

Traditional medicines sold by vendors in Merkato, Addis Ababa: Aspects of their utilization, trade, and changes between 1973 and 2014

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Abstract

Background: Many traditional medicines are sold by vendors in the large Merkato market area in Addis Ababa but little is known about their trade, use, safety and sustainability.

Objectives: This study aimed at obtaining information on traditional medicines sold by vendors and purchased by clients in Merkato, including their utilization, trade, and changes between 1973 and 2014.

Methods: Forty-four vendors and 47 of their customers were interviewed using two questionnaires and a direct observation guide. Data were analyzed qualitatively and quantitatively by applying a χ^2 test. Pharmacists in 2 pharmacies in Merkato were interviewed about the sale of taenicides.

Results: Forty-five plant species and 4 minerals were found to be sold by the vendors for the treatment and prevention of various infectious and non-infectious diseases and magico-religious illnesses. The most common plant products were from *Boswellia* spp., *Commiphora* spp. (*etan*), *Echinops kebericho* (*kabericho*), *Ruta chalepensis* (*tena adem*), *Rosmarinus abyssinicus* (*yesege metbesha*), *Ocimum lamifolium* (*damakase*), and *Taverniera abyssinica* (*dingetegna*). Comparison with the 1973 study revealed a decline in the number of vendors and mean number of medicines sold per vendor, particularly taenicides. The major general medicines continued to be widely used. The sale of 13 other medicines was reported only in 2014. The sanitation and handling of medicines observed engenders undesirable health effects for clients. The information obtained from vendors and clients on the medicines was similar, indicating persisting cultural practices and reliability of the questionnaires.

Conclusion and Recommendations: Further studies are needed in Merkato and other retail outlets to ensure the safety, efficacy and sustainability of traditional medicines and to inform health officials and policy makers of changing health needs and demands for indigenous medicines in the population. [*Ethiop. J. Health Dev.* 2014;28(2):136-152]

Introduction

The trade and use of traditional medicines are increasingly receiving attention from policy makers, health officials, social scientists, and environmentalists due to the medicines' role as supplementary and alternative medicines as well as social and economic support systems (1). Ethiopians were recently estimated to buy traditional medicine on average 6.1 times a year from market vendors, plant collectors, and shops (2).

Traditional medical practices in Ethiopia are deep-rooted and persist in both rural and urban populations due to their accessibility, affordability, and cultural acceptability (3). Plant-based medicines are commonly employed by traditional healers (4) and knowledgeable household members who obtain them from markets, shops, fields, forests, and their gardens (5-7). Thus traditional medicine plays an important role in primary health care in Ethiopia, where an estimated 80% of human illnesses and 90% of livestock diseases are being treated with plant materials, minerals, and animal products (8).

Rapid urbanization and socio-cultural demand for low-cost, easily accessible medicines have created an

environment in which traditional medicine persists in spite of expanding modern health services. Increasing incidence of chronic non-communicable diseases and persisting magico-religious illnesses, which are difficult to cure with allopathic medicine increased demand for these remedies in Ethiopia (3). Trade in traditional medicines constitutes an important segment of the informal sector of the economies of Ethiopia (2).

Few studies have been carried out on vendors selling indigenous medicines in markets in Ethiopia (7, 9-11) in spite of an intense trade in these commodities in this country (2). Kloos (7, 10) provided information on the distribution and use patterns of indigenous medicines in 19 urban and rural markets. Abebe (12) reported increased use of home-based remedies prepared from local plant products in towns. Teshome-Bahiru (3) observed an increase in commercial harvesters and urban herb traders and an increase in purchases of home-based therapies in shops and markets in Addis Ababa. Similarly, Desissa (13) noted an increase in the trade of medicinal plants in various Ethiopian towns. But increased use of these plant materials may lead to overharvesting and the extinction of plant species, a

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growing concern of biologists (3, 14). No study has been carried out on traditional medicines sold in Merkato, Ethiopia's largest open market, since the study by Kloos (7) in 1973. Merkato was selected for the study because there were more vendors and more medicines sold in 1973 than in the 14 other markets combined (7). The objectives of the present study were to provide an inventory of medicinal plants and minerals sold in Merkato in 2014 compared with that of 1973, and examine utilization patterns and aspects of their trade.

Methods

Study Site:

This study was conducted in June 2014 in Merkato, often described as the largest open air market in Africa, which is located in the western part of Addis Ababa. It comprised of more than 7,000 businesses that traditionally sell mostly agricultural products (15), but increasingly also manufactured goods.

Study Design:

A combination of survey including, direct observational, and repeated cross-sectional methods were used. Observational repeated cross-sectional research methods have been used primarily to validate research findings (17). Use of repeated cross-sectional method is suitable because during both the 1973 and 2014 surveys the researchers canvassed all traditional medicinal vendors in Merkato who were present during the surveys and used standardized collection, recording, and interpretation techniques. The inventory of medicinal materials and the number of vendors found in 2014 were compared to those recorded by Kloos (10) in 1973.

Sampling:

The study was based on information obtained from 44 vendors who were found to sell traditional medicines and medicine-related food plants in Merkato during the six days of the survey and from 47 of their clients. Preliminary visits were made to the market to identify all localities where traditional medicine vendors are located. Vendors were located by asking local vendors and shopkeepers about their location in specific areas (*seffer*) within Merkato. All vendors who were in their shops or stalls during the survey and their clients who agreed to be interviewed were included. Although a few itinerant vendors who periodically visited this market area were probably missed and several shop owners were absent at the time of the survey, we consider the coverage of vendors satisfactory and comparable to that of the 1973 survey. We included incense because of its traditional use in magico-religious rites in Ethiopia and recent recognition of their promising properties for aromatherapy and other medical applications world-wide (18, 19). Street vendors selling traditional tooth brushes (*mefakia*) and the many shops selling grains, pulses, and vegetables that might include a few foods/medicines were not included.

Data Collection:

Two questionnaires and a direct observation guide were pre-tested and used to collect information from vendors and customers. The vendor questionnaire contained 21 questions and the client questionnaire contained 12 questions, mostly of the closed type. In addition, 6 observational guide check list notes were employed.

Seven experienced staff members of the Directorate of Traditional and Modern Medicine Research of the Ethiopian Public Health Institute interviewed all traditional medicine vendors they could locate in Merkato in June 2014. The vendor questionnaire contained questions about vendors' backgrounds and motivation to work as vendors as well as questions pertaining to the use, preparation, cost, and origin of medicines. A medical anthropologist from the Department of Social Anthropology, College of Social Sciences, Addis Ababa University (TC) interviewed clients of the vendors about the traditional medicines they commonly purchase from vendors, specifically their uses, preparation, and effectiveness.

The interviewers observed and recorded type of vendor stall; category of goods sold by each vendor; client flow; and the display; storage, and handling of goods. Samples of plant materials and minerals which could not be readily identified or had not been studied earlier were collected during the interviews for laboratory analysis at the Directorate of Traditional and Modern Medicine Research. The scientific names of the plants were determined by inspecting their characteristics and taking into consideration their vernacular names as reported in the official reference books (20-22).

We visited 2 pharmacies in Merkato and interviewed the senior pharmacists about trends in the sale of taenicides during the last 3 to 4 decades after it became apparent during the 2014 survey that very few vendors sold plant medicines for *Taenia saginata* infections.

Data Analysis:

Data were edited and entered into SPSS and analysis was performed using STATA software. The statistical analysis included summarizing frequency distributions and applying a χ^2 test to some of the vendor and client data and the 1973 and 2014 survey results.

Ethical Clearance:

This study was approved by the Scientific and Ethical Office of the Ethiopian Public Health Institute. Study participants were informed about the objectives of the study and oral consent was obtained from both the vendors and their clients.

Results

Socio-demographic Characteristics of Vendors and Clients:

Forty-four traditional medicine vendors, 79% of them females and 21% males, with a mean age of 50 years agreed to participate in the study. Nearly half of the vendors sold their goods from covered or uncovered stalls (Fig. 1, Table 1) and the rest squatted on the ground. Twenty-nine (65.9%) of the vendors sold traditional medicines as their primary source of income and 31.0% considered this work as their second source of income. Most felt drawn to the trade because of their knowledge of indigenous remedies. Forty-seven clients, 85% of them females (mean age 41 years), who visited the vendors were also interviewed (Table 1). Thirty-eight percent of the clients were housewives, 21% employees of private firms, 17% traders, and 10% were government employees.

Inventory of Medicines and their Origin:

Forty-six of the 50 remedies sold by the vendors were plants or plant products belonging to 25 plant families. Four medicines were minerals (sulfur, aluminum sulfate, alum, and the unidentified mineral *sibber*). Thirty-seven of the 46 medicinal plants could be identified by their scientific names. Among the resins (*etan*), only those from *Boswellia papyrifera* (frankincense) and *Commiphora myrrha* (*myrrh*) could be identified (Table 2). The scientific names of 9 plants (*adal sheraro*, *kento*, *gerba or aruse kosso*, *dejmerech*, *kune*, *ajubame*,

hanamen, *tebale or herbale*, and *jima inchet*) and 1 mineral (*sibber*) sold by vendors could not be identified (Table 2). Samples of these plants were taken during the interviews for laboratory analysis at the Directorate of Traditional and Modern Medicine Research.

More than two-thirds of the vendors said they were being supplied by merchants from distant localities in various administrative regions and others by merchants and plant collectors from around Addis Ababa (Table 1). Most information on place locations was vague, however, indicating that vendors lacked detailed knowledge about the places of origin of plant materials and minerals, apparently because plant collectors and traders tried to keep places of collection secret to protect their sources of income. It became evident, however, that the plant products from the farthest places were the *etans* and *karbe* (from the southeastern and northern Ethiopian lowlands). *Taverniera abyssinica* reportedly originated mostly in the eastern and northern highlands and *adal cheraro* and *din* (sulphur) in the Awash Valley in northeastern Ethiopia. The observers noticed fewer collectors of plants from rural areas near Addis Ababa who supplied vendors than during the 1973 survey, except for itinerant vendors selling fresh garden-grown herbs. This decrease appears to be due to the decrease in vendors in Merkato and possibly also the decline of plant resources in nearby localities, further discussed below.



Figure 1: Medicine vendors in the Etan Terra area of the Merkato in June 2014. Incense, wogert, kabericho, gisawa and other medicines are displayed in sacks and bags in the foreground. Notice the more crowded conditions than in 1973, but the same low sanitary level (see Fig. 2) and the sale of pottery and handicrafts besides medicines.
Photo by H. Kloos

Table 1: Information on vendors of traditional remedies and their clients in Merkato, Addis Ababa, from interviews and direct observations, 2014

Variable	Responses	Frequency n (%)
I. Vendors (N=44)		
Age (years)	<30	4 (9.1)
	31-49	21 (47.7)
	59+	19 (43.2)
	Mean age	50.0
Sex	Males	9 (20.5)
	Females	35 (79.5)
Reason for selling traditional medicines	To earn a living	29 (65.9)
	Has knowledge of traditional medicine and to earn income	10 (22.7)
	Second source of income	5(11.4)
Types of goods sold by vendors	Traditional medicines, incense, spices, and foods	29 (65.9)
	Spices and incense	11 (25.0)
	No response	4 (9.1)
Place where vendors sold remedies	Platform or stall	28 (63.6)
	Squatting on the street	16 (36.4)
Source of medicines	From the region	30 (68.2)
	Around Addis Ababa	7 (15.9)
	home gardens or Merkato shops	3 (7.1)
	No response	2 (4.5)
Feedback from clients about treatment outcome	Cured	16 (36.4)
	Not cured	2 (4.5)
	No response	26 (59.1)
II. Clients (N=47)		
Age (years)	<30	11 (23.4)
	31-49	24 (51.1)
	59+	12 (25.5)
	Mean age	41
Sex	Males	7 (14.9)
	Females	40 (85.1)
Items commonly bought from vendors	Traditional medicines, incense, and/or spices	36 (76.6%)
	Only traditional medicine	5 (10.6%)
	Traditional Medicines and spices	5 (10.6%)
	Traditional medicines, incense, spices, and foods	1 (2.1%)
	Spices and incense	
Feed back to the vendor about the outcome of plant medicines	Yes	1 (2.1%)
	No	39 (83.0)
	No response	1 (2.1)
Outcome of using remedies purchased from vendors	Cured	32 (68.1)
	Not cured	3 (6.4)
	Improved but not cured	1 (2.1)
	No response	11 (23.4)

Retailing and Handling of Medicines:

The retailing and handling of indigenous medicines in Merkato followed practices prevailing in other Ethiopian urban markets. Clients walk through the narrow streets and foot paths to purchase goods from vendors and shops. The number of clients (between 1 and 9) (Table 1) visiting individual vendors during the survey varied during the day and was highest on Saturdays, the busiest market day of the week. Two-thirds (65.9%) of the vendors sold medicinal plants along with spices, incense, and food. Nearly 90% of the plant medicines were leaves, roots, and stems; a few were seeds, flowers, bark, and resins. Some of the vendors sold mostly incense and odoriferous plants such as *wogert* (*Silene macroselen*), *jima inchet*, *kabericho* (*Echinopus kebericho*), and *gisawa* (*Withania somnifera*) that were used predominantly as a protection from the evil eye and evil spirits (*jinn*, *likift*, and *aganent*) by inhaling the smoke (Table 1, Fig. 1). The pungency of the smoke was believed to dispel evil spirits. Most vendors obtained dried plant materials and a few dried fresh plants in the sun.

The medicinal plant products might have been stored in vendor stalls for long periods. All except 2.4% of all medicines were displayed for sale on plastic and newspaper or in open bags and wrapped in small pieces of paper or plastic upon sale (Table 1). The collection, drying methods, and handling and storage conditions of the plant materials could expose the products to dust, moisture, and pathogenic microorganisms, negatively affecting their efficacy, safety, potency, and quality (23).

Laboratory experiments are currently in progress on the samples to determine the microbial load and contaminant indicator microorganisms, the pharmacological efficacy for the claimed traditional use, as well as identification of the chemical constituents of the procured medicinal plants. About a dozen itinerant vendors sold freshly cut green plants, including *tena adam*, *koseret*, *yeseqa meth esha* and *damakase* (Table 2).

The traditional remedies were not weighed; they were measured by scooping with a cup or lid. Often the amounts were merely visually estimated. The doses of traditional remedies varied considerably from vendor to vendor, also noted earlier by Kloos (7). Some vendors told the interviewers that overdoses of some traditional medicines, such as the *taenicide kosso* (*Hagenia abyssinica*), may have major side effects, including diarrhea and vomiting.

Preparation and Utilization of Medicines:

Vendors recommended 23 of the 50 medicines (47.0%) for more than 1 illness, including various noninfectious and infectious diseases, stomach ache, and warding off malevolent spirits and the evil eye. We therefore, labeled them as general medicines for the purpose of this article. They were followed in frequency of sales by medicines

said to be useful exclusively for infectious diseases, mainly *Taenia saginata* infection and the common cold; remedies for noninfectious diseases; food medicines; and medico-magical medicines (Table 2). This categorization must be considered tentative in view of variations in the recommendations by vendors for the use of each medicine and the relatively small number of vendors.

Three-quarters (76.6%) of the clients said that they frequently visit vendors in Merkato to buy plant medicines, incense and spices. We observed a similar 71.4% of all the goods displayed by vendors to fall in these 3 categories. Both the ready availability of these and other goods from vendors and the low cost of medicines, nearly all below 10 Birr (Table 1), were reasons people mentioned to go shopping in Merkato. However, the vendors usually sold the plants and minerals without voluntarily giving information or advice or counseling their clients about their usage, preparation, and possible side effects. The limited communication between vendors and clients was reflected in the low (40.9%) feedback vendors said to have received from clients on the outcome of treatments, as well as by few clients (7, or 14.9%) who informed the vendors about treatment outcomes. This is in contrast to the relatively large proportion of clients (68.1%) who informed the interviewers that the medicines they purchased had been curative (Table 1). These differences in feedback rates between vendors and clients may be due to vendors' promotion of their products and clients' cautiousness in divulging personal health information to vendors. The vendors recommended that 32 of the 50 (64.0%) medicines they sold are using more than 1 method, mostly by soaking the plant parts in water and drinking the filtered infusion or inhaling the smoke. These 2 methods were commonly recommended for *wogert* and several other general medicines, but a number of disparate uses for the same plants were recorded. Vendors recommended a larger number of medicines to be prepared as teas, their steam inhaled, chewed, applied as poultices, or eaten as food for a wide range of illnesses and diseases. Only the 6 magico-medical medicines and the 5 taenicides were recommended to be used only by inhaling smoke or plant fragrance for the former and drinking of aqueous plant infusion for the latter (Table 2).

A comparison of the uses of 20 medicines vendors recommended and clients normally purchased showed similar uses for 13 medicines and identical uses and methods of preparation for 5 (*kool*, *weyeba*, *enselal*, *sensal* and *besobela*). Vendors named, on average, more than 3 and clients fewer than 2 ailments that could be treated by each of the 20 plants. Similarly, vendors identified, on average, more methods of preparation for those 20 plants (1.5 methods) than clients (1.2 methods). Vendors and clients considered 15 (30.6%) and 12 (24.5%) of the 49 medicines to be useful for warding off evil spirits and the evil eye, respectively (tables 2 and 3).

None of those differences were statistically significant in a χ^2 test.

There is some evidence that overharvesting and uncontrolled trade may endanger the survival of some plants. During the surveys, several interviewers observed the sale of large quantities of *Taverniera abyssinica* (*dingetegna*) by 3 vendors to long-distance traders for delivery to medicine shops in Sudan. *T. abyssinica* is endemic only in Ethiopia, where it occurs in a few areas, is harvested only for its roots, which impedes plant regeneration, and is difficult to cultivate and sustain, making it an endangered plant (14). Uncontrolled trade and overharvesting may also endanger the survival of 2 species of *Boswellia* (*B. papyrifera* and *B. pirottae*) (14, 24), although further studies are required to determine the extent of their decline nationwide.

Changes in the Distribution of Traditional Medicines and Vendors between 1973 and 2014:

Comparison of the results of this survey with those of our earlier research (7) showed that both the number of vendors selling indigenous medicines and the quantity and types of plant medicines sold in Merkato changed significantly between 1973 and 2014. In 1973, 196

vendors were interviewed, but only 44 vendors could be found in 2014 and the mean number of medicines sold per vendor declined from 6.6 to 4.6 between the 2 surveys. The decline in the number of vendors and medicines during these 4 decades does not necessarily indicate declining demand for traditional medicines in Addis Ababa's population, but rather a widening geographical distribution of the retail trade, which is diverting trade in these products away from Merkato.

The first author observed that some vendors of indigenous medicines or their children occupied the same stalls in 2014 as in 1973 or were squatting in the increasingly crowded streets and alleys of the market area. Largely because of this pressure on land, stalls were generally smaller in 2014 than in 1973 (figs. 1 and 2). A number of vendors were said to have left Merkato for other markets which can be reached more easily by clients in the rapidly expanding urban area of Addis Ababa. The sale of the leaves of *Moringa stenopetala* (locally known as *shiferaw*), a popular folk medicine, by only 1 vendor in Merkato (Table 2), but apparently by many shops elsewhere in Addis Ababa further indicates increasing commercialization of traditional medicines.



Figure 2: Medicine vendors in the Etan Terra area of the Merkato in 1973. Note the similarities in display and storage of medicines and in sanitation levels between 1973 and 2014 (see also Fig. 1).

Photo by H. Kloos

Table 2: Traditional medicines sold by 44 Merkato vendors by type of medicine, use, preparation, and number of vendors selling them, 2014

I. General medicines (N=25)

Species (family) or mineral	Vernacular name	Parts used	Uses	Preparation and mode of use	No. of vendors
<i>Boswellia</i> spp., <i>Commiphora</i> spp. (Burseraceae)	<i>Etan, nech etan</i>	Resin	Fragrance, chronic cough	Burn and Inhale the smoke	24
<i>Echinops kebericho</i> Mesfin (Asteraceae)	<i>Kabericho</i>	Root	Fever, typhoid, tonsillitis, tooth ache, typhus, common cold, cancer, insect repellent, hypertension, colic, cough, evil eye, evil spirits	Inhale the smoke	18
<i>Taverniera abyssinica</i> A. Rich (Fabaceae)	<i>Dingetegna</i>	Root, stem	Colic, sudden illness due to evil spirits (<i>megagna beshita</i>)	Chew and swallow the juice, drink aqueous infusion	11
<i>Silene macroselen</i> Stend. Ex Rich. (Caryophyllaceae)	<i>Wogert</i>	Root, stem	Hypertension, common cold, measles, abdominal pain, chancroid, evil spirits,	Drink aqueous infusion, inhale smoke	9
<i>Cucumis prophetarum</i> L. (Cucurbitaceae)	<i>Yemedder embway</i>	Seeds	Hemorrhoids, wounds, rheumatoid arthritis, skin disease (chirt, <i>Tinea</i> sp.)	Topical application	8
<i>Withania somnifera</i> L. (Solanaceae)	<i>Gisawa</i>	Stem, root, seeds	Common cold, colic, fever, typhoid, evil eye	Tea or inhale the smoke	7
<i>Rumex abyssinicus</i> Jacq. (Polygonaceae)	<i>Mekmeko</i>	Root, stem	Diabetes, hypertension, wounds, cancer	Drink as tea, poultice, eat with food	7
<i>Crinum abyssinicum</i> Hochst. ex A. Rich (Amaryllidaceae)	<i>Yegebe_shinkurt</i>	Bulb	Rheumatoid arthritis, evil spirits	Inhale smoke	7
<i>Kleinia squarrosa</i> Cufod. (Compositae)	<i>Be_erere</i>	Stem, root	Evil eye, evil spirits, fragrance, uterus disease (<i>lemehasten</i>)	Fumigate and inhale the smoke	6
<i>Securidaca longepedunculata</i> Fresen (Polygaleae)	<i>Tsemenay</i>	Root, stem, seeds	Diabetes, cancer, evil spirits, evil eye	Inhale smoke	5
<i>Lepidium sativum</i> L. (Brassicaceae)	<i>Feto</i>	Seeds	Gastritis, abdominal pain, fever, swelling	Drink aqueous infusion	4
<i>Senna italica</i> Mill. (Fabaceae)	<i>Senemeke</i>	Leaves	Helminthiasis, amoebiasis, gastritis	Drink aqueous infusion	4
Unidentified mineral	<i>Sibber</i>	Mineral	Hypertension, diabetes, abdominal pain, light brownish discoloration of the face (<i>madiat</i>)	Drink aqueous infusion, drink with coffee or tea, topical application	4
Unidentified plant	<i>Adal cheraro</i>	Stem	Typhoid, evil spirits, evil eye	Drink aqueous infusion, inhale smoke	4
<i>Myrtus communis</i> L. (Myrtaceae)	<i>Ades,</i>	Leaves	Dysentery, sedative, fumigation, evil spirits	Tea, inhale smoke	3

Table 2 Continued
I. General medicines (N = 25)

Species (family) or mineral	Vernacular name	Parts used	Uses	Preparation	No. vendors selling the remedy
<i>Ajuga remota</i> Benth. (Labiatae)/ <i>Ajuga intigofera</i> (Lamiaceae)	<i>Armagus or akorarache</i>	Leaves	Common cold, pneumonia, bronchitis, abdominal pain, colic, hypertension, diabetes	Chew or swallow the juice or drink aqueous infusion	3
<i>Commiphora abyssinica</i> Engl. (Burseraceae)	<i>Karbe</i>	Resin	Wound, hemorrhoids, infections	Topical application	2
<i>Rubia discolor</i> Turcz (Rubiaceae)	<i>Encheber</i>	Root	Hypertension, colic, common cold	Chew and swallow juice, drink aqueous infusion	2
<i>Olea europea</i> (Oleaceae)	<i>Weyera</i>	Stem, stem bark, leaves	Typhoid, evil spirits	Drink aqueous infusion, inhale smoke	2
<i>Nicotiana tabacum</i> (Solanaceae) L.	<i>Temebaho</i>	Leaves	Tooth ache	Chew leaves	1
<i>Zingiber officinale</i> Roscoe (Zingiberaceae)	<i>Zingebel</i>	Root	Colic, common cold	Tea, drink aqueous infusion	1
Unidentified plant	<i>Kento</i>	Root, stem	Fumigation, cosmetic	Inhale smoke	2
Antimony	<i>Yedingay kool or kool</i>	Mineral	Eye disease , cosmetic	Topical	1
Aluminium sulfate	<i>Sheb</i>	Mineral	Tonsillitis, tooth ache, fumigation evil eye	Mix in water and drink, inhale smoke	1

Table 2 Continued

II. Taenicides and other medicines used for infectious diseases (n = 9)

Species (family) or mineral	Vernacular name	Parts used	Uses	Preparation	No. vendors selling the remedy
<i>Ocimum lamifolium</i> Hochst. ex Benth. (Lamiaceae)	Damakase	Leaf	Common cold, fever	Drink aqueous infusion	6
<i>Glinus lotoides</i> Loefl. (Molluginaceae)	Metere	Seeds	<i>Taenia saginata</i> (kosso)	Drink aqueous infusion	3
<i>Eucalyptus globulus</i> Labill (Myrtaceae)	Nech barzaf	Leaves	Common cold	Boil in water and Inhale the steam	3
<i>Hagenia abyssinica</i> (Brace) J.F.Gme (Rosaceae)	Kosso	Flower, leaves	<i>Taenia saginata</i> (kosso)	Drink aqueous infusion	3
<i>Myrsine Africana</i> L. (Myrsinaceae)	Kechemo	Seeds	<i>Taenia saginata</i> (kosso)	Drink aqueous infusion	2
Unidentified plant	Gerba or aruse kosso	Leaves, stem and seeds	<i>Taenia saginata</i> (kosso)	Drink aqueous infusion	1
<i>Embelia schimperi</i> Vatke (Myrsinaceae)	Enkoko	Seed	<i>Taenia saginata</i> (kosso)	Drink aqueous infusion	1
<i>Plumbago zeylanica</i> L. (Plumbaginaceae)	Amera	Roots	Skin infection (<i>chirt</i> , <i>Tinea</i> sp.)	Topical infection	1
Sulfur	Din	Mineral	Skin infection (<i>chirt</i> , <i>Tinea</i> sp.)	Topical infection	1
III. Medicines used exclusively for non-infectious diseases (n = 5)					
<i>Combretum adenogonium</i> Steud. ex A. Rich. / <i>C. fragrans</i> F. Hoffm/ <i>C. ghasalense</i> Engl. & Diels (Combretaceae)	Weyeba	Root stem or stem bark	Disease of the uterus (<i>lemehasten</i>)	Inhale the smoke	6
<i>Foeniculum vulgare</i> Mill. (Apiaceae)	Enselal	Seeds, leaves	Diuretic for <i>kulalit</i> (urine retention due to kidney disease)	Drink aqueous infusion	3
<i>Justicia schimperiana</i> (Hochst. ex Nees) T. Anders./ <i>Adhatoda schimperiana</i> (Acanthaceae)	Sensal	Leaves	Gout, asthma	Drink tea or aqueous infusion	1
<i>Moringa stenopetala</i> (Bak.) Cuf.) (Moringaceae)	Shiferaw, haleko	Leaf	Diabetes, hypertension	Drink aqueous infusion	1
Unidentified plant	Dejmerech	Leaves	Cancer, hemorrhage	Drink aqueous infusion	2

Table 2 Continued

Species (family) or mineral	Vernacular name	Parts used	Uses	Preparation	No. vendors selling the remedy
IV. Food medicines (n = 5)					
<i>Ruta chalepensis</i> L. (Rutaceae)	<i>Tena_adam</i>	Leaves and seeds	Condiment, colic, abdominal pain, common cold	Drink in water, chew and swallow the juice	15
<i>Rosmarinus officinales</i> L. (Lamiaceae)	<i>Yesega metbesha</i>	Leaves	Condiment, hypertension, tooth ache	Chew leaves, drink aqueous infusion, eat with food	13
<i>Ocimum americanum</i> L. (Lamiaceae)	<i>Besobela</i>	Leaves	Condiment, colic	Eat in food and drink aqueous infusion	11
<i>Guizotia abyssinica</i> L.f. Cass. (Compositae)	<i>Nug</i>	Seeds	Cooking oil, gastritis	Eat with food, drink aqueous infusion	1
<i>Syzygium aromaticum</i> (L.) Merr. et Perry (Myrtaceae)	<i>Nech kerenfud or kerenfud</i>	Flower buds	Condiment, fumigation	Eat in food, topical application	1
V. Medicines used exclusively for magico-religious purposes (n = 6)					
Unidentified plant	<i>Jima_inchet</i>	stem, roots	Evil spirits	Inhale smoke	4
<i>Artemisia afra</i> Jacq. (Asteraceae)	<i>Chuqun</i>	Leaves	Evil eye	Inhale plant odor, drink aqueous infusion	3
Unidentified plant	<i>Kune</i>	Seeds, roots	Evil spirits	Inhale smoke	2
Unidentified plant	<i>Ajubane</i>	Leaves and seeds	Evil spirits	Inhale smoke	1
Unidentified plant	<i>Hanamen</i>	Stem	Evil eye	Inhale smoke	1
Unidentified plant	<i>Tebale/harbela</i>	Root	Evil eye	Inhale smoke	1

Table 3: **Traditional medicines commonly purchased from medicinal plant vendors in Merkato, uses, and preparation, 2014**

Species (family) or mineral	Vernacular name	Uses	Preparation	No. of clients (N = 47)
<i>Boswellia</i> spp., Commiphora spp.	<i>Etan, nech etan</i>	Eye disease, incense	Topical application, inhale the smoke	24
<i>Echinops kebericho</i> Mesfin (Asteraceae)	<i>Kabericho</i>	Tonsillitis, cancer, typhoid, common cold, evil spirits, stomach ache	Drink after mixing with water, chew, inhale the smoke	14
<i>Taverniera abyssinica</i> A. Rich (Rubiaceae)	<i>Dingetegna</i>	Fever, stomach ache, sudden disease (<i>megagna beshita</i>)	Inhale the smoke, chew and swallow the juice	12
<i>Commiphora abyssinica</i> Engl. (Burseraceae)	<i>Karbe</i>	Incense, infection, eye diseases, cancer, evil eye	Inhale the smoke	9
Antimony	<i>Kool, ser_kool</i>	Eye diseases, cosmetic	Topical application	8
<i>Ruta chalepensis</i> L. (Rutaceae)	<i>Tena_adam</i>	Hypertension, evil spirits, spice	Drink after mixing with water, inhale the smoke	6
<i>Ocimum lamifolium</i> Hochst. ex Benth. (Lamiaceae)	<i>Damakase</i>	Acute febrile illness	Inhale the smoke	4
Unidentified plant	<i>Bukbuka</i>	Insect repellent, evil spirits, fragrance	Fumigation	4
Unidentified plant	<i>Aletate</i>	Headache, evil spirits	Inhale the smoke	3
<i>Justicia schimperiana</i> (Hochst. ex Nees) T. Anders. (Acanthaceae)	<i>Sensal</i>	Gout, asthma	Drink aqueous infusion	2
(Acanthaceae)				
<i>Artemisia rehan</i> Jacq. (Asteraceae)	<i>Ariti</i>	Hypertension	Drink aqueous infusion	2
<i>Combretum adenogonium</i> (Combretaceae)	<i>Weyeba</i>	Insect repellent, uterus disease (<i>mahtsen</i>)	Fumigate and inhale the smoke	2
<i>Cucumis prophetarum</i> L. (Cucurbitaceae)	<i>Yemedder_embway</i>	Hemorrhage, evil spirits	Fumigate and inhale the smoke	2

Table 3 Continued

Species (family) or mineral	Vernacular name	Traditional use or indications	Preparation and use	No. vendors selling the remedy
<i>Cymbopogon citratus</i> (DC.) Stapf (Poaceae)	<i>Tej sar</i>	Abdominal pain, evil spirits	Drink after mixing with water , inhale the plant's fragrance	2
<i>Securidaca longepedunculata</i> Fresen (Polygaleae)	<i>Temenay</i>	Evil sprits	Inhale the smoke	2
<i>Silene macroselen</i> Stend. Ex Rich. (Caryophyllaceae)	<i>Wogert</i>	Abdominal pain	Drink after mixing with water	2
<i>Rumex abyssinicus</i> Jacq. (Polygonaceae)	<i>Mekmeko</i>	Abdominal pain, cancer	Drink after mixing with water	2
Unidentified plant	<i>Mesekelember</i>	Fragrance	Inhale the smoke	2
Sulfur	<i>Din</i>	Evil eye, typhoid, leg diseases, acute febrile diseases	Topical application	2
<i>Withania somnifera</i> L. (Solanaceae)	<i>Gisawa</i>	Evil sprits	Chew and swallow the juice	1
<i>Zingiber officinale</i> Roscoe (Zingiberaceae)	<i>Zingebel</i>	Leg diseases	Drink after mixing with water or other liquids	1
<i>Artemisia afra</i> Jacq. (Asteraceae)	<i>Chuqun</i>	Evil eye	Inhale the plant's fragrance	1
<i>Crinum abyssinicum</i> Hochst. ex A. Rich (Amaryllidaceae)	<i>Yegibe shinkurt</i>	Rheumatoid arthritis	Inhale the smoke	1
<i>Foeniculum vulgare</i> Mill. (Apiaceae)	<i>Enselal</i>	Urinary retention	Drink aqueous infusion	1
<i>Lepidium sativum</i> L. (Brassicaceae)	<i>Feto</i>	Acute febrile illness	Drink after mixing with water	1
<i>Myrtus comminus</i> L. (Myrtaceae)	<i>Addes</i>	Dysentery, headache, chest pain, fragrance	Drink as tea, inhale the smoke	1
<i>Ocimum americanum</i> L. (Lamiaceae)	<i>Besobela</i>	Spice, sudden illness (<i>mitch</i> , <i>megagna beshita</i>)	Drink aqueous infusion	1
Aluminum sulfate	<i>Shebe</i>	Tooth ache, evil eye	Drink after mixing with water	1

Table 4: The medicinal plants sold by most Merkato vendors in 1973 and 2014

1973 (196 vendors)			2014 (44 vendors)		
Scientific name	Vernacular name	No. (%) of vendors selling this plant	Scientific name	Vernacular name	No. (%) of vendors selling this plant
<i>Hagenia abyssinica</i> (Brace) <i>J.F.Gme</i> (Rosaceae)*	Kosso	115 (58.7)	<i>Echinops kebericho</i> Mesfin (Asteraceae)***	Kabericho	18 (40.9)
<i>Silene macroselen</i> Stend. Ex Rich. (Caryophyllaceae)***	Wogert	115 (58.7)	<i>Ruta chalepensis</i> L. (Rutaceae)***	Tena adem	15 (34.1)
<i>Glinus lotoides</i> Loefl. (Molluginaceae)*	Metere	113 (57.7)	<i>Rosmarinus officinales</i> L. (Lamiaceae)	Yesega metbesha	13 (29.5)
<i>Echinops kebericho</i> Mesfin (Asteraceae)***	Kebaricho	112 (57.1)	<i>Ocimum lamifolium</i> Hochst. ex Benth. (Lamiaceae)***	Damakase	11 (25.0)
<i>Withania somnifera</i> L. (Solanaceae)***	Gizawa	109 (55.6)	<i>Taverniera abyssinica</i> A. Rich (Fabaceae)***	Dingetegna	11 (25.0)
<i>Lepidium sativum</i> L. (Brassicaceae)	Feto	105 (53.6)	<i>Silene macroselen</i> Stend. Ex Rich. (Caryophyllaceae)***	Wogert	9 (20.5)
<i>Taverniera abyssinica</i> A. Rich (Fabaceae)***	Dingetegna	104 (53.1)	<i>Cucumis prophetarum</i> L. (Cucurbitaceae)	Yemedder embway	8 (18.2)
<i>Embelia schimperi</i> Vatke (Myrsinaceae)*	Enkoko	101 (51.5)	<i>Crinum abyssinicum</i> Hochst. ex A. Rich (Amaryllidaceae)	Yegibe shinkurt	8 (18.2)
<i>Thymus serrulatus</i> Hochst. Ex Benth. (Lamiaceae)	Tossign	95 (48.5)	<i>Rumex abyssinicus</i> Jacq. (Polygonaceae)	Mekmeko	7 (15.9)
<i>Myrsine africana</i> L. (Myrsinaceae)*	Kecho	87 (44.4)	<i>Withania somnifera</i> L. (Solanaceae)***	Gisawa	7 (15.9)
<i>Croton macrostachys</i> Hochst. Ex A. Rich (Euphorbiaceae)*	Bisanna	45 (23.0)	<i>Combretum adenogonium</i> (Combretaceae)**	Weyeba	6 (13.6)
<i>Commiphora africana</i> A. Rich (Burseraceae)	Karbe	36 (18.4)	<i>Ocimum americanum</i> L. (Lamiaceae)	Besobela	6 (13.6)
<i>Ruta chalepensis</i> L. (Rutaceae) ***	Tena adam	23 (11.7)	<i>Kleinia squarrosa</i> Cufod. (Compositae)**	Be erere	6 (13.6)
<i>Ocimum lamifolium</i> Hochst. ex Benth. (Lamiaceae) ***	Damakase	17 (8.7)	<i>Securidaca longepedunculata</i> Fresen (Polygaleae)	Tsemenay	5 (11.4)

*Taenicide, ** plant species not sold by vendors in 1973, ***plant sold in both 1973 and 2014 +Based on Kloos (10).

Few comparisons can be made about the ethnic and socioeconomic status of vendors between 1973 and 2014 due to lack of quantifiable data for 1973. Gurage women represented more than two-thirds of all vendors during both surveys, not only in Merkato, but also in the other markets earlier studied in Addis Ababa and in central and southern Ethiopia (7). In addition, few vendors said to be professional healers and had limited medical experience, notwithstanding their alleged knowledge of traditional healing (10, see also Table 1).

The number and mix of plant species sold changed considerably between 1973 and 2014. Whereas each vendor sold, on average, 2.9 taenicides in 1973, that number had decreased to 0.2 in 2014. In 1973, 5 of the 14 most commonly sold plant species were taenicides (*Hagenia abyssinica*, *Glinus lotoides*, *Embelia schimperi*, *Myrsine africana*, and *Croton macrostachys*), but none of those were widely sold in 2014 (Table 4). According to the pharmacists in 2 pharmacies in Merkato, manufactured taenicides have become increasingly popular in recent decades as people have come to consider them to be safer than the traditional taenicides because of standardization of dosage and thus lower incidence of side effects from overdosage. On the other hand, the 6 widely used general medicines *kabericho*, *wogert*, *damakase*, *dingetegna*, *gisawa* and *tena adam* were sold in both 1973 and 2014, although a significantly fewer vendors sold them in 2014 ($\chi^2=50.901$, $P<0.05$) (Table 4). Moreover, 13 plant species and 1 mineral sold by vendors in 2014 had not been recorded in 1973. They were being sold mainly as fumigants to ward off evil spirits (*Kleinia squarrosa*, *Combretum adenogonium*, *kune*, *ajubame*, *hanamen*, *kento* and *tebale hebela*) and to treat intestinal parasites (*Senna italica*); skin infections (*Plumbago zeylanica*); or rheumatoid arthritis, cardiovascular diseases, diabetes, gout, and asthma (*Crinum abyssinicum*, *dejmarej* leaves, *Moringa stenopetala*, and the mineral *sibber*) (Table 2). Only 1 vendor sold crushed *Moringa stenopetala* leaves in 2014, although they are currently among the most popular remedies for the treatment of hypertension and diabetes and used as a tonic in shops and even supermarkets in Addis Ababa.

Discussion

This study provides current and longitudinal information on the supply, demand, and utilization of a wide range of traditional remedies and the characteristics of vendors in Merkato.

The survey undertaken among both vendors and customers reveals common knowledge and features pertaining to the importance of traditional remedies in alleviating health problems in spite of the presence of many geographically accessible modern health care facilities and drug retailers in Addis Ababa (25, 26).

The changes in the number of vendors and medicines between 1973 and 2014 appear to be due to a combination of the commercialization of medicinal plants, the widespread occurrence of difficult-to-treat chronic and magico-religious diseases, increasing utilization of the municipal health services, and changes in socioeconomic level, especially education. The sale of 13 plant species in 2014 which were absent during the 1973 survey also points to the application of indigenous healing knowledge to changing health needs in the population.

The decrease in taenicides in Merkato between 1973 and 2014 appears to be due mainly to their replacement by safer pharmaceutical drugs. Our interviews with the senior pharmacists of 2 pharmacies in Merkato revealed that sales of manufactured taenicides have sharply increased since the 1980s. Similarly, the trend of increasing health services utilization appears to have continued in recent years. Whereas 49.6% of the Ethiopian population used the official health services in 1982/83, this rate increased to 77.3% in 1998, the proportion of using traditional, including healer, lay and self-treatments, declined from 45.3% to 17.1% during that period (27, 8).

These data do not, however, invalidate the assertion that about 80% of the Ethiopian populations use **traditional** medicine (9) because the country's plural medical system is characterized by the widespread use of both the traditional and modern systems (6). While the use of traditional medicines was inversely related to socioeconomic status in both surveys and in a randomized household survey in Addis Ababa (30), the 2014 survey found more clients formally employed outside the household than housewives (Table 1). Although this suggests that indigenous remedies are being used by the increasingly educated urban clientele, large-sample studies are required to examine this relationship.

The only moderately strong association between the information on plant utilization provided by vendors and their clients indicates that client knowledge is based mostly on a combination of treatment outcomes and unreliable information obtained from hearsay in an environment of unregulated, non-standardized medicines. One example of unlikely use/preparation association is the recommended use of *Moringa* as a remedy exclusively for noninfectious diseases (Table 2) even though it is a major food crop of the Konso and is increasingly being used as a popular tonic and general medicine by the wider Ethiopian population (30). Similarly, our finding that a considerable number of food plants are used for medicinal purposes indicates the need for studies of their dietary and pharmaceutical properties,

an area of research that has been neglected in Ethiopia (31).

The current study and those by Kloos (10) in 1973 and by Rovesti (11) in 1932 indicate the persistent predominance of women in the traditional medicine retail trade. Females, particularly mothers, who constituted the great majority of both vendors and customers (Table 1), are knowledgeable about plant-based remedies and usually attend to the health needs of their children and older family members using various indigenous remedies (6).

The prevailing sales practices and utilization patterns described by vendors and clients point to the need to strengthen efforts to develop traditionally employed medicinal plants through scientific validation of their efficacy, safety, and quality, a need that has been expressed in many sub-Saharan and other developing and industrialized countries (2, 32). Unregulated marketing of traditional medicines entails potential health risks for consumers in the absence of standards and regulations ensuring their safety and efficacy (32, 33). For instance, blindness, changes in the cardiovascular and central nervous system, abortions and occasional deaths have been associated with overdoses of *kosso* (34-36). Thus, the unregulated marketing and sale of medicinal plants without ensuring their efficacy, safety, and quality may carry health risks for patients. Scientific validation of traditionally used herbal remedies may facilitate the local manufacture of pharmaceutical drugs from promising medicinal plants. Regulation of the marketing and distribution of traditional remedies can reduce health risks, as indicated by achievements made in several African countries (37). It may be necessary to implement monitoring mechanisms alongside the scientific validation efforts, as well as health education and mass campaigns. Such programs could raise awareness of the proper handling and storage of medicines by vendors and the safe use, benefits, and potential dangers of traditional medicines in the population. Proper marketing and utilization practices will be necessary to safeguard public health, to promote consumer trust in traditional medicines and to maximize their potential health and economic benefits.

Increasing numbers of studies of Ethiopian medicinal plants are highlighting several threats to genetic plant resources that may result in the deterioration and loss of widely used species. A combination of overharvesting and heavy domestic and international trade in incense, intensive land use in production areas, and severe droughts are endangering the survival of several species of *Boswellia* and *Commiphora* trees, *Taverniera abyssinica* and *Echinops kebericho* (14, 24, 31, 38).

Conclusion:

The current study revealed declining sales of traditional medicines by vendors in the Merkato, as indicated by

decreases in the number of medicine vendors and the average number of medicines each vendor sells. Although the sale of medicinal plants, incense, and minerals by vendors continues as an element of Ethiopia's traditional health culture; the mix of products has changed and the relative importance of Merkato as a major source of traditional medicines in Addis Ababa has been reduced due to increasing numbers of outlets for indigenous remedies in this city. Nevertheless, although sales of most medicines for infectious and noninfectious diseases decreased between 1973 and 2014, the sale of incense remained high and several plant and resin-based remedies have made their way into the market in recent years. Further studies of additional markets and shops in Addis Ababa and other towns may identify factors in the dynamics of the trade and use of traditional medicines and provide additional information on the prospects of their sustainability. They may also predict changing health needs and demands for indigenous remedies in the population that can inform local health officials and policy makers. This study also indicates the need for guidelines and scientific studies of medicinal plants and prevailing trading and retailing practices because the storage, handling and dosage of the medicines recommended by the vendors in Merkato may carry health risks for consumers of these medicines.

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