo	Canellaceae	Bark, tender leaves	Boiled, burnt, dried and pound to powder	Respiratory disorders, headache, allergies
Withania somnifera (L) Dunal	EH/12/15/068	Ketgurak/Targukai	Solanaceae	Whole plant (bark, leaves, roots)	Boiled and mix with soup	Meningitis, cerebral malaria, anthrax, detoxify meant from infected animal
Yushania alpina (K.Schum) W. C. Lin.	EH/12/15/003	Tegaa	Poaceae	Stem	Powder	Edema, blood cleanser
Zanthoxylum chalybeum Engl.	EH/12/15/029	Songoiywa	Rutaceae	Bark, fruits	Boiled, dried and pound to powder	Fever, epilepsy, psychotic disorders, oral thrush
Zea mays L. (maize cob)	EH/12/15/033	Ketibande	Poaceae	Cob	Burn to soot	Heartburn, abdominal ulcers
Other medicinal preparations						
Beeswax (*Cera alba*)		Itbokumat				Chronic wound
Dried/preserved (cured) meat		Sirgen/telia		Dried meat	Roasted	Obesity, cardiovascular disorders
Honey		Kumat		Raw honey	Consumed while raw	Respiratory disorders, oral thrush, infertility, allergies, amenorrhea, obesity, blood cleanser, malnutrition, immunostimulant
Honey from insects found in dry trees		Kipchom		Raw	Mixed with milk or water	Oral candidiasis and chest congestion
Red soil		Mukus/ Nge'nynyobirir		Soil	Mixed with little water to form paste	Poisoning
Sheep tallow		Mwaitabkejo		Oil	Administered raw	Allergies, epilepsy, psychotic disorders, headache
Sheep's milk		Milk		Raw milk	Administered raw	Heartburn, abdominal ulcers, eye illness
Soot		Monyoi		Soot powder from burnt wood over a fireplace	Mixed with a little water and drunk	Irritating cough
Swallow nest		Kopojepkiswa		Swallow nest	Nest broken, contents soaked in water	Impetigo
Termite mount		Cheptenga		Termite mount (secretions)	Broken and soil mixed with water	Measles
Traditional fermented milk		Mursik		Sour milk	Prepared by fermentation	Genial ulcers, vaginal candidiasis
Underground honey		Kusumia		Raw	Mixed with milk or water	Oral candidiasis and chest congestion

Solanum nigrum may be used. The roots of *Cleome gynandra* are also chewed and administered. For older children, a decoction made from the boiled roots of the same plant is used.

Abdominal pains in adults

A concoction made from boiling the whole of *Acanthus eminens, Caralluma acutangula, Crotalaria incana, Indigofera arrecta*, or *Rhamnus*

Table 3: F_{ic} values of the medicinal plants and complementary preparations used in treatment

Condition	Plant/substance used	*Ns*	*Nur*	F_{ic}
Synergistic herbs	*Acacia lahai* (3), *Basella alba* (4), *Dovyalis macrocalyx* (4), *Dovyalis abyssinica* (6)	4	17	0.81
Emetics	*Clausena anisata* (4), *Engleromyces goetzei* (4), *Momordica friesiorum* (3)	3	11	0.8
Purgatives	*Engleromyces goetzei* (6)	1	6	1
Oral candidiasis	*Olinia rochetiana* (3), Opuntia monacantha (3), *Trichocladus ellipticus* (2), *Zanthoxylum chalybeum* (4), honey from insects in dry trees (1), underground honey (2)	4	15	0.79
Halitosis	*Acmella calirhiza* (5)	1	5	1
Colic pain in infants	*Amaranthus hybridus* (3), *Chenopodium album* (1), *Cleome gynandra* (2), *Solanum nigrum* (3)	4	9	0.63
Abdominal/colic pains, constipation, dyspepsia	*Acanthus eminens* (3), *Basella alba* (4), *Casearia battiscombei* (2), *Caralluma acutangula* (2), *Cussonia spicata* (3), *Cyperus esculentus* (3), *Indigofera arrecta* (2), *Maerua subcordata* (5), *Momordica foetida* (4), *Rhamnus prinoides* (2), *Crotalaria incana* (2), *Psidium guajava* (2), *Salvadora persica* (3), *Euclea divinorum* (3)	14	40	0.67
Abdominal ulcers, heartburn	*Albizia gummifera* (3), *Aloe tweediae* (4), *Ehretia cymosa* (3), *Nasturtium officinale* (5), *Pennisetum clandestinum* (4), *Podocarpus falcatus* (3), *Rhus natalensis* (2), *Sida tenuicarpa* (3), Tragia brevipes (2), *Vernonia auriculifera* (3), *Zea mays* (4), Sheep's milk (5)	12	41	0.73
Poisoning	Red soil (1)	1	12	1
Liver disease	*Acokanthera oppositifolia* (4), *Albizia gummifera* (3), *Ficus thonningii* (5), *Ficus wakefieldii* (3), *Kalanchoe lanceolata* (5), *Kigelia africana* (3), *Momordica friesiorum* (4), *Plectranthus barbatus* (5), *Podocarpus falcatus* (4), *Rhus natalensis* (2)	10	38	0.76
Spleen disorders	*Kalanchoe lanceolata* (4), *Momordica friesiorum* (5), Podocarpus *falcatus* (4), *Rhus natalensis* (3)	4	16	0.8
Pancreatitis	Opuntia monacantha (4)	1	4	1
Amoebiasis	*Momordica foetida* (3)	1	3	1
Antihelminthic/dewormer	*Olea capensis* (4)	1	2	1
Respiratory disorders	*Acacia etbaica* (3), *Aloe tweediae* (5), *Balanites aegyptiaca* (3), *Cordia Africana* (3), *Croton macrostachyus* (2), *Datura stramonium* (4), *Dodonaea viscosa* (2), *Engleromyces goetzei* (4), *Euclea divinorum* (6), *Fuerstia africana* (1), *Helinus mystacinus* (2), *Meyna tetraphylla* (2), *Myrsine africana* (3), *Nuxia congesta* (3), *Physalis peruviana* (2), *Scutia myrtina* (3), *Sida tenuicarpa* (5), *Solanum incanum* (2), *Tabernaemontana stapfiana* (2), *Toddalia asiatica* (1), *Warburgia ugandensis* (3), honey (10), honey from insects in dry trees (4) underground honey (3)	24	78	0.7
Allergies	*Aloe tweediae* (12), *Cissus rotundifolia* (2), *Croton macrostachyus* (3), *Dombeya torrida* (2), *Nasturtium officinale* (5), *Prunus africana* (3), *Warburgia ugandensis* (3), honey (6), sheep tallow (6)	9	42	0.8
Wounds	*Aloe tweediae* (12), *Beeswax* (3)	2	15	0.93
Ocular infections	Ipomoea lapidosa (5), Sheep's milk (4)	2	9	0.88
Ear infections	*Cleome gynandra* (5)	1	5	1
Urinary tract infections	*Olinia rochetiana* (4)	1	2	1
Malaria/cerebral malaria	*Momordica friesiorum* (5) *Withania somnifera* (2)	2	7	0.83
Fever	*Carissa edulis* (6), *Momordica foetida* (4), *Olea europaea subsp. cuspidata* (4) *Zanthoxylum chalybeum* (3)	4	17	0.81
Meningitis	*Withania somnifera* (2)	1	2	1
Measles	*Sorghum bicolor* (5), termite mount (3)	2	8	0.86
Impetigo	Swallow nest (4)	1	4	1
Shingles (herpes zoster)	*Carissa edulis* (3)	1	3	1
Anemia	*Basella alba* (6), *Nasturtium officinale* (4), *Persea americana* (2)	3	12	0.82
Hemorrhage/bleeding	*Bidens pilosa* (9)	1	9	1
Cerebrovascular disorders	*Rotala tenella* (4)	1	4	1
Edema	*Entada abyssinica* (4), Ficus thonningii (4), *Ficus wakefieldii* (3), *Kigelia africana* (3), *Yushania alpina* (2)	5	16	0.73
Hyperlipidemia	*Rotala tenella* (6)	1	6	1
Diabetes	*Opuntia monacantha* (5), Tragia brevipes (4), *Basella alba* (7)	3	16	0.87
Kidney disease	Engleromyces goetzei (4), *Senecio hadiensis* (5), *Basella alba* (7)	3	16	0.87
Obesity	*Aloe tweediae* (11), *Rotala tenella* (6), honey (11)	3	28	0.93
Anorexia	*Maerua subcordata* (3)	1	3	1
Infertility in both men and women	*Aloe tweediae* (4), *Caralluma acutangula* (2), *Casearia battiscombei* (4), *Syzygium guineense* (5)	4	15	0.79
Infertility in men	*Bersama abyssinica* (3)	1	3	1
Infertility in women	*Periploca linearifolia* (3), honey (5)	2	8	0.86
Dysmenorrhea	*Podocarpus latifolius* (2), *Rapanea melanophloeos* (2)	2	4	0.67
Amenorrhea	Honey (5)	1	5	1
Postmenopausal syndrome	*Prunus africana* (3)	1	3	1

Contd...

Table 3: Contd...

Condition	Plant/substance used	*Ns*	*Nur*	F_{ic}
Pre- and post-menopausal syndrome	*Rotala tenella* (4), *Dombeya torrida* (4), *Periploca linearifolia* (5)	3	13	0.83
Determination of unborn baby's sex	*Calotropis procera* (1), *Capparis tomentosa* (1)	2	2	0
Blood detoxifier in pregnancy	*Chenopodium album* (6)	1	6	1
Mineral deficiency in pregnancy	*Amaranthus hybridus* (8), *Solanum nigrum* (6)	2	14	0.92
Epilepsy	*Carissa edulis* (3), *Dovyalis macrocalyx* (3), *Dovyalis abyssinica* (4), *Olea europaea subsp. cuspidata* (3), *Zanthoxylum chalybeum* (3), *sheep tallow* (4)	6	20	0.74
Psychotic disorders	*Zanthoxylum chalybeum* (3), sheep tallow (5)	2	8	0.86
Headache	*Warburgia ugandensis* (15), sheep tallow (15)	2	30	0.97
Toothache	*Clerodendrum johnstonii* (4), *Datura stramonium* (5), Ipomoea lapidosa (6)	3	8	0.86
Backache	*Vepris nobilis* (12)	1	5	1.00
Myalgia	*Rotala tenella* (11), *Dovyalis abyssinica* (12), *Senecio hadiensis* (6)	3	29	0.93
Lumbago	*Basella alba* (6), *Maytenus senegalensis* (4), *Rotala tenella* (7), *Periploca linearifolia* (3)	4	20	0.84
Paresthesia, numbness	*Rotala tenella* (10), *Syzygium guineense* (6), Ipomoea lapidosa (6)	3	22	0.9
Arthritis/joint pains	Acanthus eminens (4), Aloe tweediae (8), Basella alba (7), Casearia battiscombei (5), Clerodendrum johnstonii (3), Dombeya torrida (5), Dovyalis abyssinica (7), Engleromyces goetzei (5), Ficus thonningii (3), Polyscias kikuyuensis (4), Prunus africana (4), Rhamnus prinoides (2), Rotala tenella (8), Vepris nobilis (7)	14	72	0.82
Skin disorders, including rashes/allergy/ pimples	*Allophylus abyssinicus* (5), *Carissa edulis* (6), *Dovyalis macrocalyx* (5), *Dovyalis abyssinica* (7), *Ekebergia capensis* (3), *Euclea divinorum* (7), *Maesa lanceolata* (3), *Meyna tetraphylla* (4), *Physalis peruviana* (5), *Plectranthus barbatus* (4), *Tamarindus indica* (4)	11	53	0.81
Ringworms	*Olea europaea subsp. cuspidata* (12)	1	12	1
Cancer	*Acacia hockii* (3), *Acokanthera oppositifolia* (3), *Juniperus procera* (3), *Tabernaemontana stapfiana* (3), *Euclea divinorum* (6), *Rubus apetalus* (4), *Syzygium guineense* (5)	7	27	0.77
Anthrax	*Withania somnifera* (2)	1	2	1
Antivenom	*Acokanthera schimperi* (6)	1	6	1
Blood cleanser/detoxifier	*Aloe tweediae* (10), *Basella alba* (7), *Clausena anisata* (5), *Cleome gynandra* (6), *Dovyalis abyssinica* (7), *Euclea divinorum* (10), Ipomoea lapidosa (5), *Kalanchoe lanceolata* (3), *Maerua subcordata* (3), *Maytenus senegalensis* (4), *Nasturtium officinale* (4), *Olea capensis* (4), *Opuntia monacantha* (4), *Rotala tenella* (9), *Rubus apetalus* (6), *Senecio hadiensis* (4), *Vachellia seyal* (4), *Vepris nobilis* (5), *Yushania alpina* (6), honey (12)	20	118	0.84
Immunostimulant	*Allophylus abyssinicus* (6), *Vepris nobilis* (6), honey (12)	3	24	0.91
Malnutrition	*Nicotiana tabacum* (3), *Rubus apetalus* (6), honey (14)	3	23	0.91
Tonic/invigorant	*Allophylus abyssinicus* (6), *Dovyalis abyssinica* (6), *Euclea divinorum* (7), *Persea americana* (10), *Rhus natalensis* (6), *Syzygium guineense* (6), *Vepris nobilis* (6)	7	45	0.86
Local anesthetic agent	*Tragia brevipes* (5)	1	5	1
Other applications				
Arrow poison	*Acokanthera oppositifolia* (3)	-	-	-
Soap	*Plectranthus barbatus* (3), *Senecio hadiensis* (4)	-	-	-
Insecticide	*Nicotiana tabacum* (12)	-	-	-
Toothbrush	*Indigofera arrecta* (3)	-	-	-
Broom	*Indigofera arrecta* (3)	-	-	-

Ns: Number of species used; *N*ur: Number of use reports; F_{ic}: Informant consensus factor

prinoides plants is used to treat abdominal pain. *C. incana* is used especially when the pain is accompanied by constipation. Boiled bark of *Cussonia spicata*, bark and roots of *Casearia battiscombei* and *Salvadora persica*, or leaves of *B. alba* may also be used. An alternative treatment involves chewing of the leaves of *Momordica foetida* or *Psidium guajava*, leaves and roots of *Cyperus esculentus*, roots of *Maerua subcordata*, bark of *C. spicata*, or the bark and roots of *S. persica*. The fruits of *E. divinorum* are chewed to prevent abdominal pains.

Peptic ulcers

Treatment involves administration of a concoction made from boiled bark of *Ehretia cymosa,* bark and roots of *Albizia gummifera* or *Podocarpus falcatus,* roots and leaves of either *Rhus natalensis* or *Tragia brevipes*, or the leaves of *Nasturtium officinale.* The sap obtained from crushing the leaves of *A. tweediae* may also be administered. Treatment also involves licking burnt soot made from burning the leaves or higher parasites from *P. falcatus* and *R. natalensis* or the whole of *Sida tenuicarpa* plant. The leaves of *Vernonia auriculifera* may also be chewed. Treatment of heartburn involves chewing the leaves and roots of *Pennisetum clandestinum*, licking soot obtained from burning a maize cob (*Zea mays*). They may also be relieved by drinking cold sheep's milk.

Poisoning

Red soil ("Mukus/Nge'nynyobirir") is used in the management of poisoning. The soil is mixed with a little water to form a paste and administered to neutralize the effect of an orally administered poison.

Liver disease

There were six recorded plants used in the management of liver disorders. The bark and roots of *A. oppositifolia, A. gummifera, F. thonningii, F. wakefieldii, P. barbatus*, and *P. falcatus* are either boiled or dried and pound to powder before administration. The bark of *Kigelia africana* and roots of both *M. friesiorum* and *R. natalensis* are also boiled. Higher parasites from *A. oppositifolia, F. wakefieldii, P. barbatus*, and *R. natalensis*

are burnt to soot and licked. The fruits of *R. natalensis* may also be used. For treatment of hepatomegaly (enlarged liver), the flowers of *Kalanchoe lanceolata* are burnt and licked.

Spleen disorders

The bark and roots of *P. falcatus* and roots of *M. friesiorum* are boiled and the resultant concoction administered. Higher parasites from *P. falcatus* and those from *R. natalensis* are burnt to soot and licked. Soot from burnt *K. lanceolata* flowers is used to treat an enlarged spleen (splenomegaly).

Pancreatitis

A concoction made from boiled leaves and roots of *O. monacantha* is used. Soot from the burnt leaves is also licked.

Amoebiasis

It is treated by chewing the leaves of *M. foetida*.

Helminthiasis

The bark of *Olea capensis* is used as an antihelminthic/dewormer. It is either boiled or dried and pound to powder.

Respiratory disorders

Formulations prepared from several plants are used to manage respiratory disorders, including sore throat, cough, influenza, chest pain, and running nose. They include a concoction made by boiling the whole of *Dodonaea viscosa, Fuerstia africana,* and *S. tenuicarpa* shrubs; leaves and roots of *S. incanum*; bark and roots of *Myrsine africana* and *Tabernaemontana stapfiana*; bark of *A. etbaica, Croton macrostachyus, Helinus mystacinus, Nuxia congesta*, *Scutia myrtina*, and *Warburgia ugandensis*; and fruit bodies of *E. goetzei*. Treatment also involves administration of sap obtained from crushing the leaves of *A. tweediae* and sniffing dried and burnt leaves of *W. ugandensis*. The powder obtained from drying and pounding the bark and roots of the same plant including those of *M. africana* and *T. stapfiana* may also be administered. *Balanites aegyptiaca* seed may also be pound and mixed with soda ash before administration. Other forms include licking soot made from burnt leaves of *F. africana, S. tenuicarpa, S. incanum* and fruits of *T. stapfiana.* It also involves chewing the fruits of *M. africana* and *Toddalia asiatica*; flower and higher parasites of *A. etbaica*; and the bark of *H. mystacinus.* Treatment also includes chewing of raw honey. Underground honey or honey obtained from insects living in dry trees other than bees may also be administered. It is mixed with milk or water and drunk. Soot obtained from powder from burnt wood over a fireplace ("Monyoi") is used to treat irritating coughs. It is also mixed with a little water and drunk. A decoction prepared by boiling the bark of *Cordia africana* is included especially if pneumonia is involved. The fruits of *E. divinorum* and *P. peruviana* are chewed for prophylaxis of respiratory disorders.

Chest congestion

Management involves the smoking of rolled dry leaves of *Datura stramonium*. An alternative treatment involves chewing of *Meyna tetraphylla* fruits. Underground honey or honey from insects living in dry trees is also used. It is mixed with milk or water and drunk.

Allergies

Several herbal preparations are used in the management of allergies. They include a concoction made from boiled bark and roots of *Dombeya torrida* and *Prunus africana*; bark and leaves of *W. ugandensis;* bark of *C. macrostachyus*; and leaves of *N. officinale.* The bark and roots of *D. torrida* and *P. africana* as well as bark of *W. ugandensis* may also be dried, pound, and administered. In addition, the powder or burnt tender leaves of this plant are sniffed. Other treatment methods include administration of sap obtained from crushing the leaves of *A. tweediae* and use of the sap from *Cissus rotundifolia*. The whole of this plant is pressed and the sap produced rubbed on affected areas, for example, around the eyes to treat itchy eyes or on burning feet. It may also be mixed with water and used to wash the whole body. Raw honey and oil from sheep tallow are also administered to the patient, especially in the treatment of severe allergy.

Wounds

The sap obtained from the crushed leaves of *A. tweediae* is administered. The sap is also applied on fresh wounds to prevent scarring when healed. Beeswax (*Cera alba*) is used to dress the wound, especially chronic wounds.

Ocular disorders

A concoction made from the boiled twigs, roots, and leaves of Ipomoea lapidosa is administered. Raw sheep's milk is also applied on the affected eye. Human breast milk may also be used.

Ear infections

The leaves of *C. gynandra* are pressed and sap applied on the affected ear.

Urinary tract infections

A decoction made from the boiled bark of *O. rochetiana* is administered. Traditional fermented milk ("Mursik") is drunk to hasten recovery in patients with vaginal candidiasis and genital ulcers.

Malaria

Treatment involves administration of a decoction made from the boiled roots of *M. friesiorum*. For cerebral malaria, the bark of *Withania somnifera* is boiled and decoction mixed with soup before administration.

Fever

A concoction made from the boiled bark of *O. europaea subsp. cuspidata* and that of *Z. chalybeum* is used. They may also be dried and pound to powder before administration. Alternative treatment involves chewing of raw fruits of *Carissa edulis* and leaves of *M. foetida*. A decoction made from the boiled roots of *C. edulis* may also be used.

Meningitis

A decoction made from the boiled bark of *W. somnifera* mixed with soup is used in the treatment.

Measles

The seeds of *Sorghum bicolor* are pound to powder and applied directly on rashes on the skin. An alternative treatment involves application of soil obtained a termite mount ("Cheptenga") mixed with water on the rashes. The soil contains secretions from the termites.

Impetigo

Contents from a swallow nest ("Kopojepkiswa") are applied on the affected areas. The nest is broken and contents are soaked in water.

Shingles (Herpes zoster)

It is treated by administration of a decoction made from boiled roots of *C. edulis* and chewing the fruits.

Anemia

It is treated by administration of a concoction made from boiled leaves of either *B. alba, N. officinale*, or *Persea americana.* Treatment also involves chewing the fruits of *P. americana.*

Hemorrhage/bleeding

The leaves of *Bidens pilosa* are squeezed and sap applied on a fresh cut or wound to stop bleeding.

Cardiovascular/cerebrovascular disorders

The whole of *R. tenella* plant is either boiled or consumed while raw/dried/preserved meat ("Sirgen") is also consumed.

Edema

It is treated by administration of a concoction made from the boiled bark and roots of either *F. thonningii* or *F. wakefieldii*; bark of *Entada abyssinica* or *K. africana*; or stem of *Yushania alpina*. Powder obtained by drying and pounding to powder the bark and roots of *F. thonningii* or *F. wakefieldii* may also be used.

Hyperlipidemia

The whole of *R. tenella* plant is either boiled or consumed while raw.

Diabetes

The leaves and roots of *T. brevipes* or *O. monacantha* are boiled and administered. The leaves of this plant may also be burnt to soot and licked.

Kidney disease

A concoction made from the boiled fruit bodies of *E. goetzei* or stem, roots, and leaves of *Senecio hadiensis* is used.

Recuperating patients

A decoction made from boiled leaves of *B. alba* is combined with the herbs for treatment of diabetes or renal disease and administered to recuperating patients to speed up recovery.

Obesity

The whole of *R. tenella* plant is either boiled or consumed when raw. An alternative treatment involves consuming raw honey or administering sap obtained from crushing the leaves of *A. tweediae*. Dried/preserved meat is also consumed.

Anorexia

It is treated by chewing the roots of *M. subcordata*.

Infertility

A concoction made from boiling the whole of *C. acutangula* plant; bark, fruits, and roots of *S. guineense*; or bark and roots *C. battiscombei* is used in the treatment of infertility in both men and women. Other preparations include administration of dried and pound roots of *C. battiscombei* or sap obtained from crushing the leaves of *A. tweediae*.

For treatment of infertility in men, boiled roots of *Bersama abyssinica* are used, while a decoction made from the boiled roots and stem of *Periploca linearifolia* accompanied by consuming raw honey is used for the treatment of infertility in women.

Dysmenorrhea

Treatment is by administration of a decoction made from the boiled bark of either *Podocarpus latifolius* or *Rapanea melanophloeos*. The seeds of this plant may also be chewed or dried and pound to powder before administration.

Amenorrhea

It is treated by consuming raw honey.

Postmenopausal syndrome

The bark and roots of *P. africana* are boiled or dried and pound to powder before administration.

Both pre- and post-menopausal syndrome

The whole of *R. tenella* plant is either boiled or consumed as raw. Other preparations include the use of a concoction made from boiled stem and roots of *P. linearifolia* or bark and roots of *D. torrida*. Powder made by pounding the bark and roots of this plant may also be used.

Determination of the unborn baby's sex

A decoction made from the boiled roots of either *Calotropis procera* or/and *Capparis tomentosa* is used. It is administered before conception.

Blood detoxifier in pregnancy

The whole of *C. album* plant is cooked and consumed as vegetable.

Vitamin/mineral deficiency in pregnancy

A decoction made from the boiled leaves and roots of either *A. hybridus* or *S. nigrum* is used.

Epilepsy

Seizures including epilepsy are treated by the administration of a concoction made from boiled stem and roots of *D. macrocalyx* mixed with those of *D. abyssinica* or roots of *C. edulis*. The fruits of these plants are also chewed. An alternative treatment involves use of a concoction from the boiled bark and roots of *O. europaea subsp. cuspidata* or bark and fruits of *Z. chalybeum*. Powder obtained by drying and pounding of the same parts may also be used. Oil made from sheep tallow is also used.

Psychotic disorders

The bark and fruits of *Z. chalybeum* are either boiled or dried and pound to powder before administration. Oil made from sheep tallow is also administered.

Headache

A concoction made from the boiled bark and tender leaves of *W. ugandensis* is used. They may also be burnt and sniffed or dried and pound to powder before sniffing. Oil from sheep tallow is also used.

Toothache

A concoction made from boiled twigs, roots, and leaves of *I. lapidosa* or twigs and roots of *Clerodendrum johnstonii* is used. The seeds of *D. stramonium* may also be fried and pound before administration.

Backache

It is treated by administration of a concoction made from the boiled bark and roots of *Vepris nobilis*.

Myalgia

Treatment of muscle pains including cramps involves use of boiled stem, roots, and leaves of *S. hadiensis* or the whole of *R. tenella* plant. The plant may also be consumed when raw. We were informed by the TMPs that plant is very popular with athletes as it prevents muscle injury. An alternative treatment involves the use of the boiled bark and roots of *D. abyssinica* which may also be dried and pound and mixed with soup before administration. The fruits of the same plant are chewed.

Lumbago

Pain of the muscles and joints of lower back is treated by the use of a concoction made from either boiled leaves of *B. alba*, bark and roots of *Maytenus senegalensis*, or the whole of *R. tenella* plant, which may also be consumed while raw. Lumbago in women is treated by administration of boiled stem and roots of *P. linearifolia*.

Paresthesia

Peripheral neuropathy is treated by administration of a concoction made from boiled fruits, bark, roots of *S. guineense* or the whole of *R. tenella* which may also be consumed when raw. Numbness, especially of the feet, is treated by administration of a concoction made from boiled twigs, roots, and leaves of *I. lapidosa*.

Local anesthetic agent

The leaves of *T. brevipes* are used to provide local analgesic effect. They are pressed and rubbed on the affected sites.

Bone and connective tissue disorders

Arthritis and joint pains are treated by the use of several plants in different preparations. The boiled or dried and powder from the bark and roots of *C. battiscombei, D. torrida, F. thonningii, P. africana,* or *D. abyssinica* are used. The fruits of this plant are also chewed. An alternative preparation constitutes the boiled twigs, bark, roots, and leaves of *R. prinoides,* twigs and roots of *C. johnstonii*, bark and roots of *V. nobilis,* bark of *Polyscias kikuyuensis*, leaves of *B. alba,* or the whole of *R. tenella* plants. Boiled fruit bodies of *E. goetzei* are also used. Sap obtained from crushing the leaves of *A. tweediae* may also be administered. The whole of *A. eminens* plant is either boiled or dried and pound to powder. It may also be burnt to soot and licked.

Skin disorders

Skin conditions including rashes, allergy, and pimples are treated by a variety of plants. It includes chewing the fruits of the following plants: *Allophylus abyssinicus, C. edulis, D. macrocalyx, D. abyssinica, E. divinorum, M. tetraphylla, P. peruviana*, and *Tamarindus indica.* The bark of *Ekebergia capensis* and *Maesa lanceolata* is also chewed. In addition, a concoction made from the boiled stem and roots of *D. macrocalyx* mixed with those of *D. abyssinica,* roots of *C. edulis* and *P. barbatus* as well as bark of *E. capensis* is used. Ringworms are treated by application of oil obtained from crushing the fruits of *O. europaea subsp. cuspidata* on the affected areas.

Cancer

The treatment is by administration of a concoction made from boiled bark and roots of *Acacia hockii, A. oppositifolia, J. procera, T. stapfiana,* and *S. guineense.* The fruits of this plant may also be included. Other preparations include powder from dried and pound bark and roots of *A. hockii, A. oppositifolia,* and *T. stapfiana.* The higher parasites from *A. oppositifolia* are also burnt to powder and licked. In case there are any wounds arising from the disease, powder obtained from dried and pound bark and roots of *A. oppositifolia* is applied. For prophylaxis, roots of this plant and fruits of either *E. divinorum* or *Rubus apetalus* are chewed. A decoction made from the boiled roots of *S. guineense* may also be used.

Anthrax

A decoction made from the bark of *W. somnifera* mixed with soup is used to treat a patient with the viral disease. To detoxify meat from an animal which has died from anthrax, the meat is boiled with a decoction obtained from the bark of this plant after which it is considered edible. The sap from the leaves is applied to the lacerations on the skin of an animal with anthrax.

Antivenom

The powder obtained from dried and pound bark of *Acokanthera schimperi* is used in the management of snake bites. Incisions are made on the bitten area and powder applied to arrest movement of the venom.

Blood cleanser/detoxifier

Several plants are used as blood cleansers or detoxifiers to remove toxins from the body. These include a concoction made from the whole of *R. tenella* plant, bark and roots of *D. abyssinica, Macaranga kilimandscharica, M. senegalensis,* or *V. nobilis* as well as the bark of *C. anisata*, *O. capensis,* and *Vachellia seyal.* Other preparations include boiled twigs, roots, and leaves of *I. lapidosa;* stem, roots, and leaves of *S. hadiensis;* leaves of both *B. alba* and *N. officinale;* including the roots of *C. gynandra.* Also used is the powder made from the dried and pound stem of *Y. alpina*, bark of *O. capensis*, and bark and roots of *D. abyssinica* which is normally mixed with soup as it is bitter. In addition, the fruits of this plant are chewed. The fruits of *E. divinorum* and *O. monacantha* are also chewed as part of treatment. Also chewed are leaves of *C. gynandra* and roots of *M. subcordata.* Likewise, the whole of *R. tenella* plant and honey are consumed while raw, whereas the flowers of *K. lanceolata* are burnt and the soot licked. The sap obtained by squeezing the leaves of *A. tweediae* and fruits of *R. apetalus* is also administered for the same purpose.

Immunostimulants and related preparations

A decoction made from the boiled bark and roots of *V. nobilis* is used to stimulate immunity. In addition, the fruits of *A. abyssinicus* are chewed and raw honey was consumed.

Malnutrition

The sap made from crushing the fruits of *R. apetalus* is administered to add minerals and nutrients to the body, whereas those of *Nicotiana tabacum* are chewed for the same purpose. Honey is also used to treat malnutrition, to add minerals and vitamins to the body, as well as to strengthen bones and teeth.

Tonic/invigorant

Preparations made from several plants are used to restore vigor and vitality and reduce fatigue. They include a concoction made from boiled bark and roots of *S. guineense, D. abyssinica*, and *V. nobilis;* leaves, fruits, seeds of *P. americana;* or roots of *R. natalensis.* Leaves and higher parasites from this plant are also burnt to soot and licked. Other treatment methods include chewing the fruits of *A. abyssinicus, D. abyssinica, E. divinorum, R. natalensis*, and *S. guineense* or administration of the powder from the dried and pound bark and roots of *D. abyssinica* which is usually mixed with soup.

Other related preparations

Arrow poison

A decoction made from the roots of *A. oppositifolia* is used. The roots are boiled and allowed to settle and the sediment is then applied on the arrow heads.

Soap

The leaves of either *S. hadiensis* or *P. barbatus* are crushed and mixed with water, and the resultant froth is used as soap to wash babies.

Insecticide

The crushed leaves of *N. tabacum* are used as an insecticide. They are crushed and soaked in water and left for about 2 weeks. The liquid is then sprayed on vegetables. Alternatively, the leaves can be dried, pound, and mixed with water.

Toothbrush

The twigs of *I. arrecta* are used as toothbrushes. The young branches and leaves of this tree are also used as a broom.

DISCUSSION

Most of the plants used were those that we had identified in our earlier studies in the Marakwet, Keiyo, and Nandi studies.[4,5,21] However, the indications were different, and the TMPs tended to be very specific in their treatments. They were more knowledgeable of several medical conditions and offered specialized treatment of such conditions as infectious diseases and gynecological, pediatric, and abdominal disorders. For instance, we were for the first time informed of herbs used to determine the sex of unborn babies and those used in the

treatment of male infertility. They could also treat anthrax, cerebral malaria, hyperlipidemia, obesity, anorexia, pre- and post-menopausal syndrome, dysmenorrhea, arthritis, and psychotic disorders. In addition, they had herbs used in the prophylaxis of some diseases such as cancer *(A. oppositifolia*, *E. divinorum*, *R. apetalus*, *S. guineense)* and respiratory disorders (*E. divinorum, P. peruviana)*. To determine the sex of an unborn baby, a concoction made from the boiled roots of *C. procera* and *C. tomentosa* is used before conception. *C. procera* has been reported to inhibit implantation and therefore interfere with the estrous cycle in female rats,[22] while *C. tomentosa* has been used to treat infertility and impotence by some South African communities.[23] Most of the clients who required this service were families who had females in succession and wished to have a son. The Kalenjin, like most other Kenyan communities, still consider a son to be the heir of the family property and clan virtues as a daughter is considered as one who is to be married off to another clan, community, or even culture to start off a different family belonging to wherever she is married after payment of bridewealth.[24] Many of those without a son would therefore try all means including fathering several children in the hope that they would get a son or even marry another wife or wives. Indeed, we were informed by one TMP who specializes in that line that she receives clients from all over the country, including foreigners, and that they were all successful in their quest since they always came back to reward her handsomely.

It was interesting to note that some of the plants used in therapy had been deemed to be poisonous in our earlier studies. An example is *A. oppositifolia* which is employed in the treatment of cancer and liver disease. On searching the literature, we found out that the plant has indeed been demonstrated to possess antioxidant and moderate anticancer activity.[25,26] We also found out that *W. somnifera*, used in the management of cerebral malaria, meningitis, and anthrax, has been shown to possess antibacterial,[27] antifungal,[28] antimalarial,[29] and antiviral activities.[30,31] In addition, the TMPs informed us that they were able to detoxify meat from an animal that died from anthrax by boiling in a decoction obtained from the bark of this plant and then consumed.

There were several other recorded plants whose *in vitro* pharmacological effects have been investigated and found to correlate with the information provided by the TMPs. These include antibacterial and antifungal effects of *O. rochetiana* used in the management of urinary tract infections and oral candidiasis,[32] hypoglycemic/hepatoprotective effects of *O. monacantha* used in the treatment of diabetes and pancreatitis,[33,34] and spasmolytic effects of *A. hybridus* used to relieve colic pains and abdominal upsets.[35] Others include gastroprotective effects of *N. officinale*,[36] antimicrobial effects of *Aloe, Cleome,* and *Ipomoea*, spp.,[36-38] and hepatoprotective effects of *Ficus, Kalanchoe, Momordica,* and *Rhus spp.*[39-42]

Of specific interest is *R. tenella* which is used in the treatment of several conditions including lumbago, peripheral neuropathy, muscle cramps, joint pains, pre-and post-menopausal syndromes, obesity, cardiovascular/cerebrovascular disorders, and hyperlipidemia. It is also used as a blood cleanser. We were informed by the TMPs that plant is very popular among athletes as they believe that it contains nutrients which prevent muscle injury. In fact, we met three top athletes from Iten collecting the preparation from the residence of one of the TMPs. Iten, the County headquarters, which has been dubbed "The Home of Champions," is literally the headquarters of athletics. Most the world's elite athletes including the current world Marathon champion train there.[43] There was scant information from the literature about the pharmacological or mineral contents of this plant and research on this plant may be worth consideration.

CONCLUSIONS

Local knowledge of medicinal plants used in the treatment of several medical conditions still exists in Sangurur location and forms an important role in primary healthcare. We identified plants used in the management of several conditions including anthrax, cerebral malaria, and herbs used to detoxify meat from an animal that has died from anthrax. Of specific interest are those plants used to determine the sex of an unborn baby and *R. tenella* which is used to prevent muscle injury among many other therapeutic indications. Further research should be conducted to determine the efficacy and pharmacological profiles of the listed medicinal plants. Attempts should also be made to document medicinal plants used by other Kenyan communities who still practice herbal medicine to create a database for future research and potential development of new drugs before the knowledge is lost.

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Conflicts of interest

There are no conflicts of interest.

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