Ethnobotanical Research of Plants Used in Traditional Medicine for The Treatment of Epilepsy in Southern Mozambique

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Abstract

Background

Epilepsy is a chronic brain disease that affects about 50 million people worldwide, mainly in developing countries. It is treated with anticonvulsant drugs, but in some cases, conventional anticonvulsants have not been effective, leading patients to turn to alternative herbal treatments. The study aimed to identify plants used in traditional medicine for the treatment of epilepsy in southern Mozambique, record the parts used, the method of preparation as well as the mode of administration.

Methodology:

The study was conducted between April to June 2019. 53 Traditional Medicine Practitioners were interviewed using a semi-structured questionnaire. The data was analyzed by calculating the Percentage of Citation (%FC) and Informant Factor Consensus (IFC).

Results

A total of 32 medicinal plants belonging to 18 botanical families were identified for the treatment of epilepsy in the southern part of Mozambique. The species, *Hugonia orientalis* Engl (22.64%), *Maclura africana* Bur (16.98%), *Strychnos spinosa* Lam (13.21%), *Terminalia sericea Bruch* ex DC (13.21%) and *Manilkara mochisia* (Bark) Dubard (11.32%) were the most cited. The families Annonaceae and Menispermaceae (4 species) were the most representative in number of species. The root was the most commonly used plant part (54.2%), the frequently used preparation mode was decoction (71%), and administration of the remedies was often by oral route.

Conclusion

Medicinal plants still play an important role in primary health care in the study area. However there is a need to develop pharmacological studies based on these plants to understand the mechanism of action of the bioactive compounds and for the future development of new and more effective anticonvulsant drugs

1. Introduction

Epilepsy is a chronic non-communicable brain disease that affects about 50 million people worldwide [1]. The disease is characterized by recurrent seizures that may be partial when they involve one part of the body or generalized when they involve the whole body [1].

In Africa, epilepsy is estimated to affect about 80% of the population [1]. In Mozambique, epilepsy is the leading cause of mental health consultations, accounting for 48% of all mental health consultations [2].

Most cases of epilepsy are idiopathic, although in some cases they result from brain injury, stroke, brain tumor, genetic mutations, severe malaria and drug abuse [3].

Epilepsy can be controlled by anticonvulsant drugs such as phenytoin, carbamazepine and phenobarbital [4]. It is estimated that 70% of patients can control their seizures, on the other hand 30% of patients with focal lesions need other ways to ameliorate their seizures [5–7]. This fact leads patients to turn to alternative herbal treatments [5].

The World Health Organization estimates that 80% of the world population relies mainly on traditional medicine for primary health care [8]. In Mozambique, about 60% of the population relies on traditional medicine for primary health care [9].

In different studies of anticonvulsant activity, several plants have shown promising results. Among them are: *Flueggea virosa*, *Psorospermum senegalensis* [13], *Bridelia micrantha*, *Crotonm acrostachyus* [14].

There is growing interest in the use of natural sources as an alternative for developing new anticonvulsant drugs that are more effective than currently available anticonvulsants [10–12].

The present study was carried out with the aim of identifying the medicinal plants used in traditional medicine for the treatment of epilepsy, recording the parts used, the method of preparation, as well as the method of administration.

2. Material And Methods

2.1. Study area

The study was conducted in the southern part of Mozambique, in the districts of Matutuine and Magude (Maputo Province), Mabalane (Gaza Province) and Funhalouro, Inharrime (Inhambane Province). These provinces were selected taking into account that in the southern part of the country, there is some

traditional knowledge for the treatment and prevention of various plant-based diseases, including epilepsy [15]. Therefore, the provinces serve as the main source of medicinal plant collection by many traditional medicine practitioners in the southern part of Mozambique [15].

Matutuíne district is located in the extreme south of Maputo Province. It covers an area of approximately 5,387 km^2 and has an estimated population of 52,703 inhabitants [16]. Magude district is located in the north of Maputo Province. It has an area of 6,960 km^2 and an estimated population of 54,225 inhabitants [16]. Mabalane district is located in the center of Gaza Province. Its area is 8,922 Km^2 with an estimated population of about 36,121 inhabitants [16]. Inharrime district is located in the southern part of Inhambane Province with an area of 2748 Km^2 and an estimated population of about 116285 inhabitants [16]. The district of Funhalouro is located in the central part of Inhambane Province with a surface area of 13617 Km^2 and an estimated population of about 44320 inhabitants [16]. (shown in Fig. 1).

2.2. Data collection and plant identification

The study was carried out between April to June 2019. A semi-structured questionnaire was developed and administered individually to each Traditional Medicine Practitioner (TMP) according to their local language and with support from a local translator. This questionnaire aimed to obtain socio-demographic information such as age, years of experience, source of knowledge of traditional treatment and the plants used for the treatment of epilepsy. Plants were mentioned by their vernacular names and the parts used methods of preparation as well as the mode of administration were identified.

Plants were collected during fieldwork with the help of Traditional Medicine practitioners. Voucher species were deposited in the LMU herbarium at Eduardo Mondlane University, where they were scientifically identified using dichotomous keys and herborized plant samples by comparison. The scientific names were confirmed in the plant list (www.theplantlist.org). Accessed 27 May 2021.

2.3. Data analysis

Data were stored in a database and analyzed in the statistical program Microsoft excel (version 2007). The percentage of citation (%FC) and Informant Consensus Factor (ICF) were calculated.

The Citation Percentage (%FC) was calculated by dividing the citation frequency (CF) by the total number of informants in the survey (N) [17]:

$$\%FC = \frac{FC}{N} \times 100 \ (0<FC<100).$$

FC values range from 0, when nobody mentions the plant as useful for epilepsy treatment, and 100 in the unlikely case where all informants mention the use of the species [17].

The Informant Factor Consensus (IFC) was calculated following the formula [18]:

$$IFC = \frac{N_{ur} - N_t}{N_{ur} - 1} \ (0<IFC<1).$$

Where N_{ur} refers to the number of reported uses in each disease category and N_t the number of species used [18].

3. Results

3.1. Socio-demographic information of the interviewees

A total of 53 Traditional Medicine Practitioners (TMP) were interviewed. Of these 43 were female (81.1%) and 10 male (18.9%). In terms of provenance, 14 were from Maputo Province, 29 from Gaza and 10 from Inhambane. Age ranged from 30–84 years, of which 52.8% were between 50–69 years, which corresponded to the majority of the interviewees, followed by those aged 30–49 years (37.7%) and lastly, those aged 70 years or more (7.5%). The majority of the interviewees (81.1%) had 10–20 years of experience as PMT, followed by those who had less than 10 years (13.2%) and 30–40 years (7.5%).

Regarding their training, 69.8% of the practitioners were trained at home by another experienced practitioner (*Mbava*) affiliated to the Traditional Healers Association of Mozambique (THAMO) and 24.5% learned their practices through the manifestations of familiar spirits that showed them the plants through visions or dreams (Table 1).

Table 1
Socio-demographic information of the interviewees

Variable	N	(%)
Gender		
Female	43	81.1
Male	10	18.9
Age (years)		
30–49	20	37.7
50–69	28	52.8
≥ 70	4	7.5
Years of experience		
< 10	7	13.2
10–29	43	81.1
30–40	4	7.5
Knowledge source		
Did training	37	69.8
Herbalist	3	5.7
Familiar spirits	13	24.5
Province		
Maputo	14	26.4
Gaza	29	54.7
Inhambane	10	18.9
Source: Data from survey participants		

3.2. Traditional perception of epilepsy

Regarding the traditional etiology of epilepsy, most of the TMP (80%) stated that epilepsy is a disease caused by spell (action of evil spirits), on the other hand, some (20%) stated that the disease is caused by "*Nhocane*" which means snake or worm. This worm lives inside the belly of the child in the area below the navel. There are 2 types, "*Nhoca ley tsongo*" which means small female snake and "*Nhoca ley Kulo*" which means male or large snake. The latter is considered to be the main cause of epilepsy in children and adults. This worm comes from the mother's womb, being the place where the child contracts it during gestation. The main clinical manifestations of the disease during an epileptic seizure were: falling down, urinating, rolling eyes, foaming at the mouth, rigidity of the upper and lower limbs, trembling, teeth grinding, stomach pains, headaches and frights.

3.3. Plants used to treat epilepsy

A total of 32 medicinal plants belonging to 18 botanical families were identified for the treatment of epilepsy in southern Mozambique. Table 2 contains information of all identified species, the family, vernacular name, voucher number, the growth form of the plants, the parts used, mode of preparation, mode of administration, other traditional uses reported and the percentage of citation for each species. Among the identified plants, the species *Hugonia orientalis* Engl. (22.64%), *Maclura africana* Bur. (16.98%), *Strychnos spinosa* Lam. (13.21%), *Terminalia sericea* Bruch. ex DC (13.21%) and *Manilkara mochisia* (Bark.) Dubard (11.32%) showed highest citation percentage (%FC) (Table 2).

Table 2
List of plants mentioned by practitioners of traditional medicine used for treating epilepsy in southern Mozambique

Scientific name	Vernacular name	Family	Voucher number	Growth form	Used part	Mode of preparation	Mode of administration	Other uses	%FC
Albertisia delagoensis (N.E.Br) Forman	Kodhodho, Cododo	Menispermaceae	AB169	Shrub	Roots	Decoction	Oral	Moon sickness	3.77
Annona senegalensis Pers.	Rofwa wa kulafi	Annonaceae	AB183	Shurb	Roots	Decoction	Oral	Colics and asthma	1.89
Ansellia africana Lindl.	Ngonhama	Orchidaceae	AB181	Herb	Roots and leaves	Decocção	Oral	Worms	7.55
Artabotrys brachypetalus Benth	Ntita	Annonaceae	AB174	Shurb	Roots	Decoction	Oral	Moon sickness	9.43
Catunaregam spinosa (Thunb.) Tirveng.	Xibamarole, Xiba marok	Rubiaceae	AB164	Shurb	Roots	Deccoction	Oral and massage	Moon sickness	5.66
Cissampelos mucronata A. Rich.	Nhocanhocane	Menispermaceae	AB184	Climber	Roots	Decotion	Oral	Back pain	3.77
Cladostemon kirkii (Oliv.) Pax & Gilg.	Mawocane	Caparraceae	AB178	Tree	Leaves	Maceration	Oral	Cough	1.89
Cocculus hirsutus (L.) W.Theob.	Mulha nhoca	Menispermaceae	AB182	Climber	Roots and leaves	Decoction	Oral	Cólicas	1.89
Cucumis metuliferus E.Mey. ex Naudin	Dema	Curcubitaceae	AB185	Climber	Roots, leaves and fruit	Decocção	Oral	Back pain and Bilharziosis	5.66
Cyphostemma congestum (Baker) Desc. ex Wild & R.B.Drumm.	Nhamuntana	Vitaceae	AB161	Climber	Roots and leaves	Decoction	Oral	Fever	1.89
Garcinia livingstonei T. Anderson.	Mahimbe	Clusiaceae	AB186	Tree	Roots and leaves	Decoction	Oral	Asthma	1.89
Gymnanthemum coloratum (Willd.) H.Rob. & B.Kahn	Phalha Kufa	Asteraceae	AB177	Shurb	Roots and leaves	Decoction	Oral	Cough and asthma	7.55
Grewia caffra Meisn.	Nhocana ukulo	Malvaceae	AB179	Shurb	Roots and leaves	Decoction	Oral	Colics	5.66
Helichrysum kraussii Sch.-Bip	Chiringuate	Asteraceae	AB187	Shurb	Roots	Decoction	Oral	Moon sickness	1.89
Holarrhena pubescens Wall. Ex G.Don	Chiritse	Apocynaceae	AB171	Tree	Roots	Decoction	Oral	Moon sickness	1.89
Huernia kirkii N.E. Br.	Lhakuzi	Apocynaceae	AB188	Herb	Roots and stem	Maceration	Oral	Worms	1.89
Hugonia orientalis Engl.	kongolotamunte	Linaceae	AB162	Shurb	Roots, bark and leaves	Decoction	Oral	Moon sickness	22.64
Ipomoea obscura (L.) Ker Gawl.	Sungucate	Convulvulaceae	AB165	Herb	Roots	Decoction	Oral	Moon sicknes	1.89
Maclura africana (Bureau) Corner	Mpumbolo	Moraceae	AB170	Shurb	Roots	Decoction	Oral	Asthma	16.98
Manilkara mochisia (Bark.) Dubard	Nwambo, Muhambo	Sapotaceae	AB168	Tree	Roots	Decoction and infusion	Oral	Worm and colics	11.32

Scientific name	Vernacular name	Family	Voucher number	Growth form	Used part	Mode of preparation	Mode of administration	Other uses	%FC
Rhoicissus revoilii Planch.	Nlalhapwane	Vitaceae	AB167	Shurb	Roots and leaves	Maceration	Oral and bath	Carbúnculo, hérpes	5.66
Senna occidentalis (L.) Link	Nhocana utsongo	Fabaceae	AB189	Shurb	Roots and leaves	Decoction and maceration	Oral and bath	Doença da lua	5.66
Senna petersiana (Bolle) Lock	Nembenembe, Nhadzente	Fabaceae	AB190	Shurb	Roots and leaves	Decoction, maceration and infusion	Oral	Worm and bilharziosis	9.43
Strychnos decussata (Pappe) Gild	Tambaculota	Loganiaceae	AB159	Tree	Roots and leaves	Decoction	Oral	Back pain	5.66
Strychnos madagascariensis Poir.	Macuacua	Loganiaceae	AB175	Tree	Roots and leaves	Decoction	Oral	Colics	9.43
Strychnos spinosa Lam.	Nsala	Loganiaceae	AB173	Tree	Roots and leaves	Decoction	Oral	Stomachache	13.21
Terminalia sericea Bruch. ex DC.	Konola	Combretaceae	AB158	Tree	Roots, bark and leaves	Decoction and maceration	Oral	Diarrhoea, bilharziosis, haemorrhoid and colics	13.21
Tiliacora funifera (Miers) Oliv.	Xiwizila	Menispermaceae	AB180	Climber	Roots and leaves	Decoction and maceration	Oral	Bilharziosis	3.77
Uvaria caffra E. Mey. ex Sond.	Tsovatsova	Annonaceae	AB160	Shurb	Roots and leaves	Decoction and maceration	Oral	Back pain	7.55
Uvaria lucida (N.E.Br.) Verdc.	Muvava	Annonaceae	AB166	Shurb	Roots and leaves	Decoction	Oral	Asthma	3.77
Vangueria infausta Burch.	Pfilwa	Rubiaceae	AB176	Shurb	Roots and leaves	Decoction	Oral	Diarrhoea	9.43
Xeroderris stuhlmannii (Taub.) Mendonça e Sousa	Ndzungua	Fabaceae	AB163	Tree	Roots, bark and leaves	Decoction anad maceration	Oral	Carbuncle and herpes	5.66

Source: Information from ethnobotanical survey of the study

The most representative botanical families in number of species were Annonaceae and Menispermaceae with 4 species followed by Fabaceae and Loganiaceae with 3 species. The other families were represented by 1 or 2 species (shown in Fig. 2).

Most plants used for epilepsy treatment were shrubs (46.9%), followed by trees (28.1%), climbers (15.6%) and herbs (9.4%). The remedies are mainly administered orally. Apart from this mode, external administration of the remedies was also mentioned in the form of bath (2 species) and body massage (1 species) (Table 2).

With regard to other reported uses, *Terminalia sericea* was the only species referred for treatment of various diseases such as epilepsy, diarrhea, bilharzia, colic and hemorrhoids.

3.4. Plant parts used, methods of preparation and level of Informant Factor Consensus (IFC)

The plant parts used by TMP for the treatment of epilepsy were the roots (54.2%), leaves (37.3%), bark (3.4%), branches and fruit (1.7%) shown in Fig. 3. The commonly used mode of preparation was decoction (71%), followed by maceration (24%) and infusion (5%).

The Table 3 contains the informant factor consensus values (IFC) for different categories of diseases. Diseases of the digestive system (diarrhea, worms) showed a high IFC value of 0.83 (2 species and 7 reported uses). This indicates that there was a consensus in the use of the plants cited for the treatment of these diseases although they showed lower number of plants and reported uses. The category of nervous system diseases, which includes epilepsy showed an IFC of 0.52 (33 species and 68 reported uses).

Table 3
Informant consensus values (IFC) of different disease categories

Disease category*	Diseases reported	N_t	N_{ur}	IFC
Certain infectious or parasitic diseases	Bilharziosis, Carbuncle and Haemorrhoid	8	33	0.78
Nervous system diseases	Epilepsy	33	68	0.52
Respiratory system diseases	Asthma and cough	7	12	0.45
Digestive system diseases	Diarrhoea and worms	2	7	0.83
Diseases of the musculoskeletal system or connective tissue	Back pain	5	19	0.78
Genitourinary Diseases	Colics	6	27	0.81
Symptoms, signs or clinical findings, not elsewhere classified	Moon sicknessand stomachache and fever	10	16	0.40
Skin diseases	Herpes	2	4	0.67

* The World Health Organization's International Statistical Classification of Diseases and Health-Related Problems (ICD) was used to define disease categories(https://icd.who.int/dev11/l-m/en).

4. Discussion

In the present study, most of the TMP interviewed were female (81.1%) compared to male (18.9%). This is due to the fact that women are responsible for the primary health care of their families, particularly children [19]. Most of the TMP were aged between 50–69 years. Generally older people use more traditional remedies than young people and this traditional knowledge tends to disappear in the young layer [20]. This fact may be coupled with lack of interest in traditional practices, on the part of young people.

Traditional perceptions regarding the etiology of epilepsy are common in different regions of Africa. For example, in Tanzania, Congo and Guinea-Bissau most traditional doctors also believed that epilepsy is caused by witchcraft [21–23]. Therefore, health programs should be developed in rural communities to clarify the causes of epilepsy in order to reduce or eliminate the existing myths and taboos surrounding the disease.

The families Annonaceae and Menispermaceae were most representative in number of species (4 species). According to Auditeau et al [24], species belonging to these families are characterized for presenting anticonvulsant properties.

The plants *Hugonia orientalis*, *Maclura africana, Strychnos spinosa*, *Terminalia sericea* and *Manilkara mochisia* were the most cited for the treatment of epilepsy in the study area. On the other hand, there are no published studies regarding the use of these plants for the treatment of epilepsy. However, these plants are frequently used in traditional medicine for the treatment of different ailments in Mozambique and other countries [25–28].

In Mozambique *Hugonia orientalis* is commonly used in traditional medicine for the treatment of Malaria, diarrhea and wounds [25, 29]. *Maclura africana* is used in traditional medicine for treatment of respiratory diseases and helminthiasis [25, 30]. *Strychnos spinosa* is used for the treatment of helminthiasis, venereal diseases, hernia, snake bite, earache [25, 31]. In Madagascar it is used as anti-dandruff, and anti-flu [27].

Dichloromethane extracts of *Strychnos spinosa* leaves possess efficient anti-plasmodial and anti-trypanosomal activity [28, 32]. *Terminalia sericea* is commonly used in Mozambique for treatment of, dysentery, helminthiasis, hemorrhoids, colic and female infertility [9, 25, 31]. In South Africa it is often used to treat diarrhea [26]. *Terminalia sericea* also exhibits efficient anti-oxidant activity, activity and anti-HIV- through inhibition of the enzyme alpha-glucosidase [33–34]. Extracts of *Terminalia sericea* root possess efficient anti-mycobacterial activity due to the presence of ellagitannins, ellagic acid and stilbene glycoside [35].

4.1. Parts of the plant used, method of preparation, administration and Informant Factor consensus (IFC)

The root (54.2%) was the part of the plant most used for the treatment of epilepsy in southern Mozambique. Similarly, in Tanzania, roots are frequently used for the treatment of epilepsy [22]. The wide use of the roots by practitioners of traditional medicine is based on the perception that the therapeutic power is most concentrated in this part of the plant [36].

The commonly used mode of preparation is decoction (71%). Moshi et al [22] reported that decoction is also frequently used for treatment of epilepsy in Tanzania. This is because it is believed that active ingredients are easily extracted by boiling the plants, coupled with this, traditional medicine practitioners do not have much conventional knowledge about the ways of extracting active ingredients in plants [37].

The administration of the remedies was mainly by oral route. The preference of the method by traditional medicine practitioners may be due to the fact that the remedy administered orally is easily absorbed by the body [36]. Apart from oral administration, administration by means of bath and massage has been mentioned. This method is also common in India, where the administration of the remedies is through baths [38]. This method is usually coupled with traditional beliefs for the removal of evil spirits and purification of the body.

With respect to Informant Factor consensus (IFC), the highest level of consensus was observed in the category of digestive system diseases (diarrhea, roundworms) (0.83), despite the category containing the lowest number of species and reported uses. Similar results have been reported in several studies where the highest level of IFC was observed in the category with the lowest number of species and reported uses [17, 29, 39]. The category of nervous system disorders, which includes epilepsy showed an IFC of 0.52. This reinforces the fact that different types of plants were cited by traditional medicine practitioners for the treatment of epilepsy [29].

4.2. Anticonvulsant activity

Of the plants used for treatment of epilepsy in southern Mozambique, only two (2) species, namely: *Annona senegalensis* Pers and *Senna occidentalis* (L) Link, showed anticonvulsant activity [40–45]. No published studies on the anticonvulsant activity of the remaining species were found (Table 4).

Table 4
Anticonvulsant activity of some plants used in traditional medicine to treat epilepsy in southern Mozambique.

Cientific name	Analised part	Exctrat/ compounds used	Experimental model of seizure	Experimental animals	Results	Reference
Annona senegalensis Pers.	Stem bark	Methanol, n-hexane fraction, ethyl acetate fraction and aqueous fraction	Pentylenetetrazole (PTZ) and pilocarpine	Male mice (25-30g) and male rats (200-250g)	Extracts and fractions were not significant in reducing the latency of first seizures induced by pentylenetetrazole or pirocarpine. Treatment with methanolic extracts and aqueous fraction (400mg/kg) were significant ($p < 0.05$) in protecting against pentylenetetrazole or pyrocarpine induced seizures.	(Almamy, *et al.*, 2012)
	Roots	Aqueous	Pentylenetetrazole (PTZ) and eletroshock	Adult albino mice (20-35g)	Ethanolic extracts were effective at high doses (LD50 954.99 ± 2.86 mg/kg) in protecting against PTZ-induced seizures in rats, preventing elecrtochoke, and were shown to be more effective against generalized than partial seizures.	(Igwe & Nwobodo, 2014)
	Root bark	Kaurenoic acid (kaur-16-en-19-oic acid) and ethyl acetate fraction	Pentylenetetrazole (PTZ)	Adult albino rats (18-30g) and mice of (180-250g)	The ethyl acetate fraction and kaur-16-en-19-oic acid significantly ($p < 0.05$) dose-dependently delayed the onset of myoclonic spasms and tonic-clonic phases of PTZ-induced seizures and maximal electroshock seizures.	(Okoye, et al., 2013)
	Root bark	Methanol	Pentylenetetrazole (PTZ)	Adult albino mice (18-30g)	The extract (200, 400, 800mg/kg) exhibited significantly ($p < 0.05$) dose-dependent delay of onset of tonic and clonic phases of Pentylenetetrazole-induced seizures (60mgf/kg) as well as offered 100% protection (200mg/kg) against Pentylenetetrazole-induced seizures in rats.	Okeye *et al.*, 2010
	Folhas	Methanol and matanolic fraction	Pentylenetetrazole (PTZ)	Adult Swiss albino rats (150-200g), mice (19-22g)	The extracts and fractions caused significant ($p < 0.05$) inhibition of Pentylenetetrazole-induced seizures.	(Okoli *et al.*, 2010)
Senna occidentalis (L.) Link	Seeds	Ethanol	Pentylenetetrazole (PTZ) and maximum electroshock (MES).	Swiss albino mice (30-40g), Swiss albino rats (200-250g)	The ethanolic extract of Senna occidentalis seeds at a dose of 400mg/kg body weight has potent anticonvulsant activity.	(Singh *et al.*, 2019)

The stem bark and root extracts of *Annona senegalensis* are efficient in inhibiting Pentylenetetrazole (PTZ)-induced seizures [40, 41]. Likewise the methanol extracts and methanol fraction of *Annona senegalensis* leaves caused significantly ($p < 0.05$) inhibition of Pentylenetetrazole-induced seizures [44]. The anticonvulsant activity of this plant may be due to the presence of kaurenoic acids, specifically the compound kaur-16-en-19-oic acid isolated from the root bark, as it showed efficient anticonvulsant activity by delaying the onset of myoclonic spasms and tonic-clonic phases of PTZ-induced seizures and maximal electroshock seizures [42].

The ethanoic extract of *Senna occidentalis* seeds at a dose of 400mg/kg body weight possesses potent anticonvulsant activity [45]. These findings reveal that these plants may be promising for the development of new antiepileptic drugs, although they are not among the most commonly cited plants for the treatment of epilepsy in southern Mozambique.

5. Conclusion

Different types of plants were identified for the treatment of epilepsy in southern Mozambique. The results show that medicinal plants still play an important role in primary health care in the study area. However, there is still a need to preserve this traditional system through adequate recording and identification of indigenous species.

Some of the species like *Annona senegalensis* and *Senna occidentalis*, have been scientifically proven for anticonvulsant activity. There is need to develop studies of the anticonvulsant activity of *Hugonia orientalis, Maclura africana*, *Strychnos spinosa*, *Terminalia sericea* and *Manilkara mochisia* with a view to

understanding the mechanisms of action of the bioactive compounds present in the plants, since they were the most cited for the treatment of epilepsy in the study area.

Abbreviations

FC
Citation frequency; IFC:Informants Factor Consensus; TMP:Traditional Medicine Practitioner, ATHM:Association of Traditional Healers of Mozambique, PTZ:Pentylenetetrazole.

Declarations

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Authors' contributions

H.C conducted the field study, participated in field data collection, analyzed and interpreted the data, wrote the manuscript. M.W.N, F.G and G.C participated in project design, data analysis and interpretation, wrote the manuscript. P.A and M.H assisted in project development and data collection during fieldwork. A.B and E.B assisted in data collection during fieldwork, identified plants, wrote the manuscript. A.M and M.I analyzed and interpreted the data, wrote the manuscript. O.C and A.S coordinated with traditional medicine practitioners, participated in the work and fieldwork. All authors agreed with the submission of the manuscript.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

Availability of data and materials

The data sets and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical approval and consent of participants

The present study was approved by the National Bioethics Committee for Health, Ministry of Health registered under number 116/CNBS/2016. Prior to conducting the interviews, informed consent was sought from all participants. All interviewees accepted in to participate in the research.

Consent for publication

Not applicable in this section

Conflicts of interest

The authors declare that there are no conflicts of interest.

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Figures

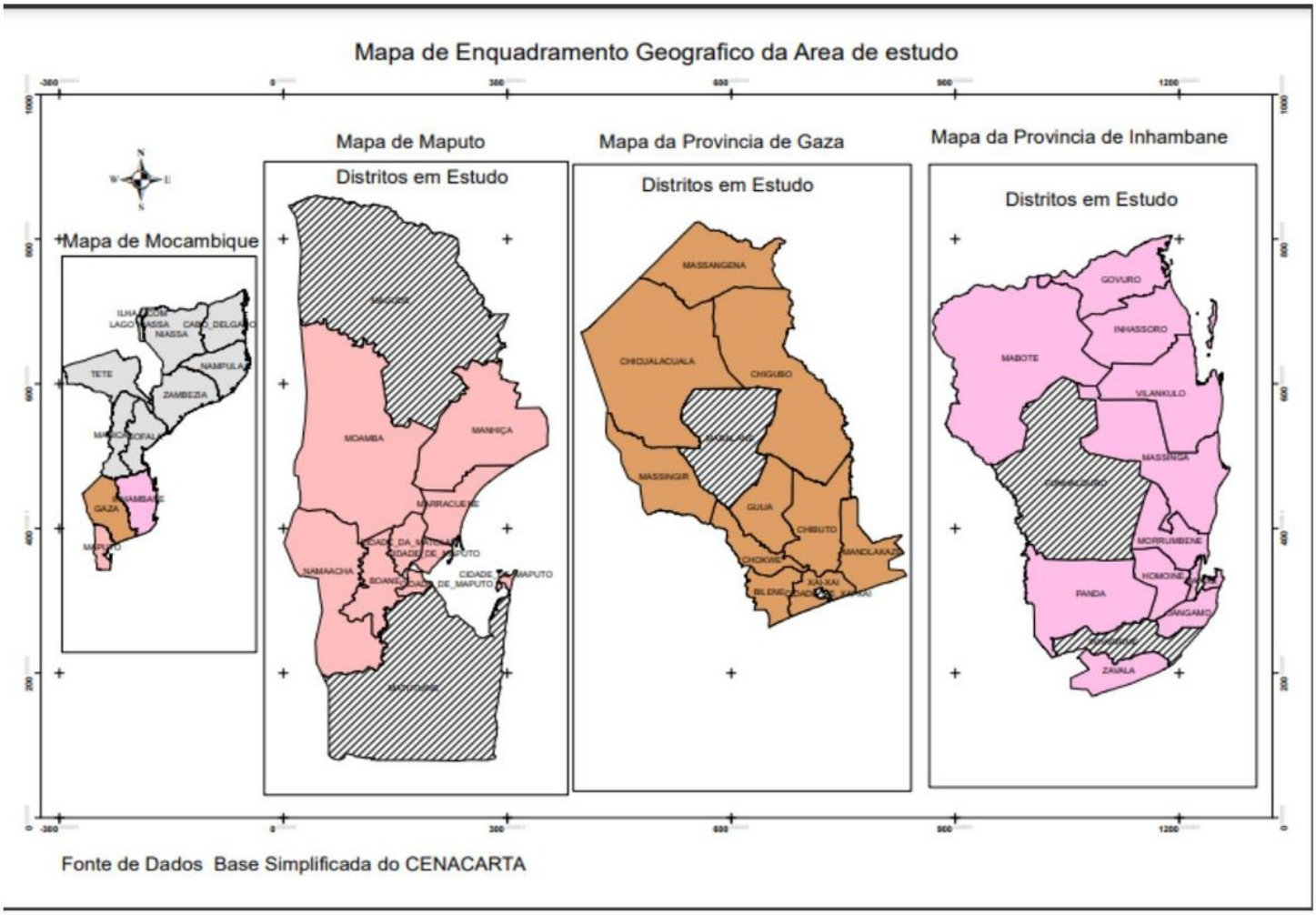

Figure 1

Location of the study area. Source: simplified base of the CENACARTA

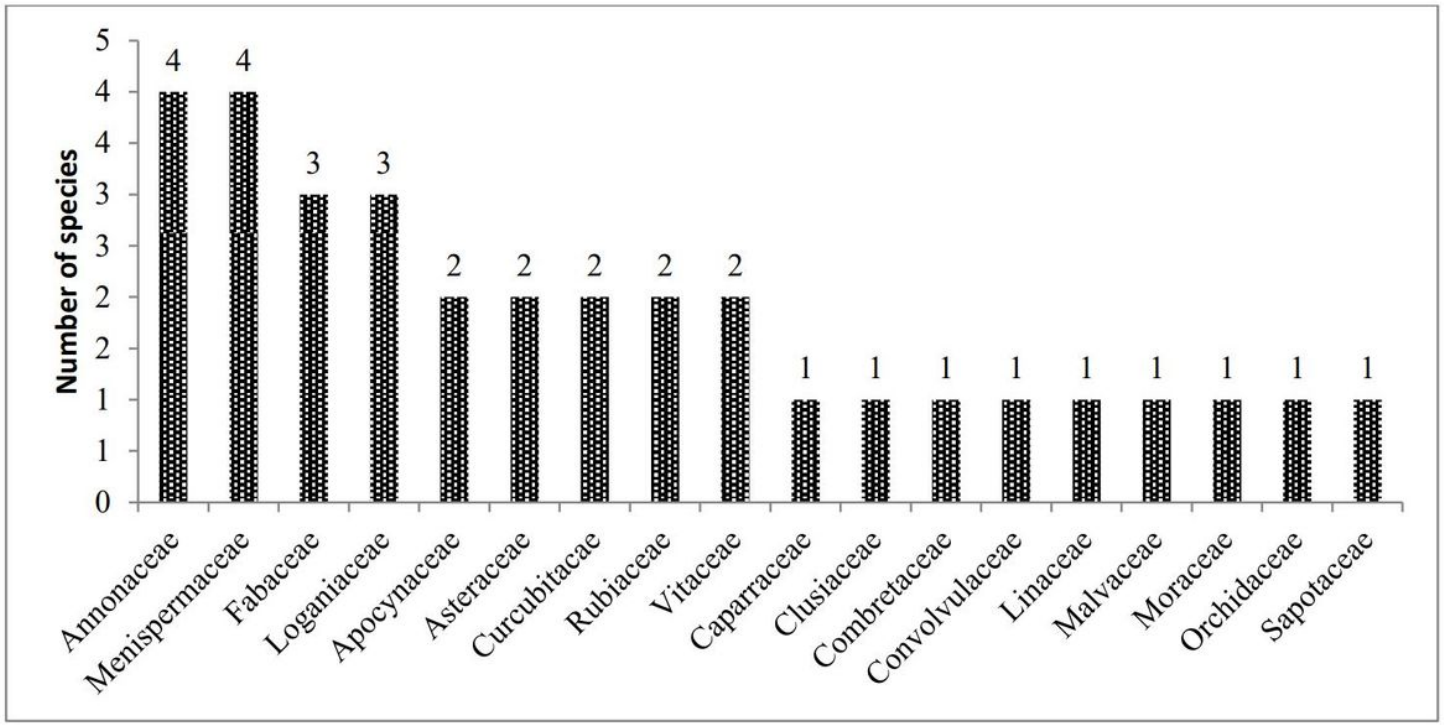

Figure 2

Frequence of botany families

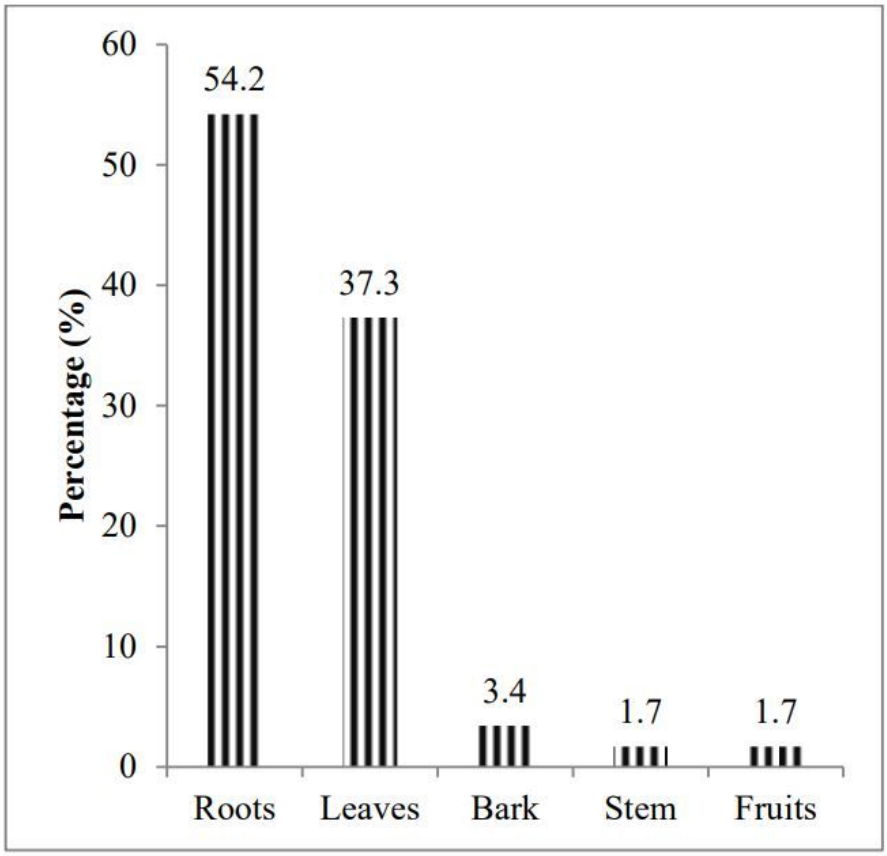

Figure 3

Parts of the plant used for epilepsy treatment

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