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Utilization And Conservation Of Medicinal Plants For Infant Health In Kitutu Central Ward, Kisii County, Kenya

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ABSTRACT

Traditional medical practice is still an important part of healthcare across various age groups in Kenya. Many studies have majorly looked at medicinal plant products for adult-related ailments such as HIV/AIDS, cancer, and infertility; and only a handful of studies exist on the diverse medicinal plants used to treat common infant ailments. This study sought to determine the utilization, distribution, and conservation of medicinal plants for optimum infant health in Kitutu Central Ward in Kisii County. Data was collected by administering questionnaires to 100 parents/guardians and five local herbalists. Thereafter, plant distribution data was obtained from forty quadrats randomly placed across roadsides, farmlands, riparian land, and forest habitats. Data was analysed using Shannon's Diversity Index and One-Way ANOVA. Results indicate that 18 plant species with a Shannon's Diversity index of 2.35 are used to manage infant ailments ranging from skin issues, respiratory and stomach ailments by the community. Fifteen plants are used to manage several infant diseases while only three plants were used for specific ailments. Farmland had the highest medicinal plant species diversity while riparian habitat had the lowest. Main conservation strategy was to cultivate and allow the medicinal plants to freely grow within the homestead. Study concludes that medicinal plants form an integral part of infant treatment regimen in Kitutu Central Ward. It is recommended that efficacy of the identified medicinal plants and value addition of the herbal products be done for enhanced affordable medical care. Additional research to document specific medicinal

plant species for other age groups like the aged persons also needs to be conducted in the wider Kisii region.

Keywords: Infant, Oral thrush, Medicinal plants, Healthcare, Kisii, Kenya.

INTRODUCTION

Ethnopharmacology defines “medicinal plants” as those plant species used in traditional medicine with beneficial elements that produce a definite physiological action towards healing diseases in humans and/or animals (Anand, *et al.*, 2019). Indigenous communities use diverse herbs in their healing rituals even in highly industrialized setups because they are important pillars of culture and human socialization (Owuor *et al.*, 2005). Hence, resulting in an estimated 80% prevalence of herbal medicine in Africa (Shewamene *et al.*, 2017). Unfortunately, widespread land degradation threatens plant resources necessitating urgent incorporation of culturally important plant species into conservation strategies for a win-win status for human health, livelihoods, and biodiversity.

In rural Sub-Sahara, access to conventional healthcare is limited because such equipment-based healthcare is either concentrated in big urban towns, available facilities are too expensive or too few facilities are available (Ahmed *et al.*, 2018; Maroyi and Cheikhoussef, 2017). In addition, many people in rural areas prefer traditional medicines because of their proximity to local herbalists who espouse their culture, health issues and environment (Mbuni *et al.*, 2020). Kipkore *et al.*, (2014) documented

that more than 70% of people use local home-made remedies as their first source of medicine while more than 90% use plant-related remedies at one time or another in Kenya. Likewise, Mothupi (2014) and Ahmed *et al.*, (2018) revealed that about 20% and 56% respectively of surveyed pregnant women used herbal medicine alongside western medicine for relief of nausea and vomiting during pregnancy, indigestion, respiratory tract infections, for boosting immunity stimulation of labour, and facilitation of childbirth. Such studies confirm the exceptional nature of traditional herbal medicine for use by a specific category of persons.

An infant is described as a child of between zero to one year of age who requires adequate nutrition and good health for lifelong health, learning, and well-being (Joubert and Reid, 2023). Common childhood infections like respiratory infections, diarrhoea, and malnutrition-related diseases contribute to high infant mortality (Githinji and Ngala, 2023). Interestingly, infant herbal medicine exists like Ramulondi *et al.*, (2022) documents a herbal mixture called *imbiza* which is used to drain all dirt from the baby's stomach, helps with healing baby's belly button, hardening the baby's skull and getting rid of the red spot on the baby's head. However, literature on the diversity of medicinal plants used to care for infants is still generally scarce.

Ethno-medicine among the Kisii community has been an integral component of their culture from time immemorial (Nyamoita *et al.*, 2020). As such, medicinal herbs constitute effective sources of natural products which are consumed as phytomedicines. For example, leaf decoctions of plants such as *Carissa spinarum*, *Urtica dioica*, *Warburgia ugandensis*, *Senna didymobotrya*, *Physalis peruviana*, *Bidens pilosa*, *Leonotis nepetifolia* and *Toddalia asiatica*, are used for the treatment of diabetes, malaria, and pneumonia among other diseases in Kisii region (Mosihuzzanman and Chowder, 2008). Moreover, according to Nyamoita *et al.*, (2020) medicinal plants such as *Opuntia ficus-indica*, *Aloe vera*, *Carrisa edulis*, and *Prunus africana* in liquid and powder forms have been used to manage HIV/AIDS-related ailments. Unfortunately, urbanisation, negative cultural attitude, and loss of traditional ecological knowledge (TEK) has led to declined interest in medicinal plant products especially for persons perceived as delicate as infants in the African family.

Consequently, this study aimed to identify the medicinal plants used for infant ailments, establish their distribution, and document the plant conservation practices by the Nyankongo community.

METHODOLOGY

Study area

Kisii County lies between latitude 0° 40' 38.4" South, and longitude 34° 34' 46° 61" East and covers an area of 1,323 km² with an estimated population of 1,370,371 in 2025. The County receives a high annual rainfall of between 1600-1900mm (CGK, 2023). The maximum temperatures in Kisii County range between 21°C and 30°C while the minimum temperatures range between 15°C and 20°C. The study was conducted in Kitutu Central Ward in Kitutu Chache South Sub-county of Kisii County located in the southwestern region of Kenya (Figure 1).

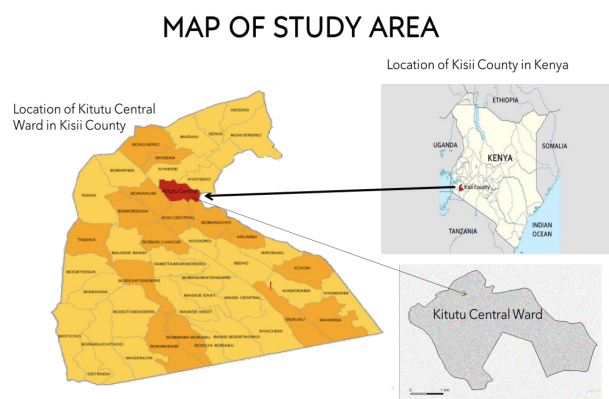


Figure 1: Map of Kitutu Central Ward in Kisii County, Kenya.

The ward covers an area of approximately 15.50 Km² hosting a population of approximately 58,556 people as per the 2019 census (KNBS, 2019). The major economic activity practised is farming due to the presence of rich volcanic soils, moderate temperatures, high and relatively reliable rainfall patterns. The cash crops grown include tea, coffee, pyrethrum, while subsistence crops include; maize, beans, potatoes, and bananas. The ward also has a vibrant dairy farming sector (CGK, 2023) as well. The area has a few scattered natural forests that are restricted to riparian areas.

Study Design

Data collection

Sample size determination

The study calculated the acceptable number of respondents using Yamane's Formula (below)

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n represents the number of people to be interviewed

N = number of households

e is the precision level (0.1)

Selection of participants

First, simple snowball sampling was used to randomly select 100 residents to respond to the general questionnaire on medicinal plants use. Where the researcher started with a small number of initial contacts (seeds) who fit the research criteria and are then asked to recommend other contacts who fit the criteria. Of those who agree, those participants then in turn recommend other potential participants, and so on (Gierczyk, et. al, 2023). The key criteria was for persons who actively took care of infants namely parents, guardians or caregivers and were possibly using traditional herbal medicine to treat their infants. Secondly, the study also targeted local herbalists who were involved in the sale and/or active conservation of some of the medicinal plant species used to treat infants. These five herbalists were selected through purposive sampling to provide additional medicinal plant preparation and decoction information.

Medicinal plants for infant ailments

A semi structured questionnaire and interview tool were designed (Appendices 1 and 2) and administered to the 105 respondents mainly in *Ekegusii* language and in Kiswahili for easy understanding. The key data requested was local plant names, diverse uses, key threats, and any conservation efforts. Herbalists were requested to also provide the plants for infant-herbal medicine. Plant identification was first done visually by the respondents, then confirmed by the herbalists and finally verified using online plant databases (<https://cropnuts.com/wp-content/uploads/2020/08/Arable-Weeds-Guide.pdf>) and (<https://identify.plantnet.org/>).

Distribution of medicinal plants across Kitutu Central Ward

A total of 40 (5m by 5m) quadrats were randomly placed across the murram roadsides in Jogoo town, farmlands in Nyakongo village, Maili Mbili area, Riparian ecosystems of Kiomakondo, Stage Miwa and Nyakongo, and forest habitats of Kiomakondo and Nyakongo. From each quadrat, all species of medicinal plants used to treat infants were recorded alongside the number of individuals of each species and the type of habitat. The data obtained from the quadrats was used to establish the diversity and distribution of the medicinal plants across the 4 main habitats.

Conservation of medicinal plants

Each respondent was asked about availability of infant medicinal plants, conservation and some of the practices they performed to ensure medicinal plants conservation.

Data Analysis

Diversity of medicinal plants

After tabulation, diversity of the medicinal plants used to treat infants was calculated using Shannon's Diversity

index.

$$H' = - \sum_{i=1}^s P_i \ln(P_i)$$

Where:

H' = the species diversity index,

P_i = the proportional abundance of the i th species

$\ln$ = the natural logarithm

s = the number of species in the community

Where $H' < 1$ diversity is relatively low, $H' < 1-3$ is medium and high when $H' > 3$ (Rhamawaty *et al.*, 2019). In addition, photos of the observed medicinal plants and online plant databases were used to accurately identify the scientific names of the plants.

Distribution of medicinal plants across the habitats.

Distribution of medicinal plants across the different habitats was determined by expressing Relative frequency (RF) of each species in percentage, whereby 100% indicates the species occurs everywhere, greater than 70% indicates the species occurs in many places (sparse distribution) and less than 70% indicates the species occurs in a few places (thin distribution). In addition, One-Way ANOVA was used to test whether the medicinal plants were evenly distributed or not in the 4 sampled habitats (95% confidence interval) from the vegetation sampling data.

Conservation practices of Medicinal plants

The list of plant management/conservation activities generated from respondents were subjected to Chi-Square analysis to reveal any association between the number of species utilized and active conservation of medicinal plant species for infant health in Kitutu Central Ward.

RESULTS AND DISCUSSION

Medicinal plants for infant ailments

A total of 18 plant species from 12 families are used to manage various infant ailments in Kitutu Central ward (Table 1). These plant species composed of 4 climbers, 10 herbs, 3 shrubs and 1 tree were all encountered during the vegetation survey. The Shannon's diversity index was 2.35 for the sampled medicinal plant species indicating medium species richness in the area.

Table 1: A table showing the local names, scientific names, medicinal applications of the medicinal plants for infant health and the relative frequency in Kitutu Central Ward.

No.	Local/ common name	Scientific name	Medicinal uses	No. of times mentioned	Relative frequency (%)
1	Risibi (Lion's ear)	<i>Leonotis nepetifolia</i>	Coughs, diarrhea, stomachache	13	5.52
2	Omosune (Horseweed)	<i>Conyza canadensis</i>	Oral thrush	24	4.83
3	Enderema (Malabar spinach/ vine spinach)	<i>Basella alba</i>	Constipation, diarrhea, proper growth of teeth, swelling on skin	8	8.28
4	Obwaranse	<i>Euphorbia prostrata</i>	Oral thrush, constipation (<i>Okomenwa</i>), diarrhea	7	2.07
5	Ogoto kwembeba (Black-eyed Susan vine)	<i>Thurnbegia alata</i>	Fever, skin rashes	8	2.07
6	Enyonyo engare	<i>Centella asiatica</i>	Oral thrush	38	12.41
7	Esuranja (Holy basil)	<i>Ocimum sanctum</i> OR <i>Ocimum tenuiflorum</i>	Boost immunity, prevent weakness, respiratory ailments, prevent infections, navel healing (1-3 weeks after birth), Prevent stomach ailments	15	4.14
8	Ekenyunyunta monu	<i>Tridax procumbens</i>	Diarrhea	9	2.76
9	Eng'urang'uri	<i>Rubia cordifolia</i>	Skin diseases e.g. rashes, diarrhea, stomachache	18	2.07
10	Ekemogamogi (Black jack)	<i>Bidens pilosa</i>	Oral thrush, prevent infections	20	13.10
11	Omogaka	<i>Aloe vera</i>	Rashes from diapers, rashes on skin	23	2.07
12	Ekeng'enta mbori (Goat weed)	<i>Ageratum conyzoides</i>	Breathing complications, prevent bacteria, Boost immunity, diarrhoea	6	5.52
13	Entamame	<i>Crassocephalum vitellinum</i>	-Stomach ailments eg. stomachache	15	5.52
14	Asthma weed	<i>Euphorbia hirta</i>	Skin rashes, coughs, Worms, jaundice, oral thrush, diarrhea	4	4.14
15	Omonyinkwa	<i>Lippia javanica</i>	Coughs, fever, colds, skin rashes, stomach ailments, diarrhea, chest pains	6	9.66
16	Egwagwa (W i l d cucumber)	<i>M o m o r d i c a foetida</i>	Skin rashes (<i>Ebiaye</i>), stomachache, diarrhea, oral thrush	10	3.45
17	Omosocho	<i>C r o t o n macrostachyus</i>	Fever, skin rashes	12	3.45
18	Omenta (T r o p i c a l chickweed)	<i>Drymaria cordata</i>	Common cold, coughing, pain in chest	5	8.97

Fifteen plants were used to treat several ailments, but the herbal medicine is given in different forms and dosages per ailment while only three plants were used to treat specific diseases. For example, *Lippia javanica* was used to treat seven ailments and was given either as a decoction

or fresh squeezed juice from the rushed flower buds. *Ocimum sanctum* was used to address six infant ailments. Conversely, *Conyza canadensis* and *Centella asiatica* were used to only treat oral thrush and *Tridax procumbens* used to only manage diarrhea.

In terms of popularity, *Centella asiatica* was the most widely cited (38 mentions) herbal plant (oral thrush), followed by *Conyza canadensis* (24 mentions) also used for oral thrush treatments and *Aloe vera* (23 mentions) for the treatment of diaper rash. While *Drymaria cordata* (5 mentions) and *Euphorbia hirta* (4 mentions) were the least cited by the respondents. All the identified plant species have extensive literature on their medicinal properties but mainly in relation to adult ailments as described by Nyamoita *et al.*, (2020).

Most medicinal plants (70%) were used for simple infant ailments of the mouth, stomach, and skin issues such as oral thrush, diarrhoea and stomach ache, constipation, fever, and skin issues. While few herbs (30%) were used to manage minor respiratory issues including coughs, breathing complications and colds. The plants were either given directly by the plant juice squeezed in the sick infants' mouth, as a drink from a decoction of leaves/ roots or powdered plant, and indirectly by washing the infant in the boiled herbal water. Also, leaves, flowers and stems of *Rubia cordifolia* and *Biden pilosa* were burnt and the resulting ash (*obosaro*) massaged on the infant. The mother was also encouraged to drink the decoctions and herbal teas to pass on the medicinal benefits to the infant through breastmilk. These diverse preparation methods are similar to Nyamwamu and Nyamwamu's (2020) work on Abagusii herbalists.

Indigenous knowledge strictly guides the preparation and administration of the herbal medicine to the infant. The age of the infant is also factored in the dosage. For example, *Ocimum sanctum* (Esuranja) is crushed and applied to fasten navel healing (umbilical cord) for infants who are 1-3 weeks after birth. Also, when an infant start teething (from five months) a small quantity of *Basella alba* (Enderema) leaves are crushed and applied on the infant's developing teeth to reduce discomfort. Deworming was also done using *Euphorbia hirta* when the infant started crawling and was introduced to solid foods. The same herb was also used to treat jaundice in infants.

All respondents stated that the sick infant is taken to hospital when the herbal treatment does not alleviate the sickness or symptoms.

Distribution of the medicinal plants in Kitutu Central Ward
The One-Way ANOVA (P-value of 0.86; $p(0.86) > 0.05$) reveals that the identified medicinal plants are not evenly distributed across the 4 major habitats in Kitutu Central Ward. The farmland had the highest number of medicinal plants (1148) because of the cultivation of certain herbal plant species for subsistence use. For instance, *Basella alba* (Enderema) is cultivated as a vegetable with a side benefit

of being medicinal. This finding confirms Nyamwamu and Nyamwamu's (2020) findings that there is no distinction between food or medicine among the Kisii people. The forest habitat documented about 1070 plants, the roadside areas about 1040 and the riparian one recorded 754 medicinal plants respectively. These results highlight the important role of mixed farming as a key habitat for herbal plants as compared to the traditional perspective of foraging for herbals in the commons which are affected by overharvesting.

Bidens pilosa was the most widely distributed species (Rf=13.10%) and occurred in 19 out of the 40 quadrats as a prominent weed in the area. This is due to its high seed production, it flowers throughout the year making up to four generations annually and studies indicate that *B. pilosa* regenerates from remaining stems after cutting the above-ground parts of the plants (Kato-Noguchi, and Kurniadie, 2024). Thus, when the community harvests *B. pilosa* for its medicinal properties then they also control the invasive nature of the plant. Similarly, *Centella asiatica* (Rf=12.4%) was abundant in the area because the species aggressively propagates both vegetatively using runners and sexually through seeds. Studies indicate that wild *Centella* spp. populations have been depleted to greater extent leading to its listing under 'Threatened' category by IUCN (Javaid, and Sharma, 2018).

Conversely, *Euphorbia prostrata*, *Thurnbergia alata*, and *Rubia cordifolia* mostly located in the roadsides and *Aloe vera* had the lowest distribution (Rf 2.07%) in the study area. Interestingly, the *Aloe vera* sampled was found potted within homesteads and not wildy growing as seen in dry regions. These four plant species mentioned occurred in only 3 quadrats out of the 40 quadrats that were established.

Community conservation practises

Direct management of the medicinal plants:

Most of the respondents practised sustainable harvesting (24%) where only a small portion of either the leaves, roots or bark from a particular herbal plant were harvested for the specific treatment leaving a viable plant (Figure 2). Another key conservation management activity was the cultivation of multi-purpose medicinal plants (MMPs) (19%) as vegetables, fruits, and medicinal plants such as Enderema (*Basella alba*) which is both a medicinal plant and a vegetable as similar found Nyamwamu and Nyamwamu's (2020). This cultivation was mainly done using organic manure (10%) to keep the herbal plants healthy for human consumption. Light trimming of plants (13%) was seen as a positive management practise whereby only a few leaves are plucked usually for extraction of the plant juice through chewing or crushing. Respondents also deliberately chose to propagate (15%) their own medicinal

plants collected either from the wild or their neighbours' compounds. These actions directly conserve the medicinal plants by the respondents.

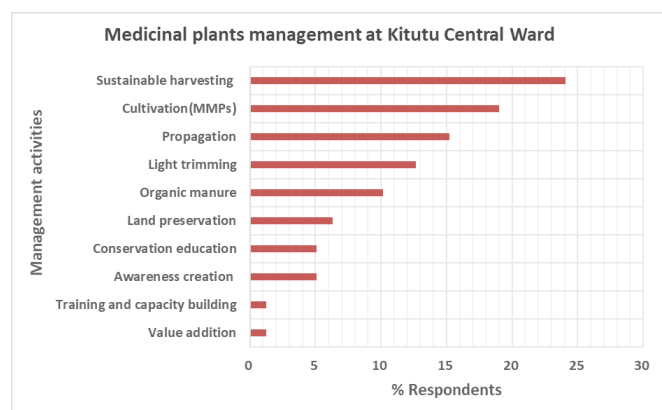


Figure 2: The diverse herbal plant conservation activities at Kitutu Central Ward.

A unique plant management strategy referred to as preservation of land (6%) was allowing diverse medicinal plants to flourish within the homesteads and along the fences. For example, *Drymaria cordata* (Omenta) flourishes in the homesteads as it is also forage for rabbits that are commonly kept by the residents. While species such as *Thurnbergia alata* are allowed to freely grow as an ornamental in the homesteads.

Indirect management of the plants:

The respondents were not well versed with scientific/technical knowledge specific for the use and conservation of medicinal plants in the area. Hence, awareness on infant medicinal plants (5%) and medicinal plant conservation education (5%) were low management option by the respondents. Also, value addition (1%) and capacity building (1%) creation were not popular activities by the community.

Fortunately, active herbal use promotion was done by the proprietors of Tenacious Herbal Centre in Jogoo town that sells well packaged value-added herbal plant extracts in the area. Some products are specific for treating children and infants. This center not only trains the community members on importance of herbal plants, best propagation practices and preservation of harvested plants but also promotes conservation through the cultivation of medicinal plants to ensure continuous production of its herbal products.

Chi-Square distribution was used to determine the association between the number of species utilized and the presence of active conservation of these species. The p-value obtained was 0.29; $p > 0.05$; meaning there was no association between the number of species utilized and the presence of active conservation of the medicinal plants for infant health in Kitutu Central Ward.

CONCLUSION AND RECOMMENDATION

This study has reaffirmed that medicinal plants do play an important role in the improvement of infants health by the *Egusii* community. The results documents 18 medicinal plant species that are used to manage diverse infant ailments at Kitutu central Ward at Kisii County. Fifteen herbs were multi-ailment as they treated several different infant diseases ranging from skin issues, respiratory and stomach ailments while only three herbs treated specific ailments. Farmland had the highest record of infant health medicinal plant species while riparian habitat had the lowest indicating that medicinal plants are not evenly distributed within the four distinct habitats. There is no association between the number of plant species utilized and the presence of active conservation of the medicinal plants used to treat infants in Kitutu Central Ward. On the positive side, the study highlights cultivation and sustainable harvesting as the key conservation activities by the community. In addition, a single stakeholder - Tanecious Herbal Centre is actively carrying out capacity building and value addition of herbal plants activities in the area.

The study recommends clinical tests to identify the different classes of phytoconstituents in various plant parts and standardise the dosage of the documented medicinal plant products to ensure that treatments are appropriate and safe for infants. Further research can be done on the medicinal plants used in the specific treatment of older children and geriatric persons. In addition to this, further research can be conducted to document medicinal plants that are used to treatment various ailments in domestic animals. Finally, more capacity building can be conducted to increase the number of local herbalists to guide the implementation of conservation strategies efficiently.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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APPENDIX 1

HOUSEHOLD INTERVIEW QUESTIONNAIRE FORM UTILIZATION AND CONSERVATION OF INFANT-ASSOCIATED MEDICINAL PLANT SPECIES IN KITUTU CENTRAL WARD, KISII COUNTY, KENYA

Dear respondent,

I am a student at Kenyatta University pursuing my studies for a degree in Conservation Biology. As a requirement of this course, I am carrying out a research that will lead me into writing a report on infant-associated medicinal plant species in Kitutu central ward.

Kindly respond to the questions honestly to facilitate this study. Your identity will be kept confidential, and all information collected from you will be used only for this study and not for any other business.

Thank you very much for your cooperation.

COVER LETTER

A. Respondent details					
Respondent's No.		Age		Gender (M/F)	
Location		Village		Date	

B. Respondent medicinal plants knowledge					
1.	Do you have children between 0-1 years?	Yes		No	
	If Yes, how old is your infant?				
2.	Have you been using any locally available medicinal plants and/or medicinal plant products to treat your infant(s)?	Yes		No	

3.	If Yes, which ones do you use?
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No	Local name of plant species(<i>Ekegusii</i> / Kiswahili)	Uses of the medicinal plant species on your infant	How you obtain it (buying, homemade etc.)	Location in Kitutu Central Ward
a.				
b.				
c.				

4.	Have you been making any efforts to actively conserve some of these medicinal plant species?	Yes		No	
	If Yes, how?				
a.					
b.					
c.					

5.	Do you have any of the mentioned medicinal plants planted within your land/premises?	Yes		No	
	If Yes, Can you show me some of these plants?	Yes		No	
	Can I document these plant species within your land/premises?	Yes		No	
6.	Do you know of any other parent nearby/ in this ward who has an infant (0-1 years)? (He/she can be my next respondent)	Yes		No	

APPENDIX 2 :

LOCAL EXPERT INTERVIEW FORM UTILIZATION AND CONSERVATION OF INFANT-ASSOCIATED MEDICINAL PLANT SPECIES IN KITUTU CENTRAL WARD, KISII COUNTY, KENYA

Dear respondent,

I am a student at Kenyatta University pursuing my studies for a degree in Conservation Biology. As a requirement of this course, I am carrying out a research that will lead me into writing a report on infant-associated medicinal plant species in Kitutu central ward.

Kindly respond to the questions honestly to facilitate this study. Your identity will be kept confidential, and all information collected from you will be used only for this study and not for any other business.

Thank you very much for your cooperation.

COVER LETTER

A. Respondent details					
Respondent's No.		Age		Gender (M/F)	
Location		Village		Date	

B. Respondent medicinal plants knowledge					
1.	As a herbalist, do you know about any locally available plants used for treatment of infants (0-1 years)?			Yes	No
If Yes, fill in the table below					
	Name of plant	Uses	How it is administered		

2.	Are there any threats and conservation of these medicinal plant species?			Yes	No
If Yes, fill in the table below					
	Name of plant	Threats	How it is conserved		