

Research Article

Ethnomedical Survey of the Plants Used by Traditional Healers in Narok County, Kenya

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Most of the plants used by herbalists amongst the various Kenyan communities have not been documented despite their widespread use. The purpose of this research was to document the medicinal plants used by the herbalists from the Maasai, a community that still relies on herbal medicine to a large extent for the provision of medical services. Semistructured interviews, direct observations, group discussions, and in-depth interviews were used to collect information from the traditional healers. A total of 47 plant species belonging to 31 families were identified. They were used in the treatment of 33 medical and 4 veterinary conditions.

1. Introduction

Medicinal plants still play an important role in primary healthcare in many sub-Saharan African countries due to variety of reasons including lack of health services, cultural norms, and traditional beliefs [1–3]. Many patients in these countries combine traditional medicine (TM) with conventional medicine, especially those with chronic diseases [4]. The use of TM is in most cases widespread and not only limited to the rural areas or low-income settings, but also in urban and well to do settings [3, 5, 6]. In addition, there is a growing global demand for traditional and complementary medicine [2]. The knowledge of these medicinal preparations is therefore important in order to enable health practitioners to be aware of the kind of TM their patients are on, so as to minimize potential adverse effects resulting from herb-drug interactions [7]. The documentation of the type of medicinal plants used by the traditional medical practitioners (TMPs) and the conditions treated is crucial to this endeavor [4]. In addition, databases containing this information would also be important for research and potential development of new drugs, as many of the drugs in current use have been

developed from medicinal plants [8, 9]. Examples of these include paclitaxel, an antitumour drug developed from the bark of *T. brevifolia* [10], the antimalarial drug artemisinin from *Artemisia annua* [11], digoxin from *Digitalis lanata*, atropine from *Atropa belladonna*, aspirin from *Filipendula ulmaria*, and several other drugs. However, despite the widespread use of medicinal plants in Kenya, several have not been documented [4, 12]. The main aim of this research was to document the medicinal plants used by the Maasai community in Narok County, one of the regions in Kenya whereby the practice of herbal medicine is still widespread for future research.

2. Materials and Methods

2.1. Study Area. The study was conducted in two locations within Narok County, Olpusimoru (2°1'0"S, 36°54'0"E) a highland area located in the Northern part; and Sekenani (1°30'58.33"S, 35°20'19.63"E) a lowland area located in the South-Western region [Siana Ward] [Figure 1]. Olpusimoru is a mountainous forested terrain with an average altitude of 2478 metres and high rainfall, while Sekenani has an average

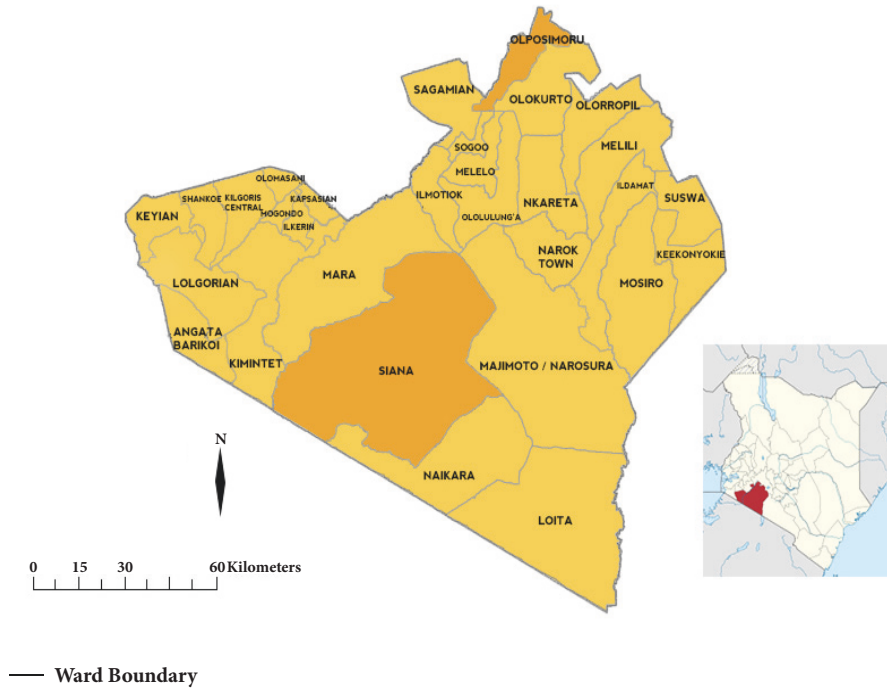


FIGURE 1: Map of Narok County showing Olpusimoru and Siana wards and its position within Kenyan map.

altitude of 1820 m with comparatively low rainfall. It borders the globally famous Maasai Mara National Reserve on the East [13, 14].

2.2. Data Collection. Ethnobotanical data was collected from TMPs between March and December 2016. The research team is comprised of professionals from the medical field and botany, including a physician (EN), two clinical pharmacologists (GK and ZK), a taxonomist (BW), and a plant specialist (WK). There were also two local lead persons, one from each site who accompanied the team at each visit in order to direct and introduce them to the TMPs. All TMPs that we met were willing to participate in the research. A total of 37 TMPs comprising 20 men and 17 women aged between 42 and 85 were interviewed. Semistructured interviews, direct observations, group discussions, and in-depth interviews were used to collect ethnopharmacological information [15–17]. The participant's biodata, conditions they treated, methods of treatment, medicinal plants used, methods of preparation and administration, and dosing forms were recorded. They were also asked to explain the manner in which they arrived at a diagnosis. At the end of each interview, the informants were requested to accompany the research team to sites where they collected the plants and assist in identification. Preliminary identification of the plants was then done by BW and WK, and the plants and their surrounding habitats photographed. The voucher specimens were then collected using standard botanical procedures, and further identification and confirmation were performed using the relevant taxonomic keys at University of Eldoret Herbarium where the specimens were subsequently deposited [18, 19]. The data was then compared to related research that has been carried out in the region.

2.3. Data Analysis. The medicinal importance of each plant species used was calculated as per the use-value index for each plant species (UVs) using the formula:

$$UVs = \frac{U}{N} \quad (1)$$

where U is the number of different uses mentioned by each TMP (informant) whereas N is the total number of TMPs interviewed during the survey [20, 21]. The UV index theoretically varies from 0, which implies that none of the informants mention any use of the plant, to 1 whereby the plant is most frequently mentioned as useful in treatment of the highest number of conditions.

3. Results and Discussion

A total of 47 plant species belonging to 31 families were identified, out of which 36 (77%) were from the lowland area (Sekenani), while 11 (23%) species were from the highlands (Olpusimoru) [Table 1]. The plant details including the voucher numbers are outlined in Table 2.

Medicinal Plant Uses. The plants were used in the treatment of 33 medical and 4 veterinary disorders. The detailed list of the plants and their respective medicinal uses are outlined in Table 2 and Supplementary Material section (available here). The most frequently used plant was *Solanum incanum* which had seven medical uses ($UV = 0.19$) followed by *Olea europaea subsp. cuspidata* which had five applications ($UV = 0.14$). *Asparagus africanus*, *Carissa edulis*, *Commiphora africana*, *Elaeodendron buchananii*, and *Kigelia africana* had four medicinal uses each ($UV = 0.11$).

TABLE 1: Classification of medicinal plants.

Family		No	Species
			Members
1.	FABACEAE	5	<i>Albizia gummifera</i> , <i>Dichrostachys cinerea</i> , <i>Erythrina senegalensis</i> , <i>Senegalia senegal</i> , <i>Vachellia nilotica</i>
2.	SOLANACEAE	4	<i>Physalis peruviana</i> , <i>Solanum arundo</i> , <i>Solanum incanum</i> , <i>Solanum mauense</i>
3.	AMARANTHACEAE	2	<i>Achyranthes aspera</i> , <i>Aerva javanica</i>
4.	APOCYNACEAE	2	<i>Acokanthera schimperi</i> , <i>Carissa edulis</i>
5.	BURSERACEAE	2	<i>Commiphora africana</i> , <i>Ficus sycomorus</i>
6.	CELASTRACEAE	2	<i>Elaeodendron buchananii</i> , <i>Mystroxyton aethiopicum</i>
7.	EUPHORBIACEAE	2	<i>Clutia abyssinica</i> , <i>Croton dichogamous</i>
8.	MALVACEAE	2	<i>Grewia bicolor</i> , <i>Sida cuneifolia</i>
9.	RHAMNACEAE	2	<i>Rhamnus prinoides</i> , <i>Ziziphus mucronata</i>
10.	RUBIACEAE	2	<i>Galium aparinoides</i> , <i>Pavetta subcana</i>
11.	RUTACEAE	2	<i>Teclea nobilis</i> , <i>Toddalia asiatica</i>
12.	APIACEAE	1	<i>Anthriscus sylvestris</i>
13.	ASPARAGACEAE	1	<i>Asparagus africanus</i>
14.	ASTERACEAE	1	<i>Acmella calirhiza</i>
15.	BIGNONIACEAE	1	<i>Kigelia africana</i>
16.	BORAGINACEAE	1	<i>Cordia monoica</i>
17.	CANELACEAE	1	<i>Warburgia ugandensis</i>
18.	CAPPARIDACEAE	1	<i>Boscia angustifolia</i>
19.	COLCHICACEAE	1	<i>Gloriosa superba</i>
20.	COMMELINACEAE	1	<i>Aneilema equinoctiale</i>
21.	CRASSULACEAE	1	<i>Kalanchoe crenata</i>
22.	CUCURBITACEAE	1	<i>Momordica friesiorum</i>
23.	EBENACEAE	1	<i>Diospyros abyssinica</i>
24.	FLACOURTIACEAE	1	<i>Dovyalis abyssinica</i>
25.	LABIATAE	1	<i>Leonotis mollissima</i>
26.	OLEACEAE	1	<i>Olea europaea subsp. cuspidata</i>
27.	PRIMULACEAE	1	<i>MyrsineaAfricana</i>
28.	ROSACEAE	1	<i>Prunus africana</i>
29.	SANTALACEAE	1	<i>Osyris lanceolata</i>
30.	SAPINDACEAE	1	<i>Pappea capensis</i>
31.	VITACEAE	1	<i>Cissus fischeri</i>
Total		47	

Most of the plants used by traditional healers in Kenya have not documented despite the imminent risk of disappearance of this plants due to several factors including deforestation and overexploitation [4]. In addition, the practice is usually a guarded family secret, and some of the siblings may not be willing to inherit the art due to changing lifestyles [22]. The lack of adequate regulation of the practice in Kenya has also led to infiltration by several quacks. However, the Maasai is one community in Kenya which still practices TM to a large extent owing to several reasons including lack of adequate health facilities and traditional values [23]. Some of the reported plants have been evaluated *in vitro* and found to exhibit pharmacological activities related to the uses described by the TMPs [24]. These include *Aerva javanica*, *Asparagus africanus*, *Carissa edulis*, *Sida cuneifolia*, and *Solanum incanum* which have demonstrated to possess antibiotic/antifungal activities [25–28],

while *Gloriosa superba* that is used as an abortifacient has oxytocic activity [29]. The plants used by the TMPs are largely similar to those used by their Kalenjin counterparts that we have reported before, although for different medicinal uses [3, 12, 30, 31]. Additionally, the methods of preparations are slightly different as the Maasai TMPs tend to use a lot of cold herbal infusions prepared by soaking the plant parts in water and hardly use the burnt leaves/barks as their counterparts

4. Conclusions

It is important to document traditional medicinal plants used by the various communities in Kenya in order to develop a database for future research. The risk of the rapid disappearance of the knowledge on traditional medicine calls for an urgent multidisciplinary approach towards conserving the information before it is lost forever. Some of these plants

TABLE 2. Medicinal plant uses.

No	Botanical Name	Family	Voucher No.	Maa name	Habitat	Parts used	Method of preparation	Medicinal uses
1.	<i>Achyranthes aspera</i> L.	AMARANTHACEAE	OLP/08/15/007	Olerubat	Highland	Roots	Boiled	Arthritis
2.	<i>Aemelia caltrhiza</i> Del	ASTERACEAE	OLP/08/15/009	Ekum	Highland	Flowers	Crushed and mixed with water	Oral thrush in children
3.	<i>Acokanthera schimperii</i> (A.DC.) Schweinf	APOCYNACEAE	MAU/08/15/027	Olmorijioi	Lowland	Roots	Boiled	Syphilis
4.	<i>Aerva javanica</i> (Burm.f.) Shult.	AMARANTHACEAE	MAU/08/15/032	Eleleshwa-ekop	Lowland	Flowers	Soaked in water	Arrow poison
5.	<i>Albizia gummifera</i> (J.F. Gmel.) C.A.Sm.	FABACEAE	MAU/08/15/018	Osupakupe	Lowland	Pods	Crushed	Stomachache
6.	<i>Anelenna aequinoctiale</i> P. Beauv	COMMELINACEAE	MAU/08/15/020	Enkaieteyiai	Lowland	Leaves	Soaked in water	Skin disorders
7.	<i>Anthriscus sylvestris</i> (L.) Hoffm	APIACEAE	MAU/08/15/028	Oldule	Lowland	Flowers	Pressed to produce juice	Malnutrition, colds
8.	<i>Asparagus africanus</i> Lam	ASPARGACEAE	MAU/08/15/006	Emperenpapa	Lowland	Seeds	Mixed with honey and chewed	Ocular disorders
9.	<i>Boscia angustifolia</i> Harvey	CAPPARIDACEAE	MAU/08/15/001	Oloireroi	Lowland	Leaves, stem & roots	Soaked in water	Chesty colds
10.	<i>Carissa edulis</i> Harv	APOCYNACEAE	MAU/08/15/003	Olamuriaki	Lowland	Leaves	Soaked in water	Mental illness
11.	<i>Cissus fischeri</i> Gilg	VITACEAE	MAU/08/15/011	Oskarurtuti	Lowland	Leaves	Soaked in water	Wounds
12.	<i>Glutia abyssinica</i> Jaub. & Spach.	EUPHORBIACEAE	OLP/08/15/011	Enkiparyeny	Highland	Roots	Soaked in water	Veneral diseases
13.	<i>Commiphora africana</i> (A. Rich.) Endl	BURSERACEAE	MAU/08/15/034	Osilalei	Lowland	Roots	Chewed	Cough & sore throat
14.	<i>Cordia monoica</i> Roxb	BORAGINACEAE	MAU/08/15/031	Oseki	Lowland	Fruits	Boiled	Cattle fever
15.	<i>Croton dichogamous</i> Pax	EUPHORBIACEAE	MAU/08/15/008	Ollokirdangai	Lowland	Leaves, bark	Crushed & mixed with water	Gynaecological disorders
						Roots	Boiled	Lower abdominal pains in pregnancy, gonorrhea, chest pains, polio symptoms
						Leaves, bark	Soaked in water	Respiratory disorders in cattle
						Roots	Boiled	Appetizer
						Leaves, bark	Leaves- boiled, bark - pounded	Swollen testicles, abdominal pains
						Roots	Boiled	Snake bite
						Leaves	Boiled	Typhoid
						Roots	Pounded	Leprosy
						Leaves	Boiled	Mental illness
						Roots	Pounded	Ocular disorders
						Roots	Boiled	Polio-like symptoms, gonorrhea, chest pain

TABLE 2: Continued.

No	Botanical Name	Family	Voucher No.	Maa name	Habitat	Parts used	Method of preparation	Medicinal uses
16.	<i>Dichrostachys cinerea</i> Wight et Arn	FABACEAE	MAU/08/15/009	Emerrumori	Lowland	Leaves	Pounded	Local anaesthesia, ulcers, gonorrhoea
17.	<i>Diospyros abyssinica</i> Hiern	EBENACEAE	MAU/08/15/025	Olchartuyian	Lowland	Bark	Pounded & soaked in water	Malaria, ocular disorders in livestock
18.	<i>Dovyalis abyssinica</i> (A. Rich.) Warb	FLACOURTIACEAE	OLP/08/15/006	Olmorogi	Highland	Roots Leaves	Boiled Chewed	Gonorrhoea Toothache
19.	<i>Elaeodendron buchananii</i> (Loes) Loes.	CELASTRACEAE	MAU/08/15/004	Osoket	Lowland	Roots Leaves	Dried and ground to powder Boiled or dried and ground to powder Chewed	Wounds, syphilis Respiratory disorders Diarrhoea
20.	<i>Erythrina senegalensis</i> DC.	FABACEAE	MAU/08/15/036	Ol-oboni	Lowland	Roots	Boiled	Polio-like symptoms, gonorrhoea, chest pain
21.	<i>Ficus sycomorua</i> L.	BURSERACEAE	MAU/08/15/024	Olgaboli	Lowland	Roots	Boiled, chewed	Abortifacient
22.	<i>Gadum aparinoides</i> Forssk	RUBIACEAE	MAU/08/15/026	Olgieriantus	Lowland	Whole plant	Pounded & soaked in water or boiled	Throat cancer in cattle
23.	<i>Gloriosa superba</i> L.	COLCHICACEAE	MAU/08/15/022	Sakutayei	Lowland	Roots	Chewed or soaked in water	Abortifacient
24.	<i>Grewia bicolor</i>	MALVACEAE	MAU/08/15/014	Osteti	Lowland	Roots	Soaked in water	Respiratory disorders, snake bite
25.	<i>Kalanchoe crenata</i> (Andrews) Haw	CRASSULACEAE	OLP/08/15/008	Ormasilig	Highland	Leaves	Warmed	Poultice
26.	<i>Kigelia africana</i> (Lam.) Benth.	BIGNONIACEAE	MAU/08/15/021	Oldarpoi	Lowland	Fruits Roots Bark Leaves	Brewed Boiled Boiled Boiled	Measles in children Abortifacient Headache Malaria
27.	<i>Leonotis mollissima</i> Guerke	LABIATAE	OLP/08/15/003	Ol-bibi	Highland	Leaves	Soaked in water or boiled	Antiseptic, skin rashes, blood purifier
28.	<i>Momordica frutescens</i> (Harms) C. Jeffrey	CUCURBITACEAE	OLP/08/15/001	Esumeito	Highland	Roots	Pounded & mixed with water	Induce vomiting
29.	<i>Myrsine africana</i> L.	PRIMULACEAE	OLP/08/15/004	Seketet	Highland	Seeds	Ground	Antihelminthic, heartburn
30.	<i>Mystroxydon aethiopicum</i> (Thunb.) Loes.	CELASTRACEAE	MAU/08/15/035	Olodonganayioi	Lowland	Bark	Boiled	Colic pain, especially in children
31.	<i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. ex G. Don) Cif.	OLEACEAE	MAU/08/15/023	Oloirien	Lowland	Bark Leaves Roots	Pounded and soaked in water Boiled Boiled	Antihelminthic Liver disease Polio-like symptoms, gonorrhoea, chest pain
32.	<i>Osyris lanceolata</i> Hochst. & Steud. ex A. DC.	SANTALACEAE	MAU/08/15/016	Oloesitai	Lowland	Bark Leaves Roots	Boiled Pounded Boiled	Abdominal pains in children Diarrhoea Gonorrhoea
33.	<i>Pappea capensis</i> Eckl. & Zeyh	SAPINDACEAE	MAU/08/15/029	Olkisik-ongo	Lowland	Bark Roots	Boiled Boiled	Abdominal disorders Gonorrhoea
34.	<i>Pavetta subcana</i> Hiern.	RUBIACEAE	MAU/08/15/002	Olabei	Lowland	Whole plant	Soaked in water	Cough in calves, fleas
35.	<i>Physalis peruviana</i> L.	SOLANACEAE	OLP/08/15/010	Ormumai	Highland	Roots	Squeezed/chewed	Tonsillitis

TABLE 2: Continued.

No	Botanical Name	Family	Voucher No.	Maa name	Habitat	Parts used	Method of preparation	Medicinal uses
36.	<i>Prunus africana</i> (Hook.f.) Kalkman	ROSACEAE	MAU/08/15/012	Olkujuk	Lowland	Leaves Bark	Pounded & soaked in water Pounded & mixed with water	Appetizer Stomachache
37.	<i>Rhamnus prinoides</i> L'Hér.	RHAMNACEAE	OLP/08/15/002	Olkonyel	Highland	Roots Stem	Boiled Pounded and mixed with water	Gonorrhoea, arthritis Preservative
38.	<i>Senegalia senegal</i> (L.) Britton & P. Wilson	FABACEAE	MAU/08/15/010	Oitioibor	Lowland	Roots Bark	Boiled Boiled	Purgative, constipation & gonorrhoea Diarrhoea & abdominal disorders
39.	<i>Sida cuneifolia</i> Roxb	MALVACEAE	MAU/08/15/005	Olonini	Lowland	Roots	Chewed Boiled	Sore throat Reduce foetal movements in pregnancy Fever
40.	<i>Solanum arundo</i>	SOLANACEAE	MAU/08/15/013	Esokawai	Lowland	Roots	Chewed, pounded & soaked in water Boiled	Abdominal pains, fever Toothache Snake bite
41.	<i>Solanum incanum</i> L.	SOLANACEAE	MAU/08/15/015	Entulelei	Lowland	Roots Leaves Fruits	Raw roots used Chewed and applied Juice	Chest pain, wounds & skin disorders, Respiratory disorders in sheep
42.	<i>Solanum mauense</i> Bitter.	SOLANACEAE	MAU/08/15/007	Olesayiet	Lowland	Berries Roots	Cooked Boiled	Pneumonia Anthrax in both humans and animals
43.	<i>Tealea nobilis</i> Del.	RUTACEAE	MAU/08/15/019	Ogilalai	Lowland	Leaves, roots	Boiled	Pneumonia, arthritis
44.	<i>Toddalia asiatica</i> (L.) Lam	RUTACEAE	MAU/08/15/030	Oleparmunyio	Lowland	Bark Roots	Boiled or soaked in water Boiled	Respiratory disorders Malaria
45.	<i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb	FABACEAE	MAU/08/15/033	Olkiloriti	Lowland	Bark	Pounded and mixed with water	Stomachache, indigestion
46.	<i>Warburgia ugandensis</i> Sprague.	CANELACEAE	OLP/08/15/005	Osokonoi	Highland	Bark	Pound and mixed with water Boiled, ground to powder	Malaria, abdominal disorders Arthritis
47.	<i>Zizyphus mucronata</i> Willd.	RHAMNACEAE	MAU/08/15/017	Oloilalei	Lowland	Roots Bark	Soaked in water Boiled	Snake bite Arthritis, stomachache

may contain undiscovered pharmacological properties which can serve as ingredients for the development of new drugs as has happened in Asia with the discovery of artemisinin. Additionally, medical personnel would also have an idea of the kind of herbal medicine that their patients may be taking and therefore minimize toxic effects through herb-drug interactions.

Data Availability

The authors confirm that the data supporting the findings of this study are available within the article and/or its supplementary materials.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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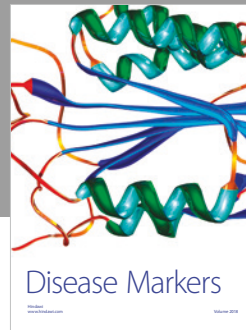
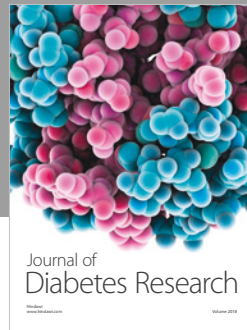
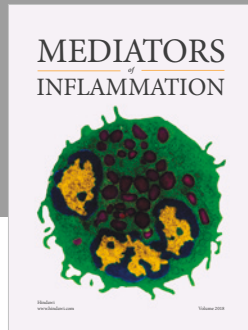
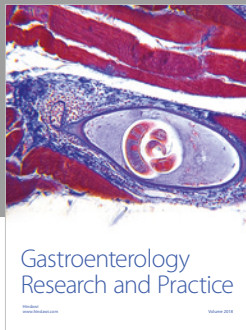
Supplementary Materials

Details of the medicinal plant uses. (*Supplementary Materials*)

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