



Quantitative ethnobotany of medicinal plants used by Kara and Kwego semi-pastoralist people in lower Omo River Valley, Debub Omo Zone, Southern Nations, Nationalities and Peoples Regional State, Ethiopia

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ABSTRACT

Aim of the study: The people in Ethiopia have been using medicinal plants over centuries and the traditional knowledge is passed verbally from generation to generation. Therefore, the aim of this study was to document the medicinal plants used by Kara and Kwego semi-pastoralist people and to establish association between the species richness and diversity, habit, parts used and administration of medicinal plants reported by the two people.

Materials and methods: Semi-structured interview was used in data collection; Chi-Square test, *t*-test and univariate analysis were used to compare medicinal plants knowledge between Kara and Kwego people. Informant consensus factor (ICF), fidelity level (FL), and preference ranking of medicinal plants were computed.

Results: Fifty-seven medicinal plant species were indicated that were distributed into 33 families and 52 genera. Thirty-four of them were common to both people whereas 12 were unique to Kara and 11 to Kwego. There was no significant difference ($p > 0.05$) between the two people in medicinal plant species richness and diversity. The growth forms, parts of medicinal plants and their conditions: fresh or dry used in the preparation of remedies and route of administration were not different ($p > 0.05$). Root was 55% of the plant parts used and oral was 61% of route of administration. The informant consensus factor was not significantly different ($p > 0.05$) between the two people. *Solanum hastifolium* Hochst. ex Dunal, *Salvadora persica* L. and *Maeura sessiliflora* Gilg were preferred more than the other medicinal plants reported to treat the prevalent diseases by both people.

Conclusions: The information documented on the medicinal plants of these people may be used as baseline data for future studies on semi-arid and arid pharmacologically important medicinal plants and for phytochemical investigations.

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1. Introduction

The lower Omo River Valley in Ethiopia contains some of the most colourful and diverse ethnic groups in Africa and many of the tribes have changed little and kept their variety of cultures intact for time immemorial. Kara and Kwego people are among the 16 tribes of Debub Omo Zone in south western part of Ethiopia (Carol and Angela, 1990; Genetu, 2005).

The Kara people live in the remote section of the valley on the eastern bank of the Omo River. They have distinct cultural identity and their cultural integrity is well kept, and speaks Omotic language. The Kara people use ornate body art, intricate headdresses and body scarification to express beauty and significance in the

community. They are known by their painted body and face decorations, which are symbolic and ornamental expression. It is an elaborate process, which ranges from fine and elaborate details to rough, but striking paintings traced with the palms or fingers that combine white (chalk), black (charcoal), yellow, ochre, and red earth. The Kara people are semi-pastoralists and fishermen (Carol and Angela, 1990; Genetu, 2005).

The Kwego people live on the bank of Omo River at its junction with the Mago River. They live in symbiotic relationship with the Kara people and their language is threatened by the influence of Bumea people. They are semi-pastoralist, fishermen, and collect honey from the wild (Carol and Angela, 1990; Genetu, 2005).

The level of development in both localities is the lowest in the country. There were no educational and modern health care facilities at Kwego except one health post at Kara at the time the study was conducted. Hence, they have limited access to mod-

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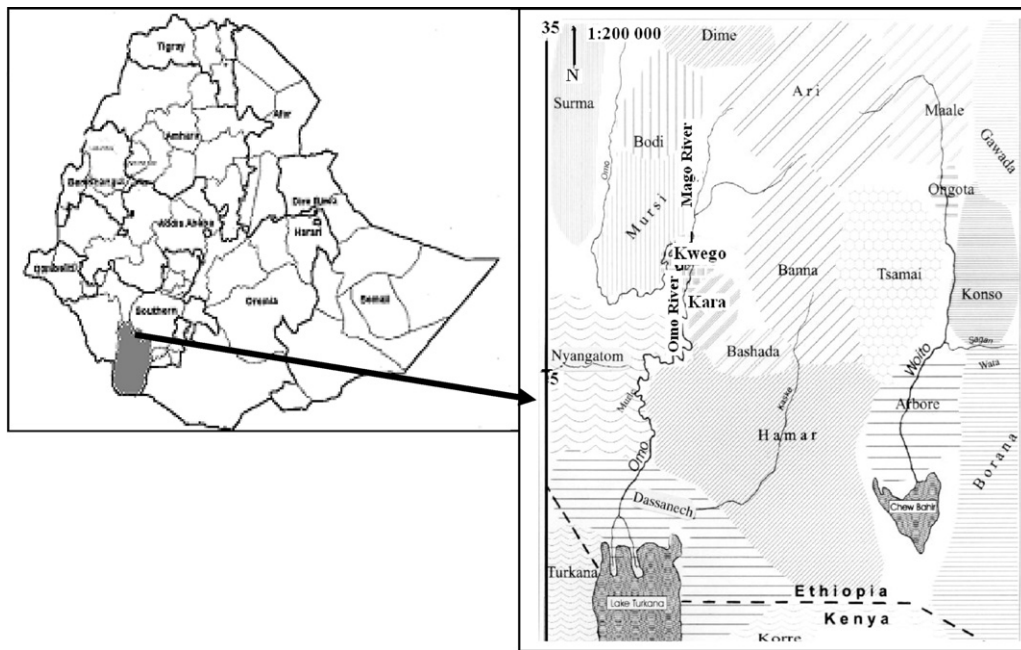


Fig. 1. Map of the study sites in Debug Omo Zone, Southern Nations, Nationalities and Peoples Regional State, Ethiopia.

ern health care facilities because of the isolation and remoteness, and depend to a larger extent on traditional medicinal plants as primary health care source. However, information on the uses of medicinal plants by these people is lacking as their traditional medicinal plants knowledge is not studied. So far, few studies have been conducted on their neighbouring people (Abbink, 1995; Giday et al., 2009) in south western Ethiopia. Therefore, the aim of this study was to document the medicinal plants used by Kara and Kwege semi-pastoralist people in lower Omo Valley, Debug Omo Zone and to establish any association between the medicinal plants used by Kara and Kwege people. The information documented on the medicinal plants of these people may be used as baseline data for future studies on semi-arid and arid pharmacologically important medicinal plants and for phytochemical investigations.

2. Materials and methods

2.1. Study area

The study area is located in lower Omo River Valley, Debug Omo Zone, Southern Nations, Nationalities and Peoples Regional State (SNNPR) at about 880 km from Addis Ababa. It is 'kola' to 'bereha' (dry arid lowland), has 400–600 mm mean annual rainfall and 20.1–27.5 °C mean annual temperature (Genetu, 2005). The Kara people live at three villages: Lebok (403.26 m.a.s.l., N 050 22' 306", E 360 12' 575"), Duss (406.30 m.a.s.l., N 050 16' 471", E 360 12' 420") and Korcho (433.13 m.a.s.l., N 050 11' 562", E 360 12' 428") on the eastern boarder of the Omo River in Hamar Woreda (District). They are bordering Hamar and Bena on the east, Nyangatom on the west, Mursi on the north, and Dasenech on the south. The total population of the three localities is 1472. The Kwege people live at six villages on the western bank of Omo River in Kuraz Woreda and the total population is 584. The location with the highest population and the prominent residential area is Kuchuru (406 m.a.s.l., N 050 25' 683", E 360 12' 717"), which is located about 42 km from Kangaton. They live within Bumea/Nyangatom people. They are bordering Nyangatom on the south and west, Mursi on the north and Kara on the east (Fig. 1).

2.2. Ethnobotanical data collection

An ethnobotanical study was conducted to record the knowledge associated with the use of medicinal plants by the Kara and Kwege people in lower Omo River Valley, Debug Omo Zone, SNNPR, Ethiopia from January 2005 to March 2007. About 10% of each people were randomly selected to serve as informants (Höft et al., 1999): 150 Kara (female=48, male=112) and 56 Kwege (female=20, male=36). The age of the Kara female informants ranged from 20 to 70 years (median=43) and that of the males' was from 23 to 80 years (median=58.5). The Kwege females' age ranged from 20 to 80 years (median=29.5) and that of males' was from 20 to 85 years (median=45). After receiving their prior informed consent, the informants in both people were interviewed using semi-structure questionnaire on the traditional knowledge of medicinal plants used to treat diseases. All interviews were conducted with the assistance of native translators. Information on local names of the plants, parts of plants used, mode of preparation and administration, and diseases treated was recorded. The Voucher specimens were collected during walks with the informants. The medicinal plants were identified by experts at the National Herbarium of Addis Ababa University and Aklilu Lemma Institute of Pathobiology (ALIPB), and deposited at ALIPB, Addis Ababa University.

2.3. Data analysis

Pearson's Chi-Square test ($\alpha=0.05$) and paired *t*-test two-tailed ($\alpha=0.05$) were used to compare medicinal plants species richness, difference in growth forms, plants parts used and routes of administration between Kara and Kwege people. Univariate analysis was used to test the variation between localities with regard to the type of families, genera and species reported.

Fidelity level (FL) was calculated using the formula: $FL (\%) = (Ip/Iu) \times 100$; where *Ip* is the number of informants who independently indicated the use of a species for the same major ailment and *Iu* the total number of informants who mentioned the plant for any major ailment (Friedman et al., 1986).

The informant consensus factor (ICF) was calculated as follows: number of use citations in each category (n_{ur}) minus the number

of species used (n_t), divided by the number of use citations in each category minus one where n_{ur} is the number of use citations and n_t is the number of species used (Heinrich et al., 1998).

$$ICF = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

Preference ranking exercise was performed to assess the degree of effectiveness of certain medicinal plants against the most prevalent diseases in the areas.

2.4. Ethical consideration

The study was ethically approved by the Ethical Committee of Akilu Lemma Institute of Pathobiology, Addis Ababa University. Prior to the collection of data, permission was secured from the Debub Omo Zone Administration and verbal consent was obtained from the informants after elaborating the aim of the study with assistance of local translators.

3. Results

3.1. Knowledge of medicinal plants

The informants, Kara and Kwegu, were capable of reporting medicinal plants that were used to treat the prevalent diseases in the localities: gastrointestinal ailments, stomach-ache, coughing, chest pain, coughing with blood/TB/, boils, abscess and swelling. The majority of Kwegu informants reported three medicinal plant species each and that of the Kara from three to six thought there was no significant difference (paired t -test two-tailed ($\alpha=0.05$, $d.f.=6$) = 2.313, $p=0.06$) between the two people in number of medicinal plants reported.

A total of 57 medicinal plant species were indicated that belong to 33 families and 52 genera. Thirty-four of the reported medicinal plants species were common to both people whereas 12 were only reported by Kara and 11 by Kwegu. Some of the common medicinal plants had different local names (Table 1). There was no significant difference (Pearson's Chi-Square test ($\alpha=0.05$, $d.f.=2$) = 0.073, $p=0.0964$) between the two people in medicinal plant species richness.

All medicinal plants were collected from the natural forest except *Cucurbita pepo* L. and there was no home garden in both localities. *Cucurbita pepo* L. was grown during the cropping season as vegetable and the seeds were used as source of food and medicine to tapeworm.

With regard to the distribution of the medicinal plant species, the family Cappariaceae had six, followed by Amaranthaceae, Combretaceae, Euphorbiaceae, and Solanaceae each with four species; Fabaceae and Tiliaceae each with three species; Apocynaceae, Olacaceae, and Salvadoraceae each with two species (Table 1). The analysis of variance showed no significant difference (locality ($\alpha=0.05$, $d.f.=1$) = 0.492, $p=0.486$; family ($\alpha=0.05$, $d.f.=32$) = 0.655, $p=0.899$; locality \times family ($\alpha=0.05$, $d.f.=32$) = 0.1441, $p=0.199$) in richness of medicinal plant families, genera and species reported by the two people. The Families: Aloiaceae, Asteraceae, Balanitaceae, Combretaceae, Moraceae and Moringaceae were reported by Kara people whereas family Malvaceae, Poaceae and Sapindaceae were reported by Kwegu people.

3.2. Growth forms, medicinal plants parts' used and administration of remedies

The growth forms (Person's Chi-Square test ($\alpha=0.05$, $d.f.=3$) = 0.341, $p=0.952$), parts of medicinal plants (paired t -test two-tailed ($\alpha=0.05$, $d.f.=7$) = 0.242, $p=0.815$) and their conditions: fresh

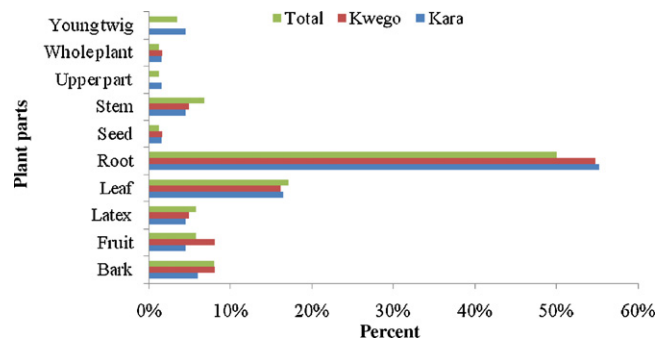


Fig. 2. Medicinal plants parts used by Kara and Kwegu people in the preparation of remedies.

and dry used in the preparation of remedies (Pearson's Chi-Square test ($\alpha=0.05$, $d.f.=1$) = 0.003, $p=0.958$) and route of administration (paired t -test two-tailed ($\alpha=0.05$, $d.f.=4$) = 0.981, $p=0.382$) were not different between Kara and Kwegu people. 33% of the medicinal plants were trees followed by 33% shrubs, 25% herbs and 9% climbers.

Root was used in 55% of the preparation of remedies by both people followed by 16% leaf and 8% bark and fruit each (Fig. 2). The majority of the plant parts were used fresh (94%) compared to dry (4%). The juice or the liquid extracts or the whole mixture was used as remedies. Water was used as solvent for extraction and honey for sweetening.

The administration route, oral (61%) was the leading in both Kara and Kwegu people (Fig. 3). The measurements of doses were dependent on the parts used and edibility. The quantity of leaves, young twigs and fruits used in the preparation of remedies were more than that of root.

Crushing and pounding were used as methods of preparation of remedies; decoction (boiling in water) and infusion (soaking in water) were the predominant methods of extraction. Squeezing fresh plant parts that were heated on fire were used to treat ear and eye ailments and external injuries. Some of the medicinal plants' parts used as a treatment for severe chest pain, coughing with blood/tuberculosis/ were boiled with goat meat and the broth was taken; others, which were used as treatment for malaria, boils, abscess and swelling were boiled with coffee seeds' husk and were taken as a drink. In most cases, the medicines were taken until cure; however, some were taken only once before food such as *Plumbago zeylanica* L. for abortion and placenta retention, and *Glinus lotoides* L. against tapeworm (Table 1).

3.3. Informant agreement value

The diseases that were reported more prevalent in Kara and Kwegu were cited by more informants than the other category of diseases (Table 2). The ICF and number of medicinal plants used

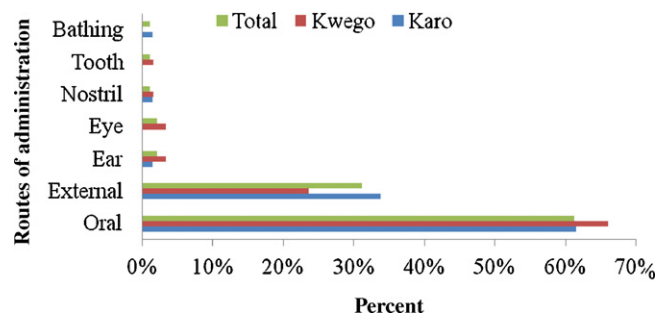


Fig. 3. Routes of administration of remedies in Kara and Kwegu people.

Table 1
List of medicinal plant species reported by Kara (KA) and Kwego (KW) people.

Family	Species	Indigenous name	Growth form	Part used	Medicinal uses	Preparation	Route	Fresh/dry	Voucher number
Acanthaceae	<i>Hypoestes forskalii</i> (Vahl) R. Br.	Tundaye (KA, KW) ^a	Herb	Root	Diarrhea with blood, stomach-ache	Chewing/infusion	Oral	Fresh	DUS-26
Aloaceae	<i>Aloe Sp.</i>	Welkinto (KA) ^a	Shrub	Upper part	External injury	Powder/ash	External	Fresh	MJI-67
Amaranthaceae	<i>Achyranthes aspera</i> L.	Quacho (KA)	Herb	Root	Amoebic, diarrhea with blood	Pounded/infusion	Oral	Fresh	LEB-16
		Kiliche (KW)		Leaf	External injury/wounds	Powdered/squeezing the leaves	External	Fresh	
	<i>Aerva javanica</i> (Burm.f.) Schultes	Chawlo (KA)Ngewka (KW)	Shrub	Root	Amoebic/diarrhea with blood, ascariis, intestinal worms, chronic chest pain	Crushed/mixed with water/infusion	Oral	Fresh	MUR-42
	<i>Amaranthus spinosus</i> L.	Sumale (KW)	Herb	Root	Epidemic, diarrhea with blood, vomiting	Pounded/mixed water	Oral	Fresh	MUR-56
	<i>Pupalina micrantha</i> Hauman	Kacho (KA, KW)	Herb	Root	Diarrhea with blood	Chewing/powder mixed with water	Oral	Fresh	LEB-13
Anonaceae	<i>Uvaria leptocladon</i> Oliv.	Zebko (KA)Chochum (KW)	Tree	Root	Chest pain, TB, cough, diarrhea with blood, stomach-ache, malaria, boils, abscess, thinness	Crushed/decoction/boiled with coffee seeds' husk	Oral	Fresh	DUS-25
Apocynaceae	<i>Adenium obesum</i> (Forssk.) Roem. & Schult.	Locombolo (KA, KW)	Shrub	Leaf/latex	External injury, wounds, scorpion sting,	Crushed/rubbing	External	Fresh	LEB-28
	<i>Saba comorensis</i> (Boj.) Pichon	Gorza (KW)	Tree	Fruit	Venereal diseases (syphilis) stomach-ache, diarrhea with blood	Powder with water	Oral	Fresh	DUS-11
Asteraceae	<i>Vernonia galamensis</i> (Cass.) Less.	Busnta (KA)	Herb	Leaf	External injury/infection, wounds	Crushed	External	Fresh	LEB-11
Balanitaceae	<i>Balanites rotundifolia</i> (van Tieghem) Blatter	Morko (KA)	Tree	Root	Diarrhea, thinning, tiredness, rash on body	Crushed boiled with goat meat	Oral	Fresh	MJI-40
Boraginaceae	<i>Cordia sinensis</i> Lam.	Midir (KA)	Shrub	Root	Chest pain	Crushed/infusion	Oral	Fresh	MUR-35
	<i>Heliotropium steudneri</i> Vatke	Kibo (KW)	Shrub	Root	Severe chest pain, chronic cough	Crushed/decoction	Oral	Fresh	DUS-62
Capparidaceae	<i>Boscia coriacea</i> Pax	Shodo (KA, KW)	Tree	Root	Diarrhea, thinning, malaria, ear pain	Crushed/boiled with water/squeezing into ear	Oral/external	Fresh	KOR-40
	<i>Cadaba forinosa</i> Forssk.	Diri (KW)	Shrub	Root	Diarrhea with blood, stomach-ache	Chewing	Oral	Fresh	MUR-44
	<i>Cadaba rotundifolia</i> Forssk.	Kenquele (KA, KW)	Shrub	Leaf/young twig	External injury, wounds, skin infection	Crushed/pounded	External	Fresh	LEB-05
	<i>Capparis fascicularis</i> DC.	Kedela (KA) Kedela (KW)	Tree	Stem Root	External injury, wounds Stomach-ache	Ash Chewing	External Oral	Fresh Fresh	DUS-05
	<i>Maeura sessiliflora</i> Gilg	Mandech (KA, KW)	Tree	Leaf/young twig	External injury, wounds, boils, swelling, rash on body	Powdered dry leaf/young twig	External	Dry	DUS-07
		Mandech (KA)		Bark	Intestinal worms, tapeworm	Powdered mixed with hot water	Oral	Dry	
		<i>Ritchiea albersii</i> Gilg	Ratse (KA)	Shrub	Root Root	Severe chest pain Stomach-ache, gastrointestinal illness	Crushed made as soup Crushed mixed with water	Oral Oral	Fresh Fresh
Combretaceae	<i>Combretum aculeatum</i> Vent.	Mega (KA)	Climber	Root	Stomach blotting, chest pain	Crushed boiled with goat meat	Oral	Fresh	KOR-37
Cucurbitaceae	<i>Cucurbita pepo</i> L.	Botolo (KA, KW)	Herb	Seed	Tapeworm	Fried seed is taken as meal	Oral	Fresh	LEB-33
	<i>Coccinia grandis</i> (L.) Voigt.	Buta (KA)	Climber	Leaf	External injury, skin infection, wounds	Crushed/poultice	External	Fresh	LEB-17
	<i>Kedrostis foetidissima</i> (Jacq.) Cogn.	Shunto (KW)	Climber	Leaf	Ear pain	hot/squeezing	Ear	Fresh	LEB-06

Cyperaceae	<i>Cyperus sp.</i>	Bez (KA)	Herb	Root	Intestinal worms/tapeworm, stomach-ache blotting, flu, sever chest pain, headache, boils,	Crushed/infusion/chewing	Oral	Fresh	MUR-10
		Keregi (KW)							
Dracenaceae	<i>Sansevieria ehrenbergii</i> Schweinf. ex Baker	Aki (KA)	Shrub	Leaf	Ear pain	Hot and inserted into ear	Ear	Fresh	MJI-35
		Ankalti (KW)		Stem	Ear sickness	Hot and squeezing into ear	External	Fresh	
		Ankalti (KW)							
Euphorbiaceae	<i>Euphorbia breviararticulata</i> Pax.	Dondelay (KW)	Tree	Latex	Eye illness/trachoma	Applying the latex on the eye	Eye	Fresh	MUR-02
				Latex		Adding the latex in the hole of the tooth	External	Fresh	
	<i>Fluggea virosa</i> (Willd.) Voigt.	Tanta (KA, KW)	Tree	Root	Goiter, swelling on body, amoebic dysentery	Crushed/decoction	Oral	Fresh	LEB-19
				Latex	Tooth decay, toothache	Adding the latex in the hole of the tooth	Tooth	Fresh	
	<i>Phyllanthus sepialis</i> Muell. Arg.	Kolempa desha (KA)	Shrub	Root	Scorpion sting	Chewing and rubbing	External	Fresh	MUR-43
		Qolompo desha (KW)		Leaf	Scorpion sting	Rubbing	External	Fresh	
	<i>Ricinus communis</i> L.	Ati (KA, KW)	Tree	Root	Flu, headache, stomach-ache/blotting, chest pain, Boils, swelling	Chewing/crushed boiled with coffee seeds' husk/decoction	Oral	Fresh	LEB-18
		Ati (KA)		Young twig		Pounded/poultice	Oral	Fresh	
Fabaceae	<i>Acacia mellifera</i> (Vahl.) Benth.	Aygae (KA)	Tree	Bark	Spleen pain	Plastering hot on patient's abdomen	External	Fresh	DUS-22
		Aygae (KW)		Leaf	External injury, wounds	Pounded	External	Fresh	
				Bark	Malaria	Pounded mixed with boiled water	Oral	Fresh	
	<i>Accasia sp.</i>	Silda (KW)	Tree	Bark	Back pain	Boiled in water	Oral	Fresh	MUR-24
	<i>Indigofera spicata</i> Forssk.	Chaki Aka (KA) Sharka Nigush (KW)	Shrub	Root	Evil eye	Chewing inserting into nostrils	Nostrils	Fresh	MJI-13
		Erbo (KW)		Leaf	External injury, wounds, Intestinal parasite	Squeezing	External	Fresh	
				Root		Chewing and swallowing	Oral	Fresh	
Malvaceae	<i>Abutilon angulatum</i> (Guill. & Perr.) Mast.	Gompolto (KW)	Shrub	Root	Chest pain, coughing with blood/TB/	Chewing	Oral	Fresh	LEB-04
Mavaceae	<i>Pavonia arabica</i> Hochst & Steud. ex Boiss.	Gundo Desha (KA, KW)	Herb	Leaf	Snake bite	Squeezing in the opening made at the site	External	Fresh	KOR-36
		Gundo Desha (KA)		Stem	Snake bite	Pounded with mixed water	Oral	Fresh	
		Guno Desha (KW)		Root	Snake bit	Chewing and applying on the site	External	Fresh	
Menispermaceae	<i>Cissampelos pareira</i> L.	Gud (KA)	Climber	Root	Chest pain/TB/coughing with blood, flu, boils, swelling, stomach-ache, diarrhea,	Crushed boiled in water	Oral	Fresh	KOR-32
		Mile (KW)							
		Gud (KA)		Stem	Scorpion stinging	Rubbing site with crushed stem	External	Fresh	
				Root	Swelling in stomach	Chewing/crushed boiled in water	External	Fresh	

Table 1 (Continued)

Family	Species	Indigenous name	Growth form	Part used	Medicinal uses	Preparation	Route	Fresh/dry	Voucher number
		Mile (KW)		Root	Febrile disease, malaria, headache, flu	Crushed/infusion	Oral	Fresh	
				Root	Swelling in breast	Crushed/decoction	Oral	Fresh	
				Root and stem	Ascari/intestinal parasites, stomach-ache	Chewing/pounded mixed with water	Oral	Fresh	
Molluginaceae	<i>Glinus lotoides</i> L.	Haka Chewlo (KA, KW)	Herb	Whole plant	Tapeworm, intestinal worms	Powdered/infusion	Oral	Dry	LEB-21
Moraceae	<i>Ficus vasta</i> Forssk.	Shafo (KA)	Tree	Latex	External injury	Applying latex on site	External	Fresh	DUS-10
Moringaceae	<i>Moringa stenopetala</i> (Bak. f.) Cuf.	Aleko (KA)	Tree	Leaf	Flu,	Boiled soup	Oral	Fresh	DUS-09
Nyctaginaceae	<i>Boerhavia coccinea</i> Mill.	Golosso (KA, KW)	Herb	Leaf	External injury, wounds	Powder/squeezed on the injured part	External	Fresh	MUR-40
Olacaceae	<i>Jasminum abyssinicum</i> Hochst. ex DC.	Guno desha (KW)	Tree	Root	Snake bite	Chewing and applying on site	External	Fresh	MJI-27
	<i>Ximenia americana</i> L.	Mekela (KA) Waljoweljo (KW)	Shrub	Fruit/young/	External injury/wounds Eye illness/trachoma, boils, swelling Stomach-ache/dysentery	Squeezing on the site Squeezing into eye or applying on site Watery part of fruit	External Eye/external	Fresh Fresh	MUR-54
				Root	Flu	Crushed/powdered mixed with water	Oral	Fresh	
				Leaf	External injury	Squeezing on injured part	External	Fresh	
Plumbaginaceae	<i>Plumbago zeylanica</i> L.	Warwaro (KA, KW)	Herb	Root	Chest pain, malaria, febrile disease, rheumatism, diarrhea, thinning, boils, abscess Abortion up to 3 months pregnancy, retained placenta	Crushed/powdered boiled with coffee seeds' husk Powdered boiled in water and with honey	Oral	Fresh Fresh	MUR-14
Poaceae	<i>Cenchrus ciliaris</i> L.	Guder Sheko (KW)	Herb	Root	Diarrhea	Chewing	Oral	Fresh	DUS-60
Salvadoraceae	<i>Dobera glabra</i> (Forssk.) Poir	Mero (KA)	Tree	Root	Chest pain, boils, abscess	Crushed/infusion	Oral	Fresh	DUS-64
	<i>Salvadora persica</i> L.	Mero (KA, KW)	Shrub	Root	Chest pain, boils, abscess	Crushed/decoction or boiled with goat meat	Oral	Fresh	MUR-46
		Mero (KW)			Chest pain/TB/coughing with blood, flu, febrile disease, malaria, cancerous swelling	Crushed/decoction	Oral	Fresh	
Sapindaceae	<i>Lecaniodiscus fraxinifolius</i> Bak.	Choro (KW)	Tree	Fruit/ripe	Diarrhea with blood, stomach-ache	Crushed/infusion	Oral	Fresh	MUR-50
Simaroubaceae	<i>Harrisonia abyssinica</i> Oliv.	Jamo (KA)	Tree	Bark	Stomach-ache, loss of appetite, vomiting, coughing with blood	Crushed with water/infusion	Oral	Fresh	MUR-13
		Moy Moy (KW)		Bark & Root	Malaria	Crushed/infusion/decoction	Oral	Fresh	
Solanaceae	<i>Lycium shawii</i> Roem. & Schult.	Doreda (KA) Lekebkebe (KW)	Tree	Root	Swelling in stomach, rush on body, cancerous swelling	Crushed/decoction/boiled with goat meat	Oral	Fresh	MUR-59
	<i>Solanum hastifolium</i> Hochst. ex Dunal	Lodocamuræ (KA) Dinkishea (KW)	Shrub	Root	Diarrhea, amoebic dysentery with blood, stomach-ache	Chewing/crushed/infusion	Oral	Fresh	MUR-28
	<i>Solanum incanum</i> L.	Garanto (KA)	Shrub	Root	Chest pain, diarrhea, amoebic dysentery with blood, stomach-ache	Crushed/infusion/chewing	Oral	Fresh	KOR-33

Family	Species (L.)	Wuchamboro (KA, KW)	Shrub	Root	Diarrhea, amoebic dysentery with blood, stomach-ache, Boils, abscess, swelling	Crushed with water	External	Fresh	MJI-25
Tiliaceae	<i>Withania somnifera</i> (L.) Dunal	Bereza (KA) Demak (KA) Quldenda (KW)	Tree Shrub	Fruit Root	Venerae diseases/syphilis Chest pain, TB, coughing with blood, chest pain	Soaked in water Crushed/decoction	Oral Oral	Fresh Fresh	MUR-31 MUR-29
Vitaceae	<i>Grewia villosa</i> Willd. <i>Cissus rotundifolia</i> (Forssk.) Vahl	Quldenda (KW) Rug Rug (KA, KW) Kalae (KA, KW)	Shrub Climber	Stem Bark Fruit Root	Rheumatism Sickness, boils Febrile disease Coughing with blood/TB or losing weight, amoeba, diarrhea with blood Rush on body	Crushed boiled in water Crushed/infusion Ripped soaked in water Crushed/infusion	Oral Oral Oral Oral	Fresh Fresh Fresh Fresh	DUS-28 DUS-23
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	Morede (KA, KW)	Herb	Root	Rheumatism, joint pain	Crushed is boiled either taken or for bathing Crushed/decoction	Oral/Bath Oral	Fresh Fresh	DUS-27
Zygophyllaceae	<i>Tribulus cistoides</i> L.	Mugro (KA, KW)	Herb	Root	Swelling on neck, boils, abscess Stomach-ace Flu.	Powdered applied on swollen part Chewing Crushed/powdered mixed with water/chewing	External External Oral	Dry Dry Fresh	DUS-16

^a Medicinal plant species labeled with KA were only reported by Kara and KW by Kwegu people. Those labeled with KA and KW were reported by both people.

Table 2

Informant consensus value for category of disease in Kara and Kwegu people.

Category	Species	(%) All species	Use citations	(%) All use citations	ICF
Abortion, placenta retention	2	4	8	1	0.86
Boils, abscess and swelling	23	40	78	14	0.71
Evil eye	2	4	6	1	0.80
External injury and wounds	18	32	43	8	0.60
Eye, ear and nostrils	8	14	12	2	0.36
Gastrointestinal illness and intestinal parasites	38	67	177	31	0.79
Headache and flu	10	18	50	9	0.82
Internal illness, malaria and febrile disease	23	40	55	10	0.59
Respiratory infection and tuberculosis	26	46	157	27	0.84
Snake bite and scorpion sting	7	12	15	3	0.57
Venereal disease/syphilis	2	4	9	2	0.88

in the treatments of the different category of diseases were not significantly different (paired *t*-test two-tailed ($\alpha = 0.05$, d.f. = 10) = 1.00, $p = 0.341$) between Kara and Kwegu people.

The FL was calculated for medicinal plants cited by three or more informants pooling the Kara and Kwegu data together since the uses of medicinal plants reported by both groups of people were similar. *Tribulus cistoides* L., *Solanum hastifolium* Hochst, *Maeura sessiliflora* Gilg, *Grewia kakothamnus* K. Schum., and *Hypoestes forskolii* (Vahl) R. Br. were cited by 13 or more informants and scored more than 90% (Table 3).

3.4. Preference ranking of medicinal plants

The medicinal plants used to treat the most prevalent disease in both localities were similar. Hence, the ranks given by selected informants from Kara and Kwegu people were pooled together. The first three medicinal plants with the highest rank that were indicated as the preferred choice of remedy to gastrointestinal illness and intestinal parasite were *Solanum hastifolium* Hochst. ex Dunal, *Cissampelos pareira* L. and *Hypoestes forskolii* (Vahl) R. Br., for respiratory infection and tuberculosis were *Salvadora persica* L., *Grewia kakothamnus* K. Schum., and *Uvaria leptocladon* Oliv., and for boils, abscess, swelling, external injury and wounds were *Maeura sessiliflora* Gilg, *Salvadora persica* L. and *Cadaba rotundifolia* Forssk.

4. Discussion and conclusions

4.1. Knowledge of Kara and Kwegu medicinal plant uses

In Kara and Kwegu, every family have good knowledge of use of medicinal plant species due to the remoteness of the localities, non-existent of modern health facilities and recognized herbalist (Giday et al., 2009), for example, *Solanum hastifolium* Hochst. was cited by 38%; *Salvadora persica* L. by 30%, *Uvaria leptocladon* Oliv. by 20%, *Plumbago zeylanica* L. by 18%, *Grewia kakothamnus* K. Schum. by 16%, *Cissampelos pareira* L. by 16% and *Maeura sessiliflora* Gilg by 12% of the Kara and Kwegu informants. However, some of the semi-pastoralists tend to keep their knowledge secret (Gemede-Dalle et al., 2005; Kassaye et al., 2006) and are not willing to tell all the remedies, they know. Nevertheless, the families in the localities use the medicinal plants for their day-to-day health problems.

The knowledge of traditional medicinal plants of these two people was similar and most of the medicinal plant species reported by Kara and Kwegu were used to treat the prevalent diseases. Some medicinal plants used by the Kara and Kwegu people had same name as Kwegu people speak the language of Kara and other

Table 3

FL value of medicinal plants cited by three or more Kara and Kwegu informants.

Medicinal plant	Medicinal uses	Ip	Iu	FL value %
<i>Boerhavia coccinea</i> Mill.	External injury/wounds	3	3	100.00
<i>Grewia bicolor</i> Juss.	Syphilis/venereal disease	7	7	100.00
<i>Kedrostis foetidissima</i> (Jacq.) Cogn.	Ear pain	5	5	100.00
<i>Lycium shawii</i> Roem. & Schult.	Swelling similar to cancerous growth on different body part and in stomach	6	6	100.00
<i>Pavonia arabica</i> Hochst & Steud. ex Boiss.	Snake bite	5	5	100.00
<i>Pupalina micrantha</i> Hauman	Diarrhea with blood, stomach-ache	5	5	100.00
<i>Sansevieria ehrenbergii</i> Schweinf. ex Baker	Ear pain	3	3	100.00
<i>Tribulus cistoides</i> L.	Flu, coughing	15	15	100.00
<i>Zingiber officinale</i> Roscoe	Boils, abscess, swelling on buttock	4	4	100.00
<i>Solanum hastifolium</i> Hochst.	Diarrhea with blood/stomach-ache, external injury, boils, malaria	74	77	96.10
<i>Maeura sessiliflora</i> Gilg	External injury/boils/abscess/swelling, chest pain	24	25	96.00
<i>Grewia kakothamnus</i> K. Schum.	Coughing with blood/TB/, saliva with blood, chest pain, swelling all over the stomach, rheumatism	31	33	93.94
<i>Hypoestes forskoolii</i> (Vahl) R. Br.	Diarrhea with blood, amoebic, stomach-ache, chest pain/TB/coughing with blood	12	13	92.31
<i>Cadaba rotundifolia</i> Forssk.	External injury, diarrhea	6	7	85.71
<i>Combretum aculeatum</i> Vent.	Chest pain, stomach blotting	4	5	80.00
<i>Achyranthes aspera</i> L.	Diarrhea with blood, external injury	7	9	77.78
<i>Ricinus communis</i> L.	Flu and headache, chest pain, stomach-ache/blotting, swelling	13	17	76.47
<i>Indigofera spicata</i> Forssk.	Evil eye, external injury/wounds, intestinal parasite	6	8	75.00
<i>Ximenia americana</i> L.	External injury/wounds, boils, abscess, eye illness/trachoma	6	8	75.00
<i>Aerva javanica</i> (Burm.f.) Schultes	Diarrhea with blood/amoebic dysentery, ascariis/intestinal worms, chest Pain	11	15	73.33
<i>Salvadora persica</i> L.	Coughing with blood, chest Pain/TB/, febrile disease/malaria/, swelling similar to cancerous growth, diarrhea/Stomach-ache	41	61	67.21
<i>Adenium obesum</i> (Forssk.) Roem. & Schult.	Scorpion sting, external injury	4	6	66.67
<i>Capparis fascicularis</i> DC.	External injury wounds, stomach-ache	2	3	66.67
<i>Dobera glabra</i> (Forssk.) Poir	Chest pain, boils, swelling, abscess	4	6	66.67
<i>Fluggea virosa</i> (Willd.) Voigt.	Boils, abscess, swelling all over the body, amoebic dysentery	4	6	66.67
<i>Glinus lotoides</i> L.	Tapeworm, intestinal worms, external injury	2	3	66.67
<i>Grewia villosa</i> Willd.	An identified febrile sickness, rush on the body	2	3	66.67
<i>Cyperus</i> sp.	Flu and headache, boils, swelling, chest pain, intestinal worms/tapeworm	18	28	64.29
<i>Acacia mellifera</i> (Vahl.) Benth.	Spleen Pain, malaria, external injury	5	8	62.50
<i>Harrisonia abyssinica</i> Oliv.	malaria, loss of appetite, vomiting,	5	8	62.50
<i>Withania somnifera</i> (L.) Dunal	Diarrhea, chest pain, swelling	5	8	62.50
<i>Cissus rotundifolia</i> (Forssk.) Vahl	Dysentery with blood, amoebic, stomach-ache, coughing with blood/TB/ or losing weight, rheumatism/joint pains, rush on body	8	14	57.14
<i>Plumbago zeylanica</i> L.	Chest pain and coughing with blood/TB/, thinning and tiredness, fever, diarrhea, swelling, abortion, rheumatism	19	36	52.78
<i>Uvaria leptocladon</i> Oliv.	Severe chest pain/coughing with blood/Tb/, boils, abscess, swelling, malaria, diarrhea, stomach-ache, weakness	21	40	52.50
<i>Cissampelos pareira</i> L.	Stomach-ache/diarrhea, intestinal worms/ascariasis, chest pain/TB/coughing, malaria, febrile disease, breast swelling, scorpion sting	14	32	43.75
<i>Boscia coriacea</i> Pax	Diarrhea and thinning, malaria, ear pain	1	3	33.33

bordering people, besides, the Kwegu people live in symbiotic relationship with Kara people, which may be one aspect for the similarity of their medicinal plant knowledge in addition to the ecology of the area (Carr, 1998; Genetu, 2005).

4.2. Medicinal plants

Most of the medicinal plant species indicated by Kara and Kwegu informants: *Abutilon angulatum* (Guill. & Perr.) Mast., *Adenium obesum* (Forssk.) Roem. & Schult., *Amaranthus spinosus* L., *Boerhavia coccinea* Mill., *Boscia coriacea* Pax, *Cadaba forinosa* Forssk., *Cenchrus ciliaris* L., *Cordia sinensis* Lam., *Dobera glabra* (Forssk.) Poir, *Euphorbia breviararticulata* Pax. *Grewia kakothamnus* K. Schum., *Heliotropium steudneri* Vatke, *Kedrostis foetidissima* (Jacq.) Cogn, *Lecaniodiscus fraudifolius* Bak., *Lycium shawii* Roem. & Schult., *Maeura sessiliflora* Gilg, *Pavonia arabica* Hochst & Steud. ex Boiss., *Pupalina micrantha* Hauman, *Saba comorensis* (Boj.) Pichon, *Solanum hastifolium* Hochst. ex Dunal, *Tribulus cistoides* L., *Uvaria leptocladon* Oliv., and *Vernonia galamensis* (Cass.) Less. have not been reported by the studies conducted elsewhere in Ethiopia (Addis et al., 2001; Balemie et al., 2004; Seifu, 2004; Giday et al., 2003, 2007; Wondimu et al., 2007; Lulekal et al., 2008; Yiniger and Yewhalaw, 2007; Yiniger et al., 2008; Bekalo et al., 2009; Flatie et al., 2009; Karunamoorthi et al., 2009; Mesfin et al., 2009; Teklehaymanot et al., 2007; Teklehaymanot, 2009a,b). This may be due to uniqueness of the medicinal plants knowledge of the Kara and Kwegu people and

the ecological settings. Furthermore, most of the medicinal plants reported so far by other studies are of midland and highland vegetation; whereas the plants in Kara and Kwegu are semi-arid and arid region vegetation (Carr, 1998).

The medicinal plants that are not commonly reported by other studies in Ethiopia are cited by the pastoralist people in semi-arid and arid regions of east Africa and Arabian Peninsula. *Solanum hastifolium* Hochst. ex Dunal is used as treatment for Anthrax and Black Leg, stomach bloating and eye lotion; *Grewia kakothamnus* K. Schum. for cough; *Uvaria leptocladon* Oliv. for epileptic fits, sun-stroke, tonsillitis; *Lycium shawii* Roem. & Schult. for toothache, bleeding nose, wolf bite, laxative, tonic and diuretic; *Maeura sessiliflora* Gilg for gastrointestinal illness, fever, headache and toothache (Bailey and Danin, 1981; Morgan, 1981; Bally, 1986; Abbas et al., 1992; Ole-Miaron, 2003; Hammiche and Maiza, 2006).

The category of disease: gastrointestinal illness and intestinal parasite, boils, abscess and swelling, and respiratory infection and tuberculosis were cited by large number of informants and medicinal plant species were used as remedies. This may be because they have limited access to modern health care facilities and health education (Teklehaymanot, 2009b).

The measurements of doses are not specific and sometimes depend on the availability of part of the plant since some of the medicinal plant parts such as the fruits of *Cordia sinensis* Lam., *Grewia bicolor* Juss., *Grewia kakothamnus* K. Schum. and *Salvadora persica* L. are used as food sources and leaves of *Cadaba farinosa*

Forssk., *Lycium shawii* Roem. & Schult., *Maerua oblongifolia* (Forssk.) A. Rich. and *Moringa stenopetala* (Bak. f.) Cuf. are used as vegetables to make soup or porridge and are taken in large amount.

The preparation of medicinal plants, hot decoction that is not common in many studies in Ethiopia is also in use in Samburu district, Kenya, where pastoralism is the major economic activity of the local people (Nanyingi et al., 2008). The medicinal plants that are boiled with goat meat or coffee seeds' husks are also used as food source: *Balanites rotundifolia* (van Tieghem) Blatter and *Uvaria leptocladon* Oliv. (Gemedo-Dalle et al., 2005).

The root was used more frequently than the other plant parts in the preparation of remedies in both localities and the most utilized growth forms were trees and shrubs compared to other studies. This may have a serious consequence from both ecological point of view and from the survival of the medicinal plant species since there are no home gardens that could play a role in easing harvest from the forest and conservation of medicinal plants (Tesfu et al., 1995; Birhanu, 2002).

The medicinal plants indicated by both Kara and Kwegu people have enabled them to survive for time immemorial without using modern pharmacopeia, despite that they use open waters source, Omo River, and poor hygienic condition; unless their periodic movement remove them from contaminated environment (Sheik-Mohamed and Velema, 1999; Teklehaymanot, 2009b). Nevertheless, phytochemical studies are required to verify the efficacy of these medicinal plants since the medicinal plants are not commonly cited in the studies conducted in different parts of the country. The information documented on the medicinal plants of these people may be used as baseline data for future studies on semi-arid and arid pharmacologically important medicinal plants and for phytochemical investigations.

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