Ethnobotanical study of medicinal plants used in the treatment of neurological disorders in the Western Ghats region of Dakshina Kannada district, Karnataka, India.

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Research

Abstract

Background: The incidence of neurological disorders has increased globally over last decade particularly in developing countries. People inhabiting in the remote regions of Dakshina Kannada district are often affected with several kinds of neurological disorders. No specific survey has been carried out for neurological disorders so far, hence the present study was undertaken to document the plants used to treat such disorders.

Methods: This study was conducted in Western Ghats region of Dakshina Kannada district, Karnataka, India, during 2018 - 2022 to document the ethnomedicinal plants used in the treatment of neurological disorders by the tribal and ethnic groups of this region. This region is considered as a repository of ethnomedicinal wealth for treating various human ailments. Data was collected based on semi-structured questionnaire, interviews and discussions with traditional practitioners. Recorded data were analyzed by conventional methods as well as quantitative ethnobotanical parameters such as Use Value (UV), Relative Frequency of Citation (RFC) and Informants Consensus Factor (ICF).

Results: The study provides useful information on 143 plant species belonging to 61 families used to treat neurological disorders such as epilepsy, depression, insomnia, paralysis and psychosis. Among these species, 101 were wild and 42 cultivated. Leaves are widely utilized in the preparation of remedies. The most predominant family was Fabaceae (16 species), and growth form was the trees (56 species). The medicinal plant exhibited highest RFC (0.36) value is *Eclipta prostrata*. Higher informant consensus factor (ICF) value was reported for psychosis (ICF=0.35) followed by epilepsy (ICF=0.24), insomnia (ICF=0.22), depression (ICF=0.13) and least for paralysis (ICF=0).

Conclusion: The medicinal plants were documented with the focus on conserving the ethnic knowledge as documentary evidence for natural herbal product research. This study concluded that medicinal plant species such as *Cuminum cyminum*, *Cynodon dactylon*, *Rauvolfia serpentina*, *Vitex negundo* and *Withania somnifera* have been used to treat maximum number of ailments. IUCN status of 143 medicinal plant species showed that, 3 species are in near threatened (NT) category, 5 species vulnerable (VU), 3 species endangered (EN), 48 are in least concern (LC) category, 2 species are in data deficient (DD) category and the status is not evaluated (NE) for 82 species.

Keywords: Folk medicine, Western Ghats, Neurological disorders, Tribal communities, Conservation status

Background

Neurological conditions are associated with the nervous system, particularly the brain and the spinal cord, which plays a key role in performing number of important functions. Various factors affect the structure or function of brain (encephalopathy) or spinal cord (myelopathy) causing neurological or psychiatric or neurodegenerative complications. Neuroprotection denotes strategies to defend the nervous system against a number of factors such as structural defects, infections, neuronal injury, autoimmune disorders, neurodegeneration and tumors, which may lead to nervous system disorders (Upadhyay 2014). A new report from the World Health Organization, shows that neurological disorders affect up to one billion people worldwide, among them 6.8 million people die every year. In addition, the prevalence of CNS disorders is around two times higher in developing countries than in the developed world (Uddin & Zidorn 2020). Inadequate and inaccessible health facilities in the rural and remote areas have forced the various tribes and non-tribal communities to use ethno-phyto therapeutics against different ailments. Use of traditional medicine, has been a common practice globally against a number of diseases including neurological disorders such as convulsions, myalgia (Saki *et al*. 2014, Sharma *et al*. 2013), epilepsy (Sahranavard *et al*. 2014, Mballow *et al*. 2020), mental and neurological disorders (Maria *et al*. 2012, Amoateng *et al*. 2018, Laddimath & Rao 2016, Mabaleha *et al*. 2019), paralysis (Mikawlrawng *et al*. 2018), Alzheimer's disease, depression, dementia, Huntington's disease (Sharma *et al*. 2022). An increase in awareness on neurological conditions and possible therapeutic interventions has resulted in an increase in the herbal research and discovery of new natural compounds which possess neuro-pharmacological related activities (Femi-Akinlosotu *et al*. 2022, Dey *et al*. 2017).

Phytochemicals present in plants such as phenolic compounds, tannins, alkaloids and terpenoids have great therapeutic potential against these disorders. The herbal folk therapies in the form of crude extracts of single plant or combinations of plants have been used in alleviating and curing disorders related to nervous system. Many positive aspects of traditional medicine such as easy availability, minimum or no side effects, reliability and low cost could be attributed to their global acceptance (Amoateng *et al*. 2018). The use of medicinal plants in Unani, Siddha, and Ayurveda of traditional Indian healthcare practices is well known around the world. In India, around 70% of the rural population relies on traditional medicines for their treatment (Sharma *et al*. 2022).

Western Ghats region of Dakshina Kannada district is a treasure house of medicinal plants. Tribal communities such as Naikas, Malekudiya, Koragas, famous adivasi Nalike community and non-tribal ethnic communities such as Belchavada, Bhandary, Billava, Havyakas, Bunt, Devadiga, Ganiga, Kumbara, Mugera, Patali, Saraswaths, Vishwakarma, Vokkaliga, Parava and Yadavas inhabit remote forest regions. These communities practice and still rely on traditional medicine for their primary health care including neurological disorders (Bhandary 2000, Yogeesha & Krishnakumar 2022). A considerable number of researchers have documented ethnobotanical information from many parts of Western Ghats region of Karnataka (Bhandary 2000, Gireesha & Raju 2013, Lingaraju *et al*. 2013, Rajakumar & Shivanna 2009, Parinitha *et al*. 2004, Mahishi *et al*. 2005, Shiddamallayya *et al*. 2010 a, Shiddamallayya *et al*. 2010 b, Bhandary & Chandrashekar 2014, Savinaya *et al*. 2016). Previous ethnobotanical investigations from Uttara Kannada district of Karnataka indicated that Siddis (Bhandary *et al*. 1995), Gowlis (Bhandary *et al*. 1996), Kunabis (Harsha *et al*. 2002) and Khare Vokkaliga community (Achar *et al*. 2010) have been studied for their ethnic knowledge. Previously researchers' have documented ethnomedicinal information from the tribes such as Naikas (Bhat 2005) and Nalike (Acharya *et al*. 2022) inhabiting remote regions of Dakshina Kannada district.

Previous investigations have explored the ethnomedicinal information for the treatment of herpes in Coastal Karnataka (Bhandary & Chandrashekar 2011), wounds, bone fracture and arthritis in Uttara Kannada district (Bhat *et al*. 2012, Upadhya *et al*. 2012, Bhat *et al*. 2019), psychological disorders in Vijayapur district (Laddimath & Rao 2016), migraine and sprains in the Western Ghats of Dakshina Kannada district (Yogeesha & Krishnakumar 2022a, Yogeesha & Krishnakumar 2022b). However, ethno-medico-botanical investigations in Dakshina Kannada district are still incomplete. Hence, this is an attempt to fill this lacuna and carried out extensive studies on traditional herbal remedies for neurological disorders in this region. Results of this finding have been presented in this paper.

Materials and Methods

Study area

Dakshina Kannada is the southern district of Karnataka state, India, with an area of 4866 km^2. It lies between 12°23' - 13°49' North latitude and 74°37' - 75°41' East longitude (Figure 1). Annual average rainfall varies between 3500 mm and 4550 mm. About 85% of the annual rainfall occurs during the monsoon months. The taluks such as Puttur, Sullia, Kadaba, Belthangady and parts of Bantwal are along the Western Ghats in Karnataka and receive more rainfall than the coastal localities. Mean relative humidity is 78% with highest in July (89%) and lowest (55%) during December- January. Netravathi, Kumaradhara,

Phalguni, Shambhavi, Nandini and Payaswani are the major rivers of the district. Major crops of this region are areca nut, pepper, cocoa, rubber and coconut. Dakshina Kannada is well known for Yakshagana- a fabulous, costumed dance drama form, Kambala- the sport of buffalo racing by farmers, Kori-katta (Cock Fight), Nagaradhane- is a form of snake worship and Bootha Kola (Folk ritual dance).

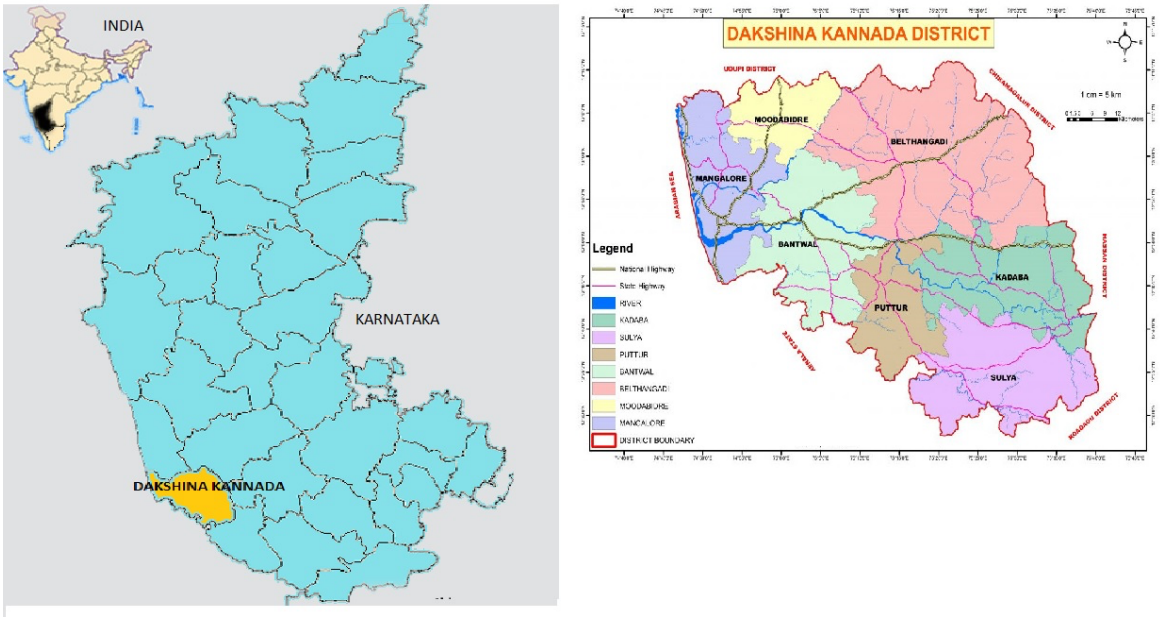

Figure1. Map of the study area showing location of the survey in Dakshina Kannada district, Karnataka state, India.

Ethno-botanical survey

Ethno-botanical information was documented from the local traditional healers from 2018 to 2022 through a total of 4 visits including a preliminary visit and a visit covering summer, rainy and winter seasons in the Western Ghats taluks such as Puttur, Sulya, Kadaba, Belthangady and parts of Bantawal (Figure 1 & 2).The data was collected through semi-structured open-ended interviews with the practitioners using a questionnaire (Martin 1995). Free and Prior Informed Consent has been taken verbally from each of the informant before all photographic documentations and written documentation of knowledge. The information was collected in the local Tulu and Kannada language and was then translated to English language. The written consent was also taken from traditional practitioners in the declaration part of questionnaire (Appendix-I).

Plant collection and identification

Plant specimens collected during field visits were identified using relevant floras such as Flora of South Kanara (Bhat 2014), Flora of Presidency of Madras (Gamble 1984), Flora of Karnataka (Saldahana 1984). The valid names of the plants were updated visiting World Flora Online (https://www.worldfloraonline.org) and Plants of the World Online (https://powo.science.kew.org). The voucher specimens were deposited in the herbarium of the Department of Applied Botany, Mangalore University, Karnataka State, India.

IUCN Conservation status

Identified plant species were checked for their present conservation status by consulting database Red List of Threatened Species (https://www.iucnredlist.org/).

Disease categorization

Medical terms for tribal terminology of different diseases, symptoms and ailments recorded during the survey were identified by consultation with allopathic medical practitioners. Finally all the diseases were categorized and tabulated following the standard method of Cook (1995) with some necessary modifications based on the findings of the present survey.

Plate. 1
Figure 2. Data collection by interviewing traditional practitioners (Plate. 1 and Plate. 2)

Data analysis

The data was analyzed using Microsoft office excel sheet by conventional methods and quantitative techniques. The information such as scientific name of the plant, family name, voucher specimen number, local name and part used in the herbal formulation were attributed to each species. Ethnobotanical quantitative tools such as use-value (UV), relative frequency of citation (RFC)) and informant consensus factor (ICF) were employed in analyzing the data. Data of this investigation were cross-checked with Ayurvedic literatures, other publications and have been presented in Table 2.

Use-Value (UV)

Use-value is a measure of importance of a plant species on the basis of number of different uses reported in a community. It is calculated using the following formula (Albuquerque *et al*. 2006),

$$UV = \sum Us/N$$

Where, UV is Use-value for the species, ∑Us is sum of the uses mentioned for a species; N is total number of informants.

Plate. 2

Figure 2. Data collection by interviewing traditional practitioners (Plate. 1 and Plate. 2)

Relative Frequency of Citation (RFC)

Relative frequency of citation is obtained by dividing the number of informants mentioning the use of a particular species to the total number of informants participated in the study. Highest number of citations for a particular plant species accounts for its wide use in a community. It is calculated using the following formula (Tardio & Pardo-de Santayana 2008),

$$RFC = FC/N$$

Where, RFC = Relative frequency of citation

FC = Number of informants who mentioned a particular species

N = Total number of informants.

RFC value usually ranges between 0 and 1. RFC value is close to zero when only few informants mention a particular species and the upper limit (one) is obtained when more informants quote a particular species.

Informant Consensus factor (ICF)

The informant consensus factor (ICF) is a measure employed to find out intercultural relevance and acceptability of use of a particular plant species in consideration. This value for a disease category ranges from 0 to 1. ICF values are low (near 0) if plants are selected randomly or if there is no exchange of information among healers and ICF values will be high (near 1) if there is a well-defined selection criterion in the community or if the information is exchanged between the informants.

The ICF is calculated using the following formula (Heinrich *et al*. 1998)

ICF = Nur- Nt/Nur-1

Where 'Nur' is the number of citations in each ailment category and 'Nt' is number of taxa used for particular ailment category.

Results and Discussion

Socio-Demographic Characteristics of Informants

In the present study, 92 traditional practitioners were interviewed (Table 1). Traditional practitioners of Dakshina Kannada district possess a rich and diversified ancestral medicinal knowledge. Of the informants, 71.74% were male and only 28.26% of the informants were female. From this investigation it has been revealed that only 2.17% of the informants aged below 40 years. A very good number of the informants were culturally experienced and senior members of the society aged above the 61 years (54.35%) whereas the rest of the informants (43.48%) were aged between 41 to 60 years. In this survey, it was found that herbal knowledge passed down from generation to generation as a family heirloom. Knowledge flow in a society depends on a number of factors, such as people's mentorship in a family, socio-economic status and availability of needed resources in the locality (Pradhan & Mondal 2023). Present data depicted that older people still rely on the valuable traditional system whereas it is dwindling among the younger generation. This is due to acculturation and modernization of the society and lack of interest in nurturing the traditional medicine-culture of the family. The younger generation is not familiar and serious to know about surrounding floristic composition and their local identity and uses (Ambu *et al*. 2020, Lingaraju *et al*. 2013, Pradhan & Mondal 2023).

Table1. Demographic data of traditional practitioners

Variable	Categories	No. Of Persons	Percentage
Gender	Male	66	71.74%
	Female	26	28.26%
Age group	Below 40 Years	2	2.17%
	41-60 Years	40	43.48%
	61-80 Years	44	47.83%
	Above 81 Years	6	6.52%
Education	No Formal education	20	21.74%
	Primary Education	41	44.57%
	Secondary education	28	30.43%
	Graduation	3	3.26%
Profession	Najee Vaidyas	68	73.91%
	Agriculturist	12	13.04%
	Agricultural Labourers	11	11.96%
	RMP	1	1.09%
Source of Knowledge	Family Inheritance	85	92.39%
	Trained	7	7.61%

Enumeration of ethnomedicinal plants

A total of 143 species of plants belonging to 61 families has been recorded from the district. The plant species are arranged alphabetically with botanical name, family name, parts used, disease treated, RFC, UV, conservation status. Present data on mentioned plants were crosschecked with the Ayurvedic books and several publications using online resources and has been presented in Table 2.

The most represented family was Fabaceae (16 species), followed by Apocynaceae (8 species), Rutaceae and Lamiaceae (7 species each), Rubiaceae and Euphorbiaceae (6 species each), Apiaceae and Asteraceae (5 species each), Phyllanthaceae, Acanthaceae and Moraceae (4 species each), Malvaceae, Myrtaceae, Combretaceae, Solanaceae and Oleaceae (3 species each) and other families with 1 or 2 species. Our findings agree with earlier surveys conducted in different localities where Fabaceae, Apocynaceae, Rutaceae, Phyllanthaceae, Rubiaceae, Acanthaceae, Malvaceae, Euphorbiaceae and Lamiaceae to be the dominant families (Bhat 2005, Maria *et al*. 2012, Singh *et al*. 2020). These families also possess a wide variety of aromatic, medicinal plants producing essential oils which contains variety of bioactive compounds responsible for healing activities (Ayyanar & Ignacimuthu 2011, Biswas *et al*. 2010). Habit wise trees were the primary source of medicine (56 species), followed by herbs (38 species), shrubs (25 species) and climbers (24 species) (Table 2). Majority of the plant species used in ethnomedicine were wild (101 species) and 42 species were cultivated. The traditional healers use different plant parts for the preparation of remedies. The most commonly used part was leaves (38.68%) followed by bark (16.02%), root

(12.71%), seed (12.15%), fruit (7.18%), whole plant (4.97%), stem (3.87%), flower (1.66%) and heart wood (1.11%), rhizome, bulb and prop root (0.55% each) (Figure 3). The predominance of life forms of medicinal plants and the parts used for the preparation of formulation, in the present finding agrees with earlier reports (Mohanty *et al*. 2015, Halim *et al*. 2007). A traditional belief on the use of leaves in ethnomedicine is very much logical and acceptable since leaves are the site of accumulation of minerals through different physiological processes like ascent of sap and synthesis of secondary metabolites through biochemical processes including photosynthesis (Chaachouay *et al*. 2019, Mohanty *et al*. 2015, Yogeesha & Krishnakumar 2022a, Zheng & Xing 2009, Giday *et al*. 2003).

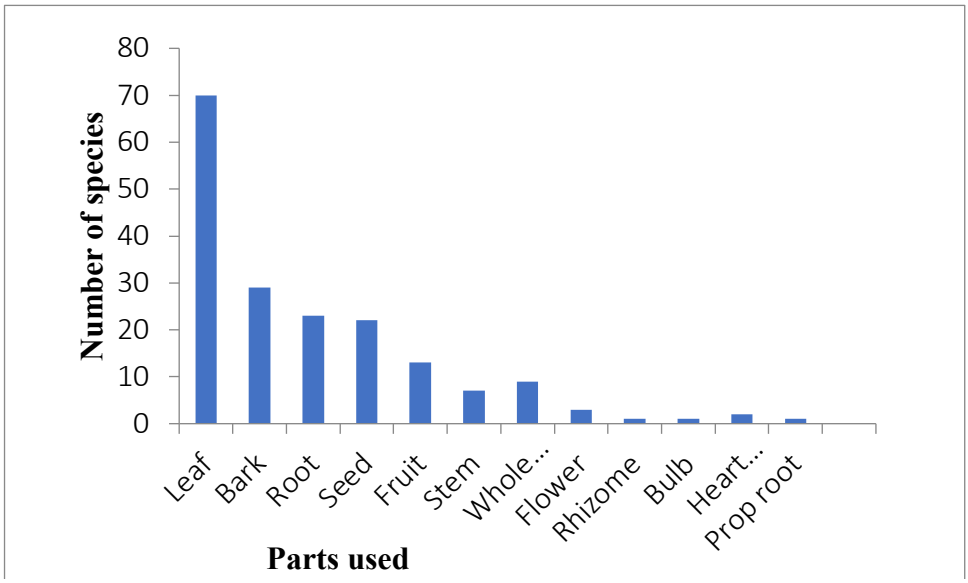

Figure 3. Plant parts used versus number of species

Traditional practitioners employ different modes of remedy preparations to facilitate the administration of active principles of the plant (Table 3). Most preferred method was preparation of oil (51.64%) followed by paste (17.21%), decoction (13.11%), juice (8.20%), powder (7.38%), tablet (1.64%) and medicated food (0.93%) (Figure 4). Route of administration depends on type of disease and ingredients used in remedy preparation. External uses (72.96%) were predominant over internal uses (27.04%). Selection of plant parts in the preparation of ethnomedicine depends on type of formulation, category of disease and availability of plant parts during different seasons. The plant parts are used afresh, or shade dried and was preserved in airtight containers for future use (Pradhan & Mondal 2023). Traditional healers use different ingredients such as cow's milk, honey, rice water, cow's urine, ghee, hot water as the medium for herbal drug preparation. These ingredients will enhance and improve the medicinal property of the preparations (Rahim *et al*. 2023, Bhat *et al*. 2019). In this study, 27 monoherbal and 95 polyherbal formulations have been reported in the treatment of neurological disorders (Table 3). Use of polyherbal drug formulation could be attributed to the belief of synergic reactions where one plant enhances the medicinal value of the other. Multiple prescriptions contain a wide range of pharmacologically active metabolites and hence polyherbal combinations have more healing power than a single medicinal plant (Senthilkumar *et al*. 2013, Rani *et al*. 2011). Application of drug on forehead was common in case of insomnia. Oral intake of medicine in the form of paste, decoction or powder mixed with honey or milk has been suggested by practitioners for epilepsy, psychosis and depression. Most popular method in the treatment of paralysis involves direct external application of oil followed by massage and a medicated bath with decoction. This is in consistent with the general observations made earlier in relation to ethnomedicinal documentations (Bhat 2005, Uddin & Zidorn 2020). However, the dosage, method and duration of treatment were entirely based on patient's physical condition, age and severity of the symptoms which is revealed in previous surveys also (Bhat *et al*. 2019, Chaachouay *et al*. 2019, Rajakumar 2010).

Earlier reports revealed that, the use of 35 ethnomedicinal species namely *Abrus pulchellus*, *Acacia rugata*, *Acampe praemorsa*, *Ailanthus triphysa*, *Annona muricata*, *Averrhoa carambola*, *Baccharoides anthelmintica*, *Breynia vitis-idaea*, *Bridelia stipularis*, *Buchanania cochinchinensis*, *Bunium bulbocastanum*, *Calophyllum apetalum*, *Careya arborea*, *Citrus reticulata*, *Colocasia antiquorum*, *Cyanthillium cinereum*, *Embelia tsjeriam-cottam*, *Eryngium foetidum*, *Euphorbia thymifolia*, *Ficus drupacea*, *Gymnostachyum febrifugum*, *Hydnocarpus wightianus*, *Ichnocarpus frutescens*, *Jasminum malabaricum*, *Madhuca neriifolia*, *Magnolia champaca*, *Merremia tridentata*, *Naregamia alata*, *Neolamarckia cadamba*, *Salacia chinensis*, *Scleropyrum pentandrum*, *Sida alnifolia*, *Syzygium caryophyllatum*, *Terminalia crenulata*, *Thottea siliquosa* and *Thunbergia*

mysorensis documented from the study area are exclusively new reports in respect of their parts used, mode of administration and medicinal uses pertaining to neurological disorders (Sharma & Sahu 2022, Khare 2008, Nambiar *et al*. 1985, Bhandary 2000, Bhat 2005, Saroya 2017). It is noteworthy information among the mentioned plants that, *Calophyllum apetalum*, *Cyclea peltata*, *Dalbergia horrida*, *Garcinia indica*, *Gymnostachyum febrifugum*, *Hydnocarpus wightianus*, *Ixora brachiata*, *Jasminum malabaricum*, *Myristica malabarica*, *Pterocarpus santalinus*, and *Vateria indica* were endemic to Western Ghats and Peninsular India (Sasidharan 2004).

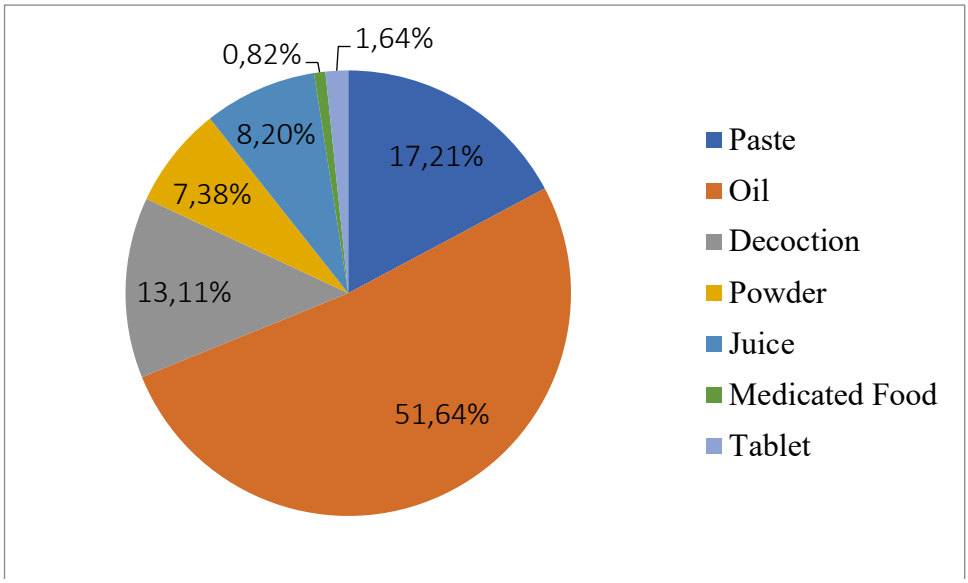

Figure 4. Types of formulation

Quantitative analysis

Use values of reported plant taxa are listed in table 2. This value ranged from 0.03 to 1. The highest use value (UV=1) was scored by five species namely *Cyclea peltata*, *Santalum album*, *Ficus drupacea*, *F. religiosa* and *Haldina cordifolia*, followed by *Piper longum* (UV=0.75), *Aegle marmelos*, *Aloe vera*, *Aristolochia indica*, *Ceiba pentandra*, *Ixora coccinea*, *Dalbergia horrida*, *Eucalyptus tereticornis*, *Pterocarpus marsupium*, *Moringa oleifera*, *Magnolia champaca*, *Sida alnifolia*, *Withania somnifera* and *Salacia chinensis* (UV=0.67 each). Certain plant species such as *Azadirachta indica*, *Calotropis gigantea*, *Hemidesmus indicus*, *Euphorbia thymifolia*, *Ricinus communis* (UV=0.60 each), *Vitex negundo*, *Sesamum indicum* and *Leucas aspera* (UV=0.50 each), *Rauvolfia serpentina* (UV=0.44), *Cynodon dactylon* (UV=0.36), *Naregamia alata* (0.33), *Cuminum cyminum* (UV=0.25) and *trigonella foenum-graecum* (UV=0.23) are considered as very important medicinal plants used against neurological disorders.

The Relative Frequency of Citation values of reported plant taxa are listed in Table 2. Results of this study depicted that *Eclipta prostrata* exhibited the higher RFC (0.36), followed by *Centella asiatica* (RFC=0.26), *Phyllanthus emblica* (RFC=0.21), *Citrus limon* (RFC=0.18), *Cuminum cyminum* (RFC=0.17), *Trigonella foenum-graecum* (RFC=0.14), *Cynodon dactylon*, and *Garcinia indica* (RFC=0.12 each), *Naregamia alata*, *Rauvolfia serpentina* and *Ventilago maderaspatana* (RFC=0.10 each) and *Merremia tridentata* (RFC=0.09). The higher RFC values indicate that these species are most familiar and harvested very frequently from the habitat whereas the low RFC value indicates the comparatively less use pressure on those species (Pradhan & Mondal 2023). Previous literature reports were available for the medicinal uses of 106 plant species documented in this study (Table 2). However, medicinal plant species such as *Merremia tridentata* (with high RFC value), *Ficus drupacea*, and *Sida alnifolia* (with high use values) reported against paralysis and insomnia in this study which was not reported earlier. Similarly, *Euphorbia thymifolia* (with high use value) was newly reported in this study against paralysis, insomnia and depression. The medicinal species *Naregamia alata* (with high RFC value) is newly reported against psychosis, paralysis and insomnia.

Table 2: Ethnomedicinal plant species used to treat neurological disorders in the Western Ghats region of Dakshina Kannada district, Karnataka, India.

Botanical Name, Family Name, Voucher Number	**Local Name**	**Parts used**	**Ethnomedicinal uses**	**IUCN status**	**RFC**	**UV**	**Literature reports for the treatment of neurological disorders**
Abrus pulchellus Thwaites., Fabaceae, YGA 132	Usulu Balli	Leaf, Root	Depression	NE	0.02	0.50	NR
Acacia rugata (Lam.) Fawc. & Rendle., Fabaceae, YGA 118	Seegekai	Fruit, Leaf	Paralysis	NE	0.04	0.25	NR
Acampe praemorsa (Roxb.) Blatt. & McCann., Orchidaceae, YGA 086	Marabare	Whole plant, Leaf	Paralysis	NE	0.02	0.50	NR
Achyranthes aspera L., Amaranthaceae, YGA 055	Uttarane	Leaf, Whole plant	Insomnia	NE	0.03	0.33	Epilepsy, paralysis (Uddin & Zidorn 2020); epilepsy (Santhoshkumar *et al*. 2019); antidepressant, anti-inflammatory (Sharma & Sahu 2022); insomnia (Saroya 2017)
Acorus calamus L., Acoraceae, YGA 138	Baje	Root	Psychosis	LC	0.01	1.00	Mental problems (Nambiar *et al*.1985); epilepsy, paralysis (Uddin & Zidorn 2020); epilepsy (Santhoshkumar *et al*. 2019); psychoneurosis, epilepsy (Khare 2008); epilepsy, neurosis, insomnia (Sharma & Sahu 2022); memory enhancer (Saroya 2017)
Aegle marmelos (L.) Correa., Rutaceae, YGA 062	Bilva	Leaf	Paralysis, Insomnia	NT	0.03	0.67	Paralysis, mental disorders (Uddin & Zidorn 2020); anti-inflammatory (Sharma & Sahu 2022); epilepsy, myalgia, mental illness (Saroya 2017)
Ageratum conyzoides (L.) L., Asteraceae, YGA 159	Parangi Tulasi/ Naayi Tulasi	Leaf	Paralysis	NE	0.01	1.00	Paralysis (Uddin & Zidorn 2020); nervous disorders (Amoateng *et al*. 2018)
Ailanthus triphysa (Dennst.) Alston., Simaroubaceae	Dhoopada Mara	Leaf	Paralysis	NE	0.01	1.00	NR
Allium sativum L., Amaryllidaceae, YGA 164	Belluli	Bulb	Paralysis	NE	0.08	0.14	Paralysis (Mikawlrawng *et al*. 2018); nervous disorders (Amoateng *et al*. 2018); epilepsy (Santhoshkumar *et al*. 2019); epilepsy, psychosis (Khare 2008); neuromuscular diseases (Sharma & Sahu 2022); convulsions (Saroya 2017)
Aloe vera (L.) Burm.f., Xanthorrhoeaceae, YGA 013	Lolerasa	Leaf	Paralysis, Insomnia	NE	0.03	0.67	Paralysis (Uddin & Zidorn 2020); mental problems (Khare 2008); insomnia (Bhat 2005); epilepsy, analgesic (Sharma & Sahu 2022)

Alstonia scholaris (L.) R. Br., Apocynaceae, YGA 114	Balindra Pale/ Entani	Bark	Paralysis	LC	0.01	1.00	Nervous debility (Uddin & Zidorn 2020); paralysis (Acharya *et al*. 2022)
Annona muricata L., Annonaceae, YGA 225	Laxmanaphala	Seed, Leaf	Psychosis	LC	0.02	0.50	NR
Arachis hypogaea L., Fabaceae, YGA 131	Nelakadale	Seed	Paralysis	NE	0.01	1.00	Antialzheimer (Nadaf *et al*. 2019); paralysis (Acharya *et al*. 2022)
Aristolochia indica L., Aristolochiaceae, YGA 068	Iswaraberu	Root	Paralysis, Epilepsy	NE	0.03	0.67	Epilepsy (Kariyajjanavar *et al*. 2016); paralysis (Acharya *et al*. 2022); nervous disorders (Santhoshkumar *et al*. 2019)
Asparagus racemosus Willd., Asparagaceae, YGA 106	Uduriballi/ Shathavari	Leaf	Insomnia	NE	0.01	1.00	Paralysis (Mikawlrawng *et al*. 2018); paralysis (Acharya *et al*. 2022); epilepsy, nervous disorders (Santhoshkumar *et al*. 2019); antistress, antispasmodic, epilepsy (Sharma & Sahu 2022); epilepsy (Saroya 2017)
Averrhoa carambola L., Oxalidaceae, YGA 047	Darepuli	Fruit	Paralysis	NE	0.01	1.00	NR
Azadirachta indica A.Juss., Meliaceae, YGA 043	Kahibevu	Seed, Leaf	Paralysis, Insomnia, Epilepsy	LC	0.05	0.60	Nervous disorders (Amoateng *et al*. 2018); paralysis (Acharya *et al*. 2022); CNS depressant , analgesic (Sharma & Sahu 2022); neuromuscular pain (Saroya 2017)
Baccharoides anthelmintica (L.) Moench., Asteraceae, YGA 195	Kalajeerige	Seed	Paralysis	NE	0.02	0.50	NR
Baringtonia racemosa (L.) Spreng., Lecythidaceae, YGA 115	Samudra maphala	Bark, Leaf	Paralysis	NE	0.01	1.00	Insomnia (Yogeesha & Kumar 2022)
Borassus flabellifer L., Arecaceae, YGA 066	Thale Mara	Leaf	Epilepsy	EN	0.07	0.17	Epilepsy (Uddin & Zidorn 2020); paralysis (Acharya *et al*. 2022)
Brassica nigra (L.) K.Koch., Brassicaceae, YGA 137	Sasive	Seed	Paralysis	LC	0.05	0.20	Paralysis (Shiddamallayya *et al*. 2016)
Breynia vitis-idaea (Burm.f.) C.E.C.Fisch. Phyllanthaceae, YGA 058	Pallisoppu	Leaf	Paralysis	LC	0.01	1.00	NR
Bridelia stipularis (L.) Blume., Phyllanthaceae, YGA 123	Banda gida	Bark	Paralysis	LC	0.01	1.00	NR
Buchanania cochinchinensis (Lour.) M. R.Almeida., Anacardiaceae, YGA 141`	Erpe Mara	Bark	Paralysis	NE	0.01	1.00	NR
Bunium bulbocastanum L., Apiaceae, YGA 146	Karijeerige	Seed	Paralysis, Insomnia	LC	0.05	0.40	NR
Butea monosperma (Lam.) Taub., Fabaceae, YGA 149	Palasha	Leaf	Insomnia	LC	0.01	1.00	Antispsmodic, anticonvulsant, antistress (Sharma & Sahu 2022)
Caesalpinia bonduc (L.) Roxb., Fabaceae, YGA 064	Kalengikai	Leaf	Paralysis	LC	0.01	1.00	Epilepsy, nervous complaints (Nambiar *et al*. 1985)

Calophyllum apetalum Willd., Calophyllaceae, YGA 071	Sirihonne	Seed	Paralysis	VU	0.01	1.00	NR
Calophyllum inophyllum L., Calophyllaceae, YGA 070	Ponne Mara	Seed	Paralysis, Insomnia	LC	0.07	0.33	Paralysis (Acharya *et al.*.2022)
Calotropis gigantea (L.) Dryand., Apocynaceae, YGA 017	Ekkada Gida	Leaf	Paralysis, Insomnia, Epilepsy	NE	0.05	0.60	Paralysis (Nambiar *et al*. 1985); paralysis (Uddin & Zidorn 2020); epilepsy (Santhoshkumar *et al*. 2019); paralysis (Acharya *et al*. 2022)
Carallia brachiata (Lour.) Merr., Rhizophoraceae, YGA 116	Andipunar	Bark, Leaf	Paralysis	NE	0.01	1.00	Anti-inflammatory (Khare 2008)
Careya arborea Roxb., Lecythidaceae, YGA 045	Daddalu/ Kumbi Mara	Bark	Paralysis	NE	0.01	1.00	NR
Cassia fistula L., Fabaceae, YGA 117	Konde Mara	Bark, Leaf	Paralysis	LC	0.01	1.00	Inflammation (Nambiar *et al*. 1985); epilepsy, nervous debility (Uddin & Zidorn 2020); paralysis (Mikawlrawng *et al*. 2018); epilepsy (Santhoshkumar *et al*. 2019)
Catharanthus roseus (L.) G.Don., Apocynaceae, YGA 218	Sada Puspha	Root,	Depression, Epilepsy	NE	0.04	0.50	Mental disorders (Laddimath & Rao 2016); Hypertension (Santhoshkumar *et al*. 2019); mental disorders (Khare 2008); analgesic (Saroya 2017)
Ceiba pentandra (L.) Gaertn., Malvaceae, YGA 129	Hasige Hatthi Mara	Leaf, Bark	Paralysis, Insomnia	LC	0.03	0.67	Migraine (Khare 2008)
Centella asiatica (L.) Urb., Apiaceae, YGA 056	Ondelaga	Whole plant	Psychosis, Insomnia, Epilepsy	LC	0.26	0.13	Epilepsy (Nambiar *et al*. 1985); mental disorders (Uddin & Zidorn 2020); neurosis (Santhoshkumar *et al*. 2019); sedative (Khare 2008); epilepsy (Acharya *et al*. 2022); anticonvulsant, antidepressant antispasmodic (Sharma & Sahu 2022)
Cinnamomum verum J.Presl., Lauraceae, YGA 052	Ijin kette/ Dalchinni	Bark	Paralysis	NE	0.04	0.25	Paralysis (Acharya *et al*. 2022); headache, paralysis (Sharma & Sahu 2022)
Citrus limon (L.) Osbeck., Rutaceae, YGA 030	Nimbe Gida	Fruit	Paralysis, Insomnia, Epilepsy	LC	0.18	0.18	Paralysis (Vinay *et al*. 2013); migraine (Nagalakshmi & Rashmi 2020)
Citrus medica L., Rutaceae, YGA 005	Mahaphala	Leaf	Paralysis	LC	0.01	1.00	Headache (Santhoshkumar *et al*. 2019); spasmodic pain (Sharma & Sahu 2022)
Citrus reticulata Blanco., Rutaceae, YGA 221	Narangi/ Kaipura	Fruit	Insomnia	NE	0.04	0.25	NR
Clerodendrum infortunatum L., Lamiaceae, YGA 050	Ittovu	Root	Paralysis	LC	0.01	1.00	Alzheimer's disease (Uddin & Zidorn 2020); paralysis (Acharya *et al*. 2022)
Coccinia grandis (L.) Voigt., Cucurbitaceae, YGA 111	Manoli	Leaf	Psychosis	NE	0.02	0.50	Mental disorders, paralysis (Uddin & Zidorn 2020); nervous tension, insomnia (Bhat 2005)

Cocos nucifera L., Arecaceae, YGA 223	Tengina Mara	Fruit	Insomnia	NE	0.01	1.00	Mental disorders (Laddimath & Rao 2016); nervous disorders (Amoateng *et al*. 2018); anti-inflammatory (Bhat 2005)
Colocasia antiquorum Schott., Araceae, YGA 110	Karimundi	Leaf	Insomnia	NE	0.01	1.00	NR
Coriandrum sativum L., Apiaceae, YGA 217	Kottambari	Seed	Insomnia	NE	0.01	1.00	Sedative (Nadaf *et al*. 2019); neuralgia (Khare 2008)
Croton persimilis Mull.Arg., Euphorbiaceae, YGA 042	Somara Mara	Root, Bark	Paralysis	NE	0.03	0.33	Neurosis (Bhandary 2000); arthritis (Bhandary *et al*. 1996); neurosis (Bhat 2005)
Cuminum cyminum L., Apiaceae, YGA 119	Jeerige	Seed	Psychosis, Paralysis, Depression, Insomnia	NE	0.17	0.25	Paralysis (Acharya *et al*. 2022); neuroprotective, antiepileptic (Sharma & Sahu 2022)
Cyanthillium cinereum (L.) H.Rob., Asteraceae, YGA 167	Sahadevi	Leaf	Insomnia	NE	0.01	1.00	NR
Cyclea peltata (Lam.) Hook.f. &Thomson., Menispermaceae, YGA 051	Padlisoppu	Root	Depression, Insomnia	NE	0.02	1.00	Insomnia (Bhat 2005)
Cynodon dactylon (L.) Pers., Poaceae, YGA 044	Garike	Whole plant	Psychosis, Depression, Insomnia, Epilepsy	NE	0.12	0.36	Insomnia (Bhat 2005): epilepsy (Nambiar *et al*. 1985); convulsions, CNS depressant (Sharma & Sahu 2022)
Cyperus rotundus L., Cyperaceae, YGA 148	Bhadramusti	Root	Paralysis	LC	0.01	1.00	Mental disorders (Laddimath & Rao 2016); Paralysis (Uddin & Zidorn 2020); sedative (Nadaf *et al*. 2019); paralysis (Acharya *et al*. 2022); antispasmodic, anticonvulsant, neuroprotective (Sharma & Sahu 2022); analgesic (Saroya 2017)
Dalbergia horrida (Dennst.) Mabb., Fabaceae, YGA 079	Parantolu	Leaf	Psychosis, Insomnia	NT	0.03	0.67	CNS active (Khare 2008)
Eclipta prostrata (L.) L., Asteraceae, YGA 084	Garuga	Leaf	Insomnia	LC	0.36	0.03	Vertigo, brain tonic (Uddin & Zidorn 2020); insomnia (Khare 2008); anti-inflammatory (Saroya, 2017)
Elephantopus scaber L., Asteraceae, YGA 175	Nelamacchur	Leaf	Insomnia	NE	0.01	1.00	Migraine (Bhandary *et al*. 1996); paralysis (Acharya *et al*. 2022)
Embelia tsjeriam-cottam (Roem. & Schult.) A. DC., Primulaceae, YGA 140	Vayuvilanga/ Balanga	Fruit	Paralysis	NE	0.01	1.00	NR
Eryngium foetidum L., Apiaceae, YGA 139	Kadu kottambari	Leaf	Depression	NE	0.01	1.00	NR
Erythrina variegata L., Fabaceae, YGA 053	Pongare Mara	Leaf	Paralysis	LC	0.01	1.00	Epilepsy (Uddin & Zidorn 2020); paralysis, epilepsy (Santhoshkumar *et al*. 2019)
Eucalyptus tereticornis Sm., Myrtaceae, YGA 100	Neelagiri	Bark, Leaf	Paralysis, Depression	LC	0.03	0.67	

Euphorbia hirta L., Euphorbiaceae, YGA 212	Taddina gida	Whole plant	Paralysis	NE	0.01	1.00	Hypertension (Nambiar *et al*. 1985); epilepsy (Maria *et al*. 2012)
Euphorbia neriifolia L., Euphorbiaceae, YGA 048	Kolkalli	Stem	Paralysis	LC	0.02	0.50	Mental disorders (Uddin & Zidorn 2020)
Euphorbia thymifolia L., Euphorbiaceae, YGA 216	Nelambale	Whole plant	Paralysis, Depression, Insomnia	NE	0.05	0.60	NR
Ficus benghalensis L., Moraceae, YGA 081	Goli Mara/ Alada Mara	Prop Root	Insomnia	NE	0.03	0.33	Epilepsy (Uddin & Zidorn 2020)
Ficus drupacea Thunb., Moraceae, YGA 158	Goni Mara	Leaf	Paralysis, Insomnia	LC	0.02	1.00	NR
Ficus racemosa L., Moraceae, YGA 171	Atti	Bark	Insomnia	LC	0.01	1.00	Paralysis (Acharya *et al*. 2022); inflammations (Khare 2008)
Ficus religiosa L., Moraceae, YGA 091	Ashwattha	Bark, Leaf	Paralysis, Insomnia	LC	0.02	1.00	Parkinson's disease, memory deficit (Uddin & Zidorn 2020)
Garcinia indica (Thouars) Choisy., Clusiaceae, YGA 145	Punarpuli	Fruit, Leaf	Psychosis, Insomnia	VU	0.12	0.18	CNS depressant, anti-inflammatory (Khare 2008)
Glycyrrhiza glabra L., Fabaceae, YGA 227	Jesta Maddu	Stem, Leaf	Epilepsy	LC	0.01	1.00	Antidepressant (Nadaf *et al*., 2019); paralysis (Acharya *et al*. 2022); epilepsy, spasmolytic (Sharma & Sahu 2022)
Gymnostachyum febrifugum Benth., Acanthaceae, YGA 161	Nelamucchala	Leaf	Insomnia	NE	0.01	1.00	NR
Haldina cordifolia (Roxb.) Ridsdale., Rubiaceae, YGA 226	Anavu	Bark	Paralysis, Epilepsy	NE	0.02	1.00	Paralysis (Acharya *et al*. 2022), inflammation (Nambiar *et al*. 1985)
Hemidesmus indicus (L.)R.Br.ex Schult., Apocynaceae, YGA 018	Namadari/ Sukurma	Root	Paralysis, Insomnia, Epilepsy	NE	0.05	0.60	Mental disorders (Uddin & Zidorn 2020); convulsions (Santhoshkumar *et al*. 2019); paralysis (Acharya *et al*. 2022); epilepsy (Sharma & Sahu 2022); epilepsy (Saroya 2017)
Hesperethusa crenulata (Roxb.) M.Roem., Rutaceae, YGA 024	Majikkare	Leaf	Psychosis	LC	0.01	1.00	Anti-inflammatory (Wangthong *et al*. 2010)
Hibiscus rosa- sinensis L., Malvaceae, YGA 082	Dasavala	Flower	Insomnia	NE	0.04	0.25	Epilepsy (Santhoshkumar *et al*. 2019)
Holarrhena pubescens Wall. ex G.Don., Apocynaceae, YGA 016	Kodanchi	Bark	Paralysis	LC	0.03	0.33	Paralysis (Acharya *et al*. 2022); antispasmodic, CNS depressant, analgesic (Sharma & Sahu 2022)
Holoptelea integrifolia (Roxb.) Planch., Ulmaceae, YGA 037	Rahubeeja	Leaf	Paralysis	NE	0.01	1.00	Migraine (Yogeesha & Kumar 2022)
Hybanthus enneaspermus (L.) F.Muell., Violaceae, YGA 113	Purusharathna	Whole plant	Paralysis	NE	0.01	1.00	Epilepsy (Nambiar *et al*. 1985); nervine tonic (Bhat 2005)
Hydnocarpus wightianus Blume., Achariaceae, YGA 213	Netti kai/ Chalmogru	Seed	Paralysis	NE	0.02	0.50	Anti-inflammatory (Khare 2008)

Ichnocarpus frutescens (L.) W. T. Aiton., Apocynaceae, YGA 088	Peru Balli	Stem, Leaf	Paralysis	NE	0.01	1.00	NR
Indigofera tinctoria L., Fabaceae, YGA 059	Neelisoppu	Leaf	Insomnia	NE	0.01	1.00	Epilepsy (Nambiar *et al*. 1985); epilepsy (Maria *et al*. 2012); epilepsy (Khare 2008); vertigo (Sharma & Sahu 2022)
Ixora brachiata Roxb., Rubiaceae, YGA 154	Kurejji	Bark	Paralysis	NE	0.01	1.00	Paralysis (Acharya *et al*. 2022); Inflammation (Santhoshkumar *et al*. 2019)
Ixora coccinea L., Rubiaceae, YGA 028	Kepula	Root, Leaf	Insomnia, Epilepsy	NE	0.03	0.67	Insomnia, vertigo (Bhat 2005); paralysis, joint pain (Acharya *et al*. 2022); sedative, anti-inflammatory (Khare 2008)
Jasminum grandiflorum L., Oleaceae, YGA 057	Jajimallige	Leaf	Insomnia	NE	0.04	0.25	Paralysis (Mikawlrawng *et al*. 2018); sedative, CNS depressant (Khare 2008); paralysis (Acharya *et al*. 2022)
Jasminum malabaricum Wight., Oleaceae, YGA 209	Kadumallige/ Edroli soppu	Leaf	Paralysis	NE	0.01	1.00	NR
Jasminum sambac(L.) Aiton., Oleaceae, YGA 172	Gundu Mallige	Leaf	Insomnia	NE	0.01	1.00	Insanity (Uddin & Zidorn 2020)
Jatropha curcas L., Euphorbiaceae, YGA 102	Beli alamuda	Seed	Paralysis	LC	0.04	0.25	Insomnia (Bhat 2005); paralysis (Acharya *et al*. 2022); CNS depressant (Khare 2008)
Justicia adhatoda L., Acanthaceae, YGA 085	Adusoge	Leaf	Insomnia, Epilepsy	LC	0.07	0.33	Epilepsy (Santhoshkumar *et al*. 2019); paralysis (Acharya *et al*. 2022); antispasmodic, neuromuscular disease (Sharma & Sahu 2022)
Justicia gendarussa Burm.f., Acanthaceae, YGA 025	Sude Nekki/ Vatankolli	Leaf	Paralysis	LC	0.03	0.33	Paralysis (Uddin & Zidorn 2020); paralysis (Khare 2008)
Kaempferia galanga L., Zingiberaceae, YGA 105	Kasturi Gedde/ Kacchura	Rhizome	Depression	DD	0.01	1.00	Paralysis (Uddin & Zidorn 2020); insomnia, anxiety (Bhat 2005)
Lawsonia inermis L., Lythraceae, YGA 136	Madarangi	Leaf	Insomnia	LC	0.04	0.25	Migraine (Santhoshkumar *et al*. 2019); anti-inflammatory (Khare 2008); epilepsy, vertigo (Sharma & Sahu 2022)
Leucas aspera (Willd.) Link., Lamiaceae, YGA 004	Thumbe	Leaf	Depression, Insomnia, Epilepsy	NE	0.07	0.50	Migraine (Parinatha *et al*. 2004); headache (Uddin & Zidorn 2020); migraine, paralysis (Acharya *et al*. 2022)
Madhuca neriifolia (Moon) H.J.Lam., Sapotaceae, YGA 214	Nanil	Seed	Paralysis, Insomnia	LC	0.04	0.50	NR
Magnolia champaca (L.) Baill. ex Pierre., Magnoliaceae, YGA 072	Sampige	Seed	Paralysis, Insomnia	LC	0.03	0.67	NR
Merremia tridentata (L.) Hallier f., Convolvulaceae, YGA 095	Naikula Balli	Stem, Leaf	Paralysis, Insomnia	NE	0.09	0.25	NR

Moringa oleifera Lam., Moringaceae, YGA 015	Nugge Mara	Bark	Psychosis, Paralysis	LC	0.03	0.67	Paralysis, epilepsy (Uddin & Zidorn 2020); migraine (Mahishi *et al*. 2005); paralysis (Shiddamallayya *et al*. 2010); paralysis, neuralgia, antispasmodic (Sharma & Sahu 2022); nervous debility, paralysis (Saroya 2017)
Murraya Koenigii (L.) Spreng., Rutaceae, YGA 065	Karibevu	Leaf	Insomnia	LC	0.03	0.33	Spasmolytic, anti-inflammatory (Khare 2008)
Myristica fragrans Houtt., Myristicaceae, YGA 012	Jayikai	Fruit	Paralysis, Insomnia	DD	0.04	0.50	Mental disorders (Laddimath & Rao 2016); paralysis (Acharya *et al*. 2022); convulsions, antidepressant (Sharma & Sahu 2022)
Myristica malabarica Lam., Myristicaceae, YGA 061	Doddajaikai/ Ramapatre	Bark	Insomnia	VU	0.01	1.00	Paralysis (Acharya *et al*. 2022)
Naregamia alata Wight & Arn., Meliaceae, YGA 155	Nelacheri	Whole plant, Leaf	Psychosis, Paralysis, Insomnia	NE	0.10	0.33	NR
Nelumbo nucifera Gaertn., Nelumbonaceae, YGA 173	Thavare	Root, Flower	Insomnia	NE	0.02	0.50	Nervous debility (Uddin & Zidorn 2020); vertigo (Khare 2008)
Neolamarckia cadamba (Roxb.) Bosser., Rubiaceae, YGA 092	Kadamba	Bark	Paralysis	NE	0.01	1.00	NR
Ocimum basilicum L., Lamiaceae, YGA 125	Kamakasturi	Leaf	Paralysis	NE	0.01	1.00	Nerve tonic (Nadaf *et al*. 2019); anti-inflammatory (Khare 2008)
Ocimum tenuiflorum L., Lamiaceae, YGA 040	Tulasi	Leaf	Insomnia, Epilepsy	NE	0.08	0.29	Epilepsy (Suresha *et al*. 2018); mental disorders (Shiddamallayya *et al*. 2010); insomnia (Gowramma *et al*. 2020); antispasmodic, insomnia, antistress , analgesic (Sharma & Sahu 2022); anti-inflammatory (Saroya 2017)
Oldenlandia auricularia (L.) K. Schum., Rubiaceae, YGA 207	Nelanekkare	Stem, Leaf	Psychosis, Insomnia	NE	0.07	0.33	Anti-inflammatory (Anuja *et al*. 2018)
*Opuntia dillen*ii (Ker Gawl.) Haw., Cactaceae, YGA 157	Paapaskalli	Stem	Paralysis	LC	0.01	1.00	Paralysis (Uddin & Zidorn 2020); anti-inflammatory (Khare 2008)
Phyllanthus amarus Schumach. & Thonn., Phyllanthaceae, YGA 094	Nela Nelli	Whole plant, Leaf	Insomnia	NE	0.08	0.14	Anti-inflammatory (Khare 2008)
Phyllanthus emblica L., Phyllanthaceae, YGA 078	Nelli/Dhaatri	Fruit, Bark, Leaf	Insomnia	LC	0.21	0.05	Anti-inflammatory (Nambiar *et al*. 1985); epilepsy, paralysis (Uddin & Zidorn 2020); analgesic, neuroprotective (Sharma & Sahu 2022); headache (Saroya 2017)
Piper longum L., Piperaceae, YGA 063	Hippali	Fruit	Paralysis, Insomnia, Epilepsy	NE	0.04	0.75	Paralysis (Uddin & Zidorn 2020); epilepsy, insomnia (Khare 2008)

Piper nigrum L., Piperaceae, YGA 029	Kari Menasu	Seed	Paralysis	NE	0.01	1.00	Migraine (Lakshmana *et al*. 2015); epilepsy (Kariyajjanavar *et al*. 2016) paralysis, migraine (Acharya *et al*. 2022); antispasmodic, neuroprotective, paralysis (Sharma & Sahu 2022)
Plectranthus amboinicus (Lour.) Spreng., Lamiaceae, YGA 162	Sambrani/ Doddapatre	Leaf	Insomnia	NE	0.01	1.00	Migraine (Prakasha *et al*. 2010); epilepsy (Lingaraju *et al*. 2013); epilepsy (Santhoshkumar *et al*. 2019)
Pongamia pinnata (L.) Pierre., Fabaceae, YGA 107	Honge mara/ Korungu Mara	Seed	Paralysis	LC	0.03	0.33	Migraine (Ghatapandi *et al*. 2011); paralysis (Acharya *et al*. 2022); spasmolytic (Khare 2008)
Psidium guajava L., Myrtaceae, YGA 150	Perala	Leaf	Insomnia	LC	0.01	1.00	Epilepsy (Maria *et al*. 2012); anti-inflammatory (Khare 2008); paralysis (Acharya *et al*. 2022)
Pterocarpus marsupium Roxb., Fabaceae, YGA 112	Benga	Bark	Paralysis, Epilepsy	NT	0.03	0.67	Paralysis (Acharya *et al*. 2022), anti-inflammatory (Saroya 2017)
Pterocarpus santalinus L.f., Fabaceae, YGA 108	Chandana	Heart wood	Insomnia	EN	0.01	1.00	Anti-inflammatory (Khare 2008); headache, neuroprotective (Sharma & Sahu 2022)
Rauvolfia serpentina (L.) Benth.ex Kurz., Apocynaceae, YGA 023	Sarphagandha, Garudapatala	Root, Leaf	Paralysis, Depression, Insomnia, Epilepsy	NE	0.10	0.44	Mental disorders (Laddimath & Rao 2016); Psychosis, anxiety (Nambiar *et al*. 1985); epilepsy, vertigo (Uddin & Zidorn 2020); nervous disorders (Santhoshkumar *et al*. 2019); neuropsychotic disorders (Khare 2008); insomnia, mental disorders (Bhat 2005); epilepsy, insomnia, anxiety, insanity (Sharma & Sahu 2022); psychotropic, insomnia, insanity, epilepsy (Saroya 2017)
Rhaphidophora pertusa (Roxb.) Schott, Araceae, YGA 215	Kandadi Soppu	Leaf	Insomnia	NE	0.01	1.00	Analgesic, anti-inflammatory (Linnet *et al*. 2010)
Ricinus communis L., Euphorbiaceae, YGA 020	Alamuda/ Haralina Gida	Seed	Paralysis, Insomnia, Epilepsy	NE	0.05	0.60	Epilepsy (Maria *et al*. 2012); epilepsy (Santhoshkumar *et al*. 2019); antispasmodic, neuromuscular disease (Sharma & Sahu 2022)
Rubia cordifolia L., Rubiaceae, YGA 133	Manjista	Root	Insomnia	NE	0.01	1.00	Epilepsy (Santhoshkumar *et al*. 2019); anti-inflammatory (Khare 2008); antistress, analgesic, neuroprotective (Sharma & Sahu 2022); neuralgia (Warrier 1993); paralysis (Saroya 2017)
Ruta graveolens L., Rutaceae, YGA 109	Nagadali	Leaf	Insomnia	NE	0.01	1.00	Spasmolytic, anti-inflammatory (Khare 2008)
Salacia chinensis L., Celastraceae, YGA 135	Ekanayaka	Leaf, Root	Paralysis, Insomnia	NE	0.03	0.67	NR

Santalum album L., Santalaceae, YGA 096	Shreegandha	Heart wood	Paralysis, Insomnia	VU	0.02	1.00	Epilepsy, mental disorders (Uddin & Zidorn 2020); anti-inflammatory (Khare 2008); insomnia, nervous tension (Sharma & Sahu 2022); Psychopathy (Warrier 1993)
Schleichera oleosa (Lour.) Merr., Sapindaceae, YGA 199	Chakote Mara	Seed	Paralysis	LC	0.01	1.00	Paralysis (Acharya *et al*. 2022)
Scleropyrum pentandrum (Dennst.) Mabb., Santalaceae, YGA 069	Nayi Kuli	Seed	Paralysis	LC	0.02	0.50	NR
Senna occidentalis (L.) Link., Fabaceae, YGA 008	Petta thajank	Leaf	Paralysis	LC	0.01	1.00	Paralysis (Uddin & Zidorn 2020); convulsions (Maria *et al*. 2012); nervous disorders (Amoateng *et al*. 2018); convulsions (Khare 2008)
Sesamum indicum L., Pedaliaceae, YGA 200	Ellu	Seed	Psychosis, Paralysis, Insomnia	NE	0.07	0.50	Paralysis (Acharya *et al*. 2022); insomnia (Bairy 2007); migraine, analgesic (Sharma & Sahu 2022); migraine (Saroya 2017)
Sida alnifolia L., Malvaceae, YGA 009	Kurdotti/ Kadira	Root	Paralysis, Insomnia	NE	0.03	0.67	NR
Solanum melongena L., Solanaceae, YGA 197	Badane	Fruit	Insomnia	NE	0.02	0.50	Anti-inflammatory (Khare 2008)
Solanum torvum Sw., Solanaceae, YGA 180	Kudane	Leaf	Epilepsy	NE	0.02	0.50	Insomnia, paralysis (Uddin & Zidorn 2020)
Strychnos nux-vomica L., Loganiaceae, YGA 205	Kayar Mara	Bark	Paralysis	NE	0.01	1.00	Epilepsy (Nambiar *et al*. 1985); paralysis (Santhoshkumar *et al*. 2019); insomnia, paralysis, epilepsy, nervous problems (Khare 2008); antispasmodic, anticonvulsant, insomnia (Sharma & Sahu 2022); paralysis (Saroya 2017)
Syzygium caryophyllatum (L.) Alston., Myrtaceae, YGA 080	Kuntanerale	Bark	Paralysis	EN	0.01	1.00	NR
Tabernaemontana divaricata (L.) R.Br ex Roem. & Schult., Apocynaceae, YGA 130	Nandi Battalu	Bark,	Depression	LC	0.01	1.00	Mental disorders (Laddimath & Rao 2016); epilepsy, paralysis (Uddin & Zidorn 2020); anti-inflammatory (Khare 2008)
Tamarindus indica L., Fabaceae, YGA 022	Hunase	Bark, Leaf	Paralysis, Insomnia	LC	0.04	0.50	Paralysis (Yogeesha & Kumar 2022); anti-inflammatory (Khare 2008)
Terminalia bellirica (Gaertn.) Roxb., Combretaceae, YGA 075	Shanthikai	Fruit, Seed	Insomnia	LC	0.02	0.50	Paralysis (Vinay *et al*. 2013); Paralysis (Uddin & Zidorn 2020)
Terminalia chebula Retz., Combretaceae, YGA 011	Anilekayi	Fruit	Insomnia	LC	0.04	0.25	Mental disorders (Laddimath & Rao 2016); mental problems (Uddin & Zidorn 2020); antispasmodic (Sharma & Sahu 2022); neuroprotective (Saroya 2017)
Terminalia crenulata Roth., Combretaceae, YGA 077	Banupu	Bark, Leaf	Paralysis	NE	0.01	1.00	NR

Thottea siliquosa (Lam.) Ding Hou., Aristolochiaceae, YGA 198	Chakranike	Root	Paralysis	NE	0.01	1.00	NR
Thunbergia mysorensis (Wight) T.Anderson., Acanthaceae, YGA 122	Vishalyakarini	Leaf	Insomnia	NE	0.02	0.50	NR
Tinospora cordifolia (Willd.) Miers., Menispermaceae, YGA 002	Amritha Balli	Stem	Paralysis, Insomnia	NE	0.04	0.50	Paralysis (Acharya *et al*. 2022); anti-inflammatory (Khare 2008) ; analgesic, neuroprotective (Sharma & Sahu 2022)
Trigonella foenum-graecum L., Fabaceae, YGA 147	Menthe	Seed	Paralysis, Insomnia, Epilepsy	NE	0.14	0.23	Muscle relaxant (Khare 2008)
Vateria indica L., Dipterocarpaceae, YGA 101	Bili Dhoopa	Bark	Paralysis	VU	0.01	1.00	Anti-inflammatory (Khare 2008)
Ventilago maderaspatana Gaertn., Rhamnaceae, YGA 127	Aithala Balli	Root	Paralysis, Insomnia	NE	0.10	0.22	Paralysis (Acharya *et al*. 2022)
Vitex negundo L., Lamiaceae, YGA 003	Nekki	Leaf, Root	Psychosis, Paralysis, Depression, Epilepsy	LC	0.09	0.50	Mental disorders (Uddin & Zidorn 2020); epilepsy (Santhoshkumar *et al*. 2019); anti-inflammatory (Khare 2008); antispasmodic, antipsychotic, paralysis, CNS depressant (Sharma & Sahu 2022); headache (Saroya 2017)
Volkameria inermis L., Lamiaceae, YGA 181	Sude Madarangi	Leaf	Paralysis	NE	0.01	1.00	Inflammations (Santhoshkumar *et al*. 2019)
Withania somnifera (L.) Dunal., Solanaceae, YGA 169	Ashwagandha	Bark, Root	Paralysis, Depression, Insomnia, Epilepsy	NE	0.07	0.67	Mental disorders, insomnia (Laddimath & Rao 2016); paralysis (Rajakumar & Shivanna 2009); anti-inflammatory, anxiety neurosis (Khare 2008); narcotic, anti-inflammatory (Saroya 2017)
Ziziphus rugosa L., Rhamnaceae, YGA 156	KotteMullu	Bark, Leaf	Paralysis	NE	0.02	0.50	CNS depressant (Khare 2008)

Table 3. Formulations prescribed by traditional practitioners for the treatment of neurological disorders in the Western Ghats region of Dakshina Kannada district, Karnataka, India.

1. Depression

Plant Name and Parts Used	Mode of Preparation	Application
Eucalyptus tereticornis (Bark, Leaf).	Dried and powdered.	Internal (Nasal Inhalation).
Abrus pulchellus (Leaf, Root).	Crushed and boiled in coconut oil.	External on forehead.
Tabernaemontana divaricata (Bark).	Decoction is prepared.	Oral.
Catharanthus roseus (Root) + *Euphorbia thymifolia* (Whole plant).	Ground and boiled in coconut oil.	External on forehead.
Rauvolfia sepentina (Root) + *Vitex negundo* (Tender Leaf).	Dried, powdered and mixed in hot cow's milk.	Oral.
Cynodon dactylon (Whole plant) + *Cuminum cyminum* (Seed).	Decoction is prepared.	Oral.
Leucas aspera (Leaf) + *Withania somnifera* (Bark, Root).	Dried, powdered and mixed with cow's milk or honey.	Oral.
Eryngium foetidum (Leaf) + *Kaempferia galanga* (Rhizome) + *Cyclea peltata* (Root).	Crushed and boiled in coconut oil.	External on forehead.

2. Epilepsy

Plant Name and Parts Used	Mode of Preparation	Application
Citrus limon (Root).	Root is crushed in water and juice is passed over hot iron rod and collected.	Oral.
Citrus limon (Fruit).	Fruit juice is prepared.	Nasal.
Ricinus communis (Leaf) + *Trigonella foenum-graecum* (Seed).	Ground with cow's milk to form a paste.	External on forehead.
Cynodon dactylon (Whole plant).	Dried, burnt and ash mixed with honey.	Oral.
Calotropis gigantea (Leaf).	Leaf is sun dried, burnt and ash mixed with honey/ghee.	Oral.
Justicia adhatoda (Leaf).	Leaf juice is mixed with honey.	Oral.
Justicia adhatoda (Leaf)	Decoction is prepared.	Oral.
Solanum torvum (Leaf)	Juice is prepared.	Nasal.
Borassus flabellifer (Leaf)	Leaf is burnt into ash and mixed with honey.	Oral.
Glycyrrhiza glabra (Stem, Leaf) + *Piper longum* (Fruit).	Ground with honey and tablet is prepared	Oral.
Centella asiatica (Whole plant) + *Ixora coccinea* (Flower).	Crushed with cow's milk and made into a paste.	External on forehead.
Catharanthus roseus (Root) + *Haldina cordifolia* (Root) + *Piper longum* (Fruit) + *Withania somnifera* (Root) + *Azadirachta indica* (Seed).	Crushed, boiled with sesame oil and oil is dropped on to hot coal.	Nasal (fumes have been inhaled).
Rauvolfia serpentina (Root) + *Centella asiatica* (Whole plant) + *Vitex negundo* (Leaf) + *Pterocarpus marsupium* (Bark).	Ground and tablet is prepared.	Oral.
Hemidesmus indicus (Root) + *Aristolochia indica* (Root) + *Leucas aspera* (Root) + *Ocimum tenuiflorum* (Leaf) +*Citrus limon* (Fruit).	Crushed and juice is prepared.	Oral.

3. Insomnia

Plant Name and Parts Used	Mode of Preparation	Application
Ventilago maderaspatana (Root).	Crushed and boiled in coconut oil.	External on forehead.
Garcinia indica (Fruit).	Pericarp of fruit crushed with ghee and made into paste.	External on forehead.
Merremia tridentata (Leaf, Stem).	Crushed, boiled in coconut oil.	External on forehead.
Naregamia alata (Whole plant).	Ground in cow's milk and made into paste.	External on forehead.
Citrus reticulata (Fruit).	Boiled, crushed and made into paste.	External on forehead.

Solanum melongena (Fruit).	Tender fruits made into slices and boiled, cooled. To this a teaspoonful of honey is added and kept overnight. Meal preparaed in the morning.	Internal.
Citrus limon (Fruit) + *Garcinia indica* (Fruit).	Crushed and juice is prepared.	External on forehead.
Hemidesmus indicus (Root) + *Ocimum tenuiflorum* (Leaf).	Crushed, boiled in coconut oil.	External on forehead.
Phyllanthus emblica (Fruit) + *Ficus benghalensis* (Prop Root).	Crushed, boiled in coconut oil.	External on forehead.
Achyranthus aspera (leaf) + *Ocimum tenuiflorum* (Leaf) + *Cuminum cyminum* (Seed).	Crushed, boiled in coconut oil.	External on forehead.
Phyllanthus emblica (Fruit) + *Eclipta prostrata* (Leaf).	Crushed, boiled in sesame oil.	External on forehead.
Eclipta prostrata (Leaf) + *Centella asiatica* (Whole plant).	Crushed, boiled in coconut oil.	External on forehead.
Merremia tridentata (Leaf, Stem) + *Thunbergia mysorensis* (Leaf) + *Trigonella foenum-graecum* (Seed).	Crushed, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Leaf) + *Centella asiatica* (Whole plant) + *Hibiscus rosa-sinensis* (Flower).	Ground, boiled in coconut oil.	External on forehead.
Centella asiatica (Whole plant) + *Hibiscus rosa-sinensis* (Flower) + *Trigonella foenum-graecum* (Seed).	Crushed, boiled in sesame oil.	External on forehead.
Ocimum tenuiflorum (Leaf) + *Achyranthes aspera* (Leaf) + *Leucas aspera* (Leaf).	Ground, boiled with equal quantity mixture of coconut oil and sesame oil.	External on forehead.
Eclipta prostrata (Leaf) + *Centella asiatica* (Whole plant) + *Cuminum cyminum* (Seed).	Crushed and boiled in coconut oil.	External on forehead.
Eclipta prostrata (Leaf) + *Centella asiatica* (Whole plant) + *Trigonella foenum-graecum* (Seed) + *Phyllanthus emblica* (Bark).	Ground, boiled in coconut oil.	External on forehead.
Phyllanthus emblica (Fruit) + *Eclipta prostrata* (Leaf) + *Murraya koenigii* (Leaf).	Ground, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Leaf) + *Phyllanthus emblica* (Fruit) + *Centella asiatica* (Whole plant).	Crushed, boiled in coconut oil.	External on forehead.
Terminalia chebula (Fruit) + *Eclipta prostrata* (Leaf).	Crushed, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Leaf) + *Phyllanthus amarus* (Whole plant) + *Cuminum cyminum* (Seed) + *Coriandrum sativum* (Seed).	Crushed, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Leaf) + *Azadirachta indica* (Leaf) + *Lawsonia inermis* (Leaf).	Crushed, boiled in sesame oil.	External on forehead.
Ceiba pentandra (Leaf) + *Centella asiatica* (Whole plant) + *Cuminum cyminum* (Seed).	Ground and made into a paste.	External on forehead.
Eclipta prostrata (Leaf) + *Phyllanthus emblica* (Leaf, Bark) + *Trigonella foenum-graecum* (Seed) + *Cuminum cyminum* (Seed). *Ricinus communis* (Seed oil).	Crushed, boiled in *Ricinus communis* seed oil.	External on forehead.
Ventilago maderaspatana (Root) + *Trigonella foenum-graecum* (Seed) + *Ocimum tenuiflorum* (Leaf).	Crushed, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Whole plant) + *Jasminum grandiflorum* (Leaf).	Ground, boiled in coconut oil.	External on forehead.
Phyllanthus amarus (Whole plant) + *Phyllanthus emblica* (Bark) + *Citrus limon* (Fruit) + *Nelumbo nucifera* (Root) + *Merremia tridentata* (Leaf) + *Tinospora cordifolia.* (Stem).	Ground, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Leaf) + *Cynodon dactylon* (Whole plant) + *Cuminum cyminum* (Seed) + *Trigonella foenum-graecum* (Seed).	Crushed, boiled in coconut oil.	External on forehead.

Cyanthillium cinereum (Leaf) + *Ficus racemosa* (Bark) + *Phyllanthus emblica* (Fruit) + *Lawsonia inermis* (Leaf) + *Terminalia chebula* (Fruit) + *Eclipta prostrata* (Leaf).	Crushed, boiled in sesame oil.	External on forehead.
Euphorbia thymifolia (Whole plant) + *Achyranthes aspera* (Whole plant) + *Leucas aspera* (Leaf) + *Calotropis gigantea* (Leaf).	Crushed, boiled in coconut oil.	External on forehead.
Phyllanthus amarus (Whole plant) + *Cuminum cyminum* (Seed).	Decoction is prepared.	Oral.
Aegle marmelos (Leaf) + *Eclipta prostrata* (Leaf) + *Centella asiatica* (Whole plant) + *Phyllanthus emblica* (Fruit).	Crushed, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Whole plant) + *Rauvolfia serpentina* (Leaf) + *Cynodon dactylon* (Whole plant).	Crushed, boiled in coconut oil.	External on forehead.
Pterocarpus santalinus (Heart wood) + *Santalum album* (Heart wood) + *Sida alnifolia* (Root) + *Ruta graveolens* (Leaf) + *Oldenlandia auricularia* (Stem, Leaf) + *Colocasia antiquorum* (Petiole).	Crushed and juice is prepared.	External on forehead.
Terminalia chebula (Fruit) + *Terminalia bellirica* (Fruit) + *Phyllanthus emblica* (Fruit) + *Eclipta prostrata* (Whole plant).	Ground, boiled in sesame oil.	External on forehead.
Phyllanthus emblica (Leaf) + *Phyllanthus amarus* (Leaf) + *Withania somnifera* (Root).	Crushed, boiled in coconut oil.	External on forehead.
Jasminum sambac (Leaf) + *Nelumbo nucifera* (Flower) + *Elephantopus scaber* (Leaf).	Ground, boiled in coconut oil.	External on forehead.
Eclipta prostrata (Whole plant) + *Phyllanthus emblica* (Fruit) + *Tamarindus indica* (Bark) + *Citrus limon* (Fruit).	Crushed, boiled in sesame oil.	External on forehead.
Eclipta prostrata (Leaf) + *Phyllanthus amarus* (Whole plant) + *Azadirachta indica* (Leaf) + *Murraya koenigii* (Leaf).	Crushed, boiled in coconut oil.	External on forehead.
Garcinia indica (Leaf) + *Phyllanthus amarus* (Leaf) + *Centella asiatica* (Whole plant) + *Dalbergia horrida* (Leaf) + *Sesamum indicum* (Seed).	Ground in Cow's milk and made into paste.	External on forehead.
Garcinia indica (leaf) + *Phyllanthus amarus* (Leaf) + *Centella asiatica* (Whole plant) + *Dalbergia horrida* (Leaf) + *Sesamum indicum* (Seed).	Decoction is prepared.	Oral.
Eclipta prostrata (Leaf) + *Trigonella foenum-graecum* (Seed) + *Asparagus racemosus* (Leaf).	Ground, boiled in coconut oil.	External on forehead.
Merremia tridentata (Leaf) + *Piper longum* (Fruit) + *Myristica fragrans* (Fruit) + *Myristica malabarica* (Bark) + *Calophyllum inophyllum* (Seed) + *Salacia chinensis* (Leaf).	Ground, boiled in coconut oil.	External on forehead.
Phyllanthus emblica (Fruit) + *Butea monosperma* (Leaf) + *Eclipta prostrata* (Leaf) + *Magnolia champaca* (Seed).	Ground, boiled in sesame oil.	External on forehead.
Ventilago maderaspatana (Root) + *Ixora coccinea* (Root) + *Cyclea peltata* (Root) +*Bunium bulbocastanum* (Seed) + *Indigofera tinctoria* (Leaf).	Crushed, boiled with coconut oil and ghee.	External on forehead.
Eclipta prostrata (Leaf) + *Centella asiatica* (Whole plant) + *Rubia cordifolia* (Root) + *Calophyllum inophyllum* (Seed) + *Ricinus communis* (Seed).	Ground, boiled in coconut oil.	External on forehead.
Citrus reticulata (Fruit) + *Lawsonia inermis* (Leaf) + *Phyllanthus amarus* (Leaf) + *Aloe vera* (Leaf).	Ground and made into a paste.	External on forehead.
Gymnostachyum febrifugum (Leaf) + *Ventilago maderaspatana* (Root) + *Jasminum grandiflorum* (Leaf) + *Plectranthus amboinicus* (Leaf) + *Ixora coccinea* (Leaf) + *Psidium guajava* (Tender Leaf).	Ground, boiled in coconut oil.	External on forehead.

Eclipta prostrata (Leaf) + *Ocimum tenuiflorum* (Leaf) + *Citrus limon* (Fruit) + *Justicia adhatoda* (leaf).	Ground, boiled in coconut oil.	External on forehead.
Ficus religiosa (Bark) + *Ficus drupacea* (Leaf) + *Rhaphidophora pertusa* (Leaf) + *Cocos nucifera* (Tender Mesocarp).	Ground and juice is prepared.	External on forehead.
Eclipta prostrata (Leaf) + *Aloe vera* (Leaf) + *Terminalia bellirica* (Seed) + *Sida alnifolia* (Root) + *Phyllanthus emblica* (Fruit).	Crushed, boiled with mixture of cow's milk, sesame oil and camphor.	External on forehead.
Aegle marmelos (Leaf) + *Eclipta prostrata* (Leaf) + *Tamarindus indica* (Leaf) + *Ficus benghalensis* (Prop Root) + *Trigonella foenum-graecum* (Seed) + *Cuminum cyminum* (Seed).	Crushed, boiled in coconut oil.	External on forehead.
Ventilago maderaspatana (Root) + *Madhuca neriifolia* (Seed) + *Eclipta prostrata* (Leaf) + *Phyllanthus emblica* (Fruit).	Ground, boiled in coconut oil.	External on forehead.
Lawsonia inermis (Leaf) + *Phyllanthus amarus* (Leaf) + *Phyllanthus emblica* (Fruit) + *Ocimum tenuiflorum* (Leaf) + *Hibiscus rosa-sinensis* (Flower).	Crushed, boiled in coconut oil.	External on forehead.

4. Paralysis

Plant Name and Parts Used	**Mode of Preparation**	**Application**
Merremia tridentata (Leaf) + *Pongamia pinnata* (Seed) + *Hybanthus enneaspermus* (Whole plant) + *Salacia chinensis* (Root) + *Holarrhena pubescens* (Bark).	Ground in rice water and made into a paste.	External.
Merremia tridentata (Leaf) + *Pongamia pinnata* (Seed) + *Hybanthus enneaspermus* (Whole plant) + *Salacia chinensis* (Root) + *Holarrhena pubescens* (Bark).	Crushed with ghee and decoction is prepared.	Oral.
Moringa oleifera (Bark) + *Holoptelea integrifolia* (Leaf) + *Calotropis gigantea* (Leaf) + *Vitex negundo* (Leaf) + *Erythrina variegata* (Leaf) + *Jasminum malabaricum* (Leaf).	Crushed and boiled in coconut oil.	External.
Vateria indica (Bark).	Decoction is prepared.	Oral.
Holarrhena pubescens (Bark) + *Breynia vitis-idaea* (Leaf) + *Caesalpinia bonduc* (Leaf) + *Brassica nigra* (Seed) + *Allium sativum* (Bulb) + *Cuminum cyminum* (Seed).	Ground, boiled with equal quantity of mixture of sesame oil and coconut oil.	External.
Holarrhena pubescens (Bark).	Dried, powdered and mixed with milk.	Oral.
Acampe praemorsa (Whole plant) + *Holarrhena pubescens* (Bark) + *Allium sativum* (Bulb) + *Bunium bulbocastanum* (Seed) + *Baccharoides anthelmintica* (Seed).	Ground, boiled in coconut oil.	External.
Careya arborea (Bark).	Decoction is prepared.	External (medicated bath).
Ficus religiosa (Bark, Leaf) + *Carallia brachiata* (Bark, Leaf) + *Baringtonia racemosa* (Bark, Leaf) + *Alstonia scholaris* (Bark) + *Moringa oleifera* (Bark) + *Piper longum* (Fruit) + *Allium sativum* (Bulb).	Ground and boiled in coconut oil.	External.
Acacia rugata (Fruit) + *Cassia fistula* (Bark, Leaf).	Decoction is prepared.	External (medicated bath).
Ichnocarpus frutescens (Stem, Leaf) + *Merremia tridentata* (Stem, Leaf) + *Tinospora cordifolia* (Stem) + *Cyperus rotundus* (Root) + *Brassica nigra* (Seed) + *Allium sativum* (Bulb).	Ground, boiled with equal quantity of mixture of sesame oil and coconut oil.	External.
Tinospora cordifolia (Stem).	Decoction of is prepared.	Oral.

Justicia gendarussa (Leaf) + *Embelia tsjeriam-cottam* (Fruit) *+ Averrhoa carambola* (Fruit) + *Euphorbia neriifolia* (Stem) + *Eucalyptus tereticornis* (Bark).	Ground, boiled with a mixture of ghee, sesame oil and coconut oil.	External.
Calotropis gigantea (Leaf) + *Ventilago maderaspatana* (Root) + *Allium sativum* (Bulb).	Ground and boiled in sesame oil.	External.
Pterocarpus marsupium (Bark) + *Cinnamomum verum* (Bark) + *Sida alnifolia* (Root) + *Ixora brachiata* (Bark).	Crushed in cow's urine and made into paste.	External.
Salacia chinensis (Root) + *Ceiba pentandra* (Bark) + *Sida alnifolia* (Root).	Dried, powdered and mixed with milk.	Oral.
Terminalia crenulata (Bark, Leaf) + *Ziziphus rugosa* (Bark, Leaf) + *Senna occidentalis* (Leaf) + *Euphorbia neriifolia* (Stem).	Ground and hot paste is prepared.	External.
Calophyllum inophyllum (Seed) + *Hydnocarpus wightianus* (Seed) + *Brassica nigra* (Seed) + *Magnolia champaca* (Seed) + *Sesamum indicum* (Seed) + *Jatropha curcas* (Seed).	Crushed in cow's urine and made into paste.	External.
Tinospora cordifolia (Stem) + *Naregamia alata* (Whole plant) + *Ziziphus rugosa* (Leaf) + *Justicia gendarussa* (Leaf) + *Tamarindus indica* (Leaf) + *Acacia rugata* (Leaf) + *Croton persimilis* (Root) + *Hemidesmus indicus* (Root) + *Hydnocarpus wightianus* (Seed) + *Azadirachta indica* (Seed) + *Calophyllum inophyllum* (Seed) + *Allium sativum* (Bulb) + *Brassica nigra* (Seed).	Ground, boiled with equal quantity of mixture of coconut oil and sesame oil.	External.
Ocimum basilicum (Leaf) + *Volkameria inermis* (Leaf) + *Opuntia dillenii* (Stem) + *Trigonella foenum-graecum* (Seed) + *Acacia rugata* (Leaf) + *Ageratum conyzoides* (Leaf).	Crushed, boiled with equal quantity of mixture of sesame oil and coconut oil.	External.
Acacia rugata (Leaf) + *Piper nigrum* (Seed) + *Tamarindus indica* (Leaf) + *Brassica nigra* (Seed).	Hot paste is prepared.	External.
Acampe praemorsa (Leaf).	Decoction is prepared.	External.
Calophyllum inophyllum (Seed) + *Aloe vera* (Leaf) + *Azadirachta indica* (Seed) + *Brassica nigra* (Seed) + *Allium sativum* (Bulb).	Ground and boiled in coconut oil.	External.
Ventilago maderaspatana (Root) + *Cinnamomum verum* (Bark) + *Ficus drupacea* (Leaf) + *Rauvolfia serpentina* (Root) + *Hemidesmus indicus* (Root) + *Clerodendrum infortunatum* (Root) + *Croton persimilis* (Root) + *Citrus medica* (Leaf) + *Citrus limon* (Fruit) + *Bunium bulbocastanum* (Seed).	Ground and boiled in sesame oil.	External.
Hemidesmus indicus (Root).	Powder is mixed with milk.	Oral.
Tinospora cordifolia (Stem).	Decoction is prepared.	External (medicated bath).
Salacia chinensis (Root) + *Rauvolfia serpentina* (Root) + *Aristolochia indica* (Root) + *Jatropha curcas* (Seed) + *Thottea siliquosa* (Root) +*Myristica fragrans* (Fruit) + *Calophyllum apetalum* (Seed) + *Aegle marmelos* (Leaf) + *Bunium bulbocastanum* (Seed).	Crushed and boiled in sesame oil.	External.
Rauvolfia serpentina (Root) + *Aristolochia indica* (Root) + *Ventilago maderaspatana* (Root) + *Merremia tridentata* (Leaf) + *Bunium bulbocastanum* (Seed) + *Pongamia pinnata* (Bark) + *Myristica fragrans* (Fruit).	Crushed and boiled with equal quantity of mixture of sesame oil and coconut oil.	External.
Pterocarpus marsupium (Bark) + *Bridelia stipularis* (Bark).	Decoction is prepared.	External (medicated bath).
Cinnamomum verum (Bark) + *Haldina cordifolia* (Bark) + *Neolamarckia cadamba* (Bark) + *Justicia gendarussa* (Leaf) + *Croton persimilis* (Bark) + *Buchanania cochinchinensis* (Bark).	Ground in cow's urine and made into paste.	External.

Calophyllum inophyllum (Seed) + *Jatropha curcas* (Seed) + *Madhuca neriifolia* (Seed) + *Scleropyrum pentandrum* (Seed) +*Santalum album* (Heart wood).	Crushed and boiled in sesame oil.	External.
Withania somnifera (Root) + *Rauvolfia serpentina* (Root) + *Vitex negundo* (Leaf, Root) + *Strychnos nux-vomica* (Bark) + *Ailanthus triphysa* (Leaf) + *Citrus limon* (Fruit).	Ground and made into paste.	External.
Pongamia pinnata (Seed) + *Magnolia champaca* (Seed) + *Ricinus communis* (Seed) + *Myristica fragrans* (Fruit) + *Ventilago maderaspatana* (Root) + *Arachis hypogaea* (Seed) + *Madhuca neriifolia* (Seed) + *Scleropyrum pentandrum* (Seed).	Crushed and boiled in sesame oil.	External.
Naregamia alata (Whole plant) + *Cinnamomum verum* (Bark) + *Syzygium caryophyllatum* (Bark) + *Euphorbia hirta* (Whole plant) + *Euphorbia thymifolia* (Whole plant).	Ground in rice water and made into paste.	External.
Schleichera oleosa (Seed) + *Jatropha curcas* (Seed) + *Ricinus communis* (Seed) + *Madhuca neriifolia* (Seed) + *Pongamia pinnata* (Seed) + *Hemidemus indicus* (Root) + *Bacchroides anthelmintica* (Seed).	Crushed and boiled in sesame oil.	External.

5. Psychosis

Plant Name and Parts Used	**Mode of Preparation**	**Application**
Naregamia alata (Leaf).	Leaf juice mixed with cow's milk.	Oral.
Hesperethusa crenulata (Leaf).	Crushed in butter milk and made into paste.	External on forehead.
Annona muricata (Seed, Leaf).	Dried, powdered and mixed with milk.	Oral.
Vitex negundo (Tender Leaf) + *Cuminum cyminum* (Seed).	Crushed and boiled in milk.	Oral.
Cynodon dactylon (Whole plant) + *Centella asiatica* (Leaf).	Dried, powdered and mixed with honey.	Oral.
Cynodon dactylon (Whole plant) + *Oldenlandia auricularia* (Stem, Leaf).	Dried, powdered and mixed with milk.	Oral.
Coccinia grandis (Leaf) + *Oldenlandia auricularia* (Stem, Leaf).	Ground and juice is prepared.	Oral.
Moringa oleifera (Bark) + *Acorus calamus* (Root) + *Oldenlandia auricularia* (Leaf).	Crushed, decoction is prepared.	External.
Garcinia indica (leaf) + *Dalbergia horrida* (Leaf) + *Sesamum indicum* (Seed).	Crushed in cow's milk and made into paste.	External on forehead.
Garcinia indica (leaf) + *Dalbergia horrida* (Leaf) + *Sesamum indicum* (Seed).	Decoction is prepared.	Oral.

Informants' consensus factor value is a measurement from which one can easily understand the occurrence of common diseases in the study area and also elucidate the frequent use of reliable remedies employing a number of medicinal plants for the treatment of different ailments. In the present investigation, ICF values for disease categories ranged between 0 and 0.35. The high ICF value was reported for psychosis (ICF=0.35) with 14 species and 21 use reports followed by epilepsy (ICF=0.24) with 23 species and 30 use reports; insomnia (ICF=0.22) with 73 species and 93 use reports; depression (ICF=0.13) with 14 species and 16 use reports and paralysis (ICF=0) with 88 species and 18 use reports. The high ICF value indicates the high level of consensus among the informants for a particular disease category (Singh *et al*. 2020). For paralysis (ICF=0) which clearly indicate that there is no sharing of knowledge between the practitioners. The treatment of paralysis mainly includes polyherbal drug formulations and was treated only by few experts. The potential plants recorded for psychosis are *Cynodon dactylon*, *Oldenlandia auricularia* and *Naregamia alata*. Insomnia was treated by maximum number of therapeutically potential plants such as *Eclipta prostrata*, *Centella asiatica*, *Phyllanthus emblica*, *Cuminum cyminum*, *Trigonella foenum-graecum*, *Citrus limon*, *Garcinia indica*, *Phyllanthus amarus*, *Ocimum tenuiflorum*, *Ventilago maderaspatana*, *Merremia tridentata*, and *Naregamia alata*, based on our study. The potent plants for treating epilepsy are *Citrus limon*, *Borassus flabellifer*, *Justicia adhatoda*, *Cynodon dactylon*, *Centella asiatica*, and *Calotropis gigantea*. Similarly, depression was treated

by *Catharanthus roseus*, *Euphorbia thymifolia*, *Vitex negundo*, *Rauvolfia serpentina*, *Eucalyptus tereticornis*, and *Withania somnifera*. A total of 88 plants have been documented for treating paralysis, of which *Allium sativum*, *Abrus pulchellus*, *Brassica nigra*, *Bunium bulbocastanum*, *Calophyllum inophyllum*, *Cinnamomum verum*, *Jatropha curcas*, *Rauvolfia serpentina*, and *Ventilago maderaspatana* are considered as therapeutically potential species.The importance of these species for treating other ailments have been revealed in our literature survey reports (Table.2).

Conclusion

The traditional medicines have been used since ancient times. In this study, 37 species have been newly reported as remedy for neurological problems. Among the recorded plant species, *Borassus flabellifer*, *Pterocarpus santalinus* and *Syzygium caryophyllatum* are in endangered category whereas *Aegle marmelos*, *Dalbergia horrida* and *Pterocarpus marsupium* are of near threatened category. *Calophyllum apetalum*, *Garcinia indica*, *Myristica malabarica*, *Santalum album* and *Vateria indica* are in vulnerable categories, 48 species are in least concern category as per IUCN red list. So conservation priority and conservation measures should be taken up through comprehensive studies on diversity and population of those medicinal plants which are unsustainably harvested. Plants which exhibited high RFC values such as *Eclipta prostrata*, *Centella asiatica*, *Citrus limon*, *Cuminum cyminum*, *Trigonella foenum-graecum*, *Phyllanthus emblica* and *Garcinia indica* must be assessed for phytochemistry and pharmacological studies. However newly reported plants must not be neglected, and in-depth research should be undertaken on these species.

Declarations

List of abbreviations: WHO (World Health Organization), IUCN (International Union for Conservation of Nature & Natural Resources), POWO (Plant of the World Online), WFO (World Flora Online), UV (Use Value), ∑Us (Sum of Uses), N (Total Number of Informants), ICF (Informants' Consensus Factor), Nur (Number of Use Citations), Nt (Number of Taxa), RMP (Registered Medical Practitioners), RFC (Relative Frequency of Citation), FC (Frequency of Citation), VU (Vulnerable), NT (Near Threatened), EN (Endangered), LC (Least Concern), NE (Not Evaluated), NR (New Reports)

Ethics approval and consent to participate: Before conducting interviews, prior informed consent was obtained from all participants.

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DEPARTMENT OF APPLIED BOTANY
MANGALORE UNIVERSITY, MANGALAGANGOTHRI-574199

Ref.No : **Date :**

AIM: Documentation of ethnomedicinal plants used in the treatment of neurological disorders in the Western ghats region of Dakshina Kannada district, Karnataka state, India.

QUESTIONNAIRE

1. Name of the Traditional Practitioner:
2. Address:
3. Date of birth and age:
4. Gender:
5. Occupation:
6. Ethnic group/Caste/Subcaste:
7. Name of the disease/disorder treated:
8. Symptoms of disease/disorder:
9. Vernacular name of the plant/s used:
10. Habit (tree, shrub, herb, climber etc.):
11. Source of knowledge about the medicinal plants:
12. Plant part used (root/stem/leaf/bark/rhizome/tuber/latex/flower/fruit/seed/whole plant/other parts):
13. Method/time/season of collection:
14. Method of preparation and administration with dosage:
15. Readymade preparation, if any? (Ointments, oil, powder, pills etc.):
16. Dietary constraints, restrictions on regular activity?
17. Status of the plant/s (cultivated/wild):
    If wild, availability in natural resources (plenty, rare, very rare etc.):
18. Conservation needs:
19. Non-medicinal uses of the plant/s:
20. Experience in the field of treatment:
21. Number of patients treated per week:
22. Specimens collected:
23. Any other comments/information:

Declaration:

I, ……. hereby give my full consent and conscious to participate in this study and declare that to the best of my knowledge the information that I have provided is true, accurate and complete.

Place: Signature of the Trad.Knowledge holder
Date:

Remarks:

Plant/s identified as

Sl.No	Botanical Name	Family

Name & Signature of the Researcher