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ETHNOTHERAPEUTIC PRACTICES IN INDIA

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ABSTRACT

Ethnomedicinal research was first introduced in India by Janaki Ammal, in 1956, who analyzed the edible plants by certain tribes of South India. Diverse information on medicinal plants has been documented by Jain in 1963 and 1965 with the benefit of the Ministry of Environment and Forests, Govt. of India. India is one of the foremost producers of medicinal herbs that have its applicability amongst various traditional practitioners for therapy The amount of plant species having applications in numerous Indian medicines are as follows: Tibetan, 500; Siddha, 1,300; Ayurveda, 2,000; Unani, 1,000; Homeopathy, 800; Modern, 200, and folk, 4,500. History discovered that plants have a significant nutritional value, with their attribute towards therapeutic measure, and has its function in translational medicine. Alzheimer's Disease is a chronic and advanced neurodegenerative disorder discernable by behavioral and cognitive damage that suggestively inhibits with occupational and social functioning, and is recognized with 3 clusters of early indications. The first group is the cognitive related syndrome; the second is a behavioral syndrome, and the third is a syndrome in performing daily activities. Frequently, the dearth of memory is the initial symptom that seems, though, the distant memory has healthier enactment in comparison to the short-term memory. Compounds derived from plant, such as terpenoids, polyphenols, alkaloids, glycosides, saponins, and steroids, which are regulators of neurotrophin-mediated neuroprotection. These novel classes of natural compounds would have a better safety profile since these acquire lesser side-effects as compared with synthetic compounds.

Keywords: Alzheimer's Disease; Neuroprotection; Gut microbiota; Steroids

INTRODUCTION

Since ancient ages, human beings have been dependant on nature and its sources. India has a long history (since 5000 years BCE) of utilizing plants for medicinal purposes as noticed in ancient literature, that include Sushruta Samhita (660 BCE), Charaka Samhita (990 BCE), Atharva Veda (1200 BCE), Yajurveda (1400-1000 BCE), Rigveda (1700-1100 BCE), and Dhanwantari Nighantu (1800 CE) [1]. Ethnomedicinal research was first introduced in India by Janaki Ammal, in 1956, who analyzed the edible plants by certain tribes of South India. Diverse information on medicinal plants has been documented by Jain in 1963 and 1965 with the benefit of the Ministry of Environment and Forests, Govt. of India. India is one of the foremost producers of medicinal herbs that have its applicability amongst various traditional practitioners for therapy. Our country has 15 agroclimatic precincts and approximately 18000 flowering species of, which approximately 7000 are assessed to have medicinal convention in folk systems of medicine, under the National Medicinal Plants Board, India [2-5]. An assessment conducted by the All India Coordinated Research Project on Ethnobiology (AICRPE) during the last 10 years has chronicled approximately 8,000 species of wild plants used by folks all over India for handling several health glitches. About 960 medicinal plant species are assessed to be within 178 species and have annual consumption levels overhead 100 metric tons as per National Medicinal Plants Board, India. All acknowledged natures of ecologic, agro-climatic, and edaphic conditions are encountered within India. The Western Himalayan province delivers approximately 46 % of Unani, 80 % of herbal drugs in Ayurveda, 33 % of allopathic systems; 50 % of drugs chronicled in the British Pharmacopoeia are linked to medicinal plants mounting in this province. In India, circa 25,000 botanical formulations are used in traditional medicines. The amount of plant species having applications in numerous Indian medicines are as follows: Tibetan, 500; Siddha, 1,300; Ayurveda, 2,000; Unani, 1,000; Homeopathy, 800; Modern, 200, and folk, 4,500. History discovered that plants have a significant nutritional value, with their attribute towards therapeutic measure, and has its function in translational medicine [5-7]. Many scientists have explored their research activities based on the ethnomedicinal knowledge of the different tribes of India and documented their works for instance, in 1925 and 1927, Bodding had explored and documented his findings on medicinal plants applied by the Santhal tribes of Bihar. In 1964, Gupta had reported on 155 medicinal plant species from the Chamba forest province. In 1971, Shah and Joshi had investigated and reported on medicinal plants of the Kumaon region of Uttarakhand. In 1973, Jain with co-workers had documented 32 different plant species from Reddi, Valmiki, Chenchu, and Gond tribes of Andhra Pradesh, and Kondh and Saora tribes of Orissa. In 1980, Joshi with co-workers had reported on the ethnomedicinal practices of Dangs district of Gujarat. In 1981, Vartak and Gadgil had investigated and reported on folk medicines of Western Ghats of Goa and Maharashtra. In 1989, Pal and Jain had documented their findings on 40 medicinal plants, traditionally applied by the Lodhas tribe of Midnapur district, West Bengal. In 1995, Bhandary with co-workers had surveyed and reported on 98 ethnomedicinal arrangements from 69 plant species used by the Siddis of Uttara Kannada district of Karnataka. In the year 2000, Annis with co-workers had reported on 102 plant species used by the Sahariya tribe of Madhya Pradesh [8-17]. Northeast India, is very rich in floristic diversity, the typical geographical

location of this place enables this region to be a meeting place of the flora of the Indian subcontinent as well as that of China and Southeast Asian countries, thus act as a biogeographical gateway for plants migration [18]. A few ethnobotanical works of northeast India includes several reports on Karbis, Bodos, Sonowal-Kocharis, Tea-tribes of Sonapur of Kamrup district, Assam, Manipuri community of Barak valley, Zeme folk of North Cachar hills, Assam, Reang folk of Tripura, Tagin folk of Daparijo, Arunachal Pradesh, Khasi folk of Meghalaya, Lepchas, Nepalis and Bhutias of Sikkim, Lotha-Naga tribes of Nagaland, Thai Khamyangs of Assam. Exploration of medicinal floras in the northeastern province, India depends upon its distribution of climatic zones [19-27]. For instance, *Rubia manjith* and *Zanthoxylum armatum* plant species are found in temperate zones and are of greater medicinal importance than its other species *Rubia sikkimensis* and *Zanthoxylum acanthopodium*, which are found in tropical and sub-tropical areas. On the other hand, *Terminalia* species were incarcerated in temperate zones and were of greater commercial medicinal importance. In some instances, analogous species growing in different climatic zones may have similar medicinal and nutritional values. Sikkim has an enhanced distribution of medicinal plants such as *Panax* species, *Nardostachys jatamansi, Swertia chirayita, Zanthoxylum armatum, Picrorhiza kurroa*. In Arunachal Pradesh, plants from tropical areas such as *Curcuma caesia, Mesua ferrea, Aquilaria malaccensis, Mentha citrate, Oroxylum indicum, Homalomena aromatic, Piper longum, Piper mullesua, Terminalia arjuna, Terminalia citrina, Terminalia bellerica, Terminalia chebula* are in abundance with higher medicinal value and are a spot of lure for researchers and visitors. In Arunachal Pradesh, some plants from temperate and alpine areas viz., *Paris polyphylla, Iris griffithii, Bergenia ciliata, Zanthoxylum armatum, Valeriana jatamansi,* and *Swertia chirayita* are no less significant as well. Medicinal plants viz., *Taxus wallichiana, Cryptolepis buchananii, Curculigo orchioides,* and *Smilax glabra* are under high-status development found in Manipur and Nagaland. In Mizoram, there is large scale cultivation of *Gmelina arborea*. Assam is known for its cultivation of *Curcuma caesia, Piper longum, Alpinia galangal, Oroxylum indicum, Aquilaria malaccensis, Mesua ferrea*. In Tripura and the West Garo Hills district of Meghalaya, there is a wide cultivation of *Holarrhena antidysenterica*. The agronomy and conservation of medicinal plants in northeast India, has led to a high claim for their therapeutic applications [28-30]. Sharma and his co-workers in 2001 have reported on 135 plant species of Mizoram, India from 122 genera and 65 plant families, being used by the traditional processes for the treatment of different ailments [31]. In the year 1999, Jamir and his co-workers, have reported on 36 plant species from 35 genera and 28 families being traditionally formulated either as single or in combination with plant or animal parts used by the different tribes of Nagaland [32]. Dolui and his co-workers, in 2003, have stated on 46 plant species that belong to 44 genera and 34 families being traditionally formulated with plant or animal parts used by the folklores of Meghalaya. Emphasis has been put on the confined traditional healers of Meghalaya in the reports of Kharkonger and Joseph in 1981 [24,33]. Sharma with his co-workers in 2004 has reported on 75 medicinal plant species from Mahmora region of Sivasagar district (35 plant species from 35 genera, that belongs to 30 families) and in 2008 on the Sonapur region of Kamrup district (40 plant species from 40 genera, that belongs to 34 families), Assam [34,35].

1.1 PREVALENCE AND TREATMENT OF ALZHEIMER'S DISEASE (AD)

Alzheimer's disease (AD), that is termed subsequently the German psychiatrist Alois Alzheimer, who originally defined this disorder additionally one century ago, is the utmost common reason of dementia, accounting for up to 75 % of all dementia cases. AD is a chronic and advanced neurodegenerative disorder discernable by behavioral and cognitive damage that suggestively inhibits with occupational and social functioning, and is recognized with 3 clusters of early indications. The first group is the cognitive related syndrome; the second is a behavioral syndrome, and the third is a syndrome in performing daily activities. Frequently, the dearth of memory is the initial symptom that seems, though, the distant memory has healthier enactment in comparison to the short-term memory. There are numerous resemblances amid the cognitive enactments at this stage the natural aging and there is little indication on the capability to recognize these clinical changes. Populace aging has converted a universal phenomenon. Data from the UN Aging Program and the US Centers for Disease Control and Prevention have probable that the numeral of older people (65 + years) in the globe is predictable to upsurge to nearly 1 billion by 2030, and by 2050, approximately 45 million people around the globe are pretentious by the AD, with the amount of older people, being augmented from 7 % to 12 % [36]. AD is an imperative cause of morbidity and mortality globally. The World Health Organization (WHO), reports that globally, approximately 5 % of men and 6 % of women overhead 60 years of age are pretentious by AD. In, India, the total occurrence of dementia per 1000 people is 33.6 %, of which vascular dementia constitutes approximately 39 %. and AD constitutes approximately 54 %. The regularity upsurges to 50 % by the age of 80 years. Globally, occurrence of dementia was assessed to be 3.9 % in people aged 60 + years, with the regional prevalence being 4.0 % in China and Western Pacific regions, 5.4 % in Western Europe, 1.6 % in Africa, 6.4 % in North America and 4.6 % in Latin America. The numeral of people aged 65 years and older is approximately 48 million in the United States (US), more than 35 million in Japan and virtually 120 million in China, and 104 million in India, which are expected to propagate briskly above the next numerous decades. Throughout the previous limited eras, research in the epidemiology of dementia and AD has made marvelous development. Research demonstrates multiethnicity in conceptualizations of AD and related dementias [37]. Diverse influences that elevates the menace of AD or shelter the old people from the disease. Some of the remediable menace factors are cardiovascular, cognitive, mental, and social factors. Cohort studies suggest the defensive and considerable protagonist of physical activities against AD. Affording to a study, unvarying physical movement such as walking occasioned in better cognitive power (20 %) and less cognitive loss in the old females [38-40]. Oxidative stress (OS) is irreversibly concurrent with several major pathogeneses of AD including tau pathology, Aβ-induced neurotoxicity, metal dyshomeostasis, and mitochondria dysfunction. Disproportionate production of ROS transpires from mitochondrial dysfunction and surplus accretion of transition metals, credibly due to incorporation of anomalous Aβ and tau accumulation, eventually causing oxidative trauma. Oxidant agents and oxidative products augment Amyloid Protein Plaques (APP) expression, intracellular Aβ levels in non-neuronal and neuronal cells. OS augments with age through variations in ROS cohort. The jaggedness between the generation of free radicals and the role of antioxidants has been guaranteed as

a reason for AD. Conspicuously, patients with cerebral infarction and stroke are in risk of AD. Hypoxia-ischemia is an instantaneous significance of hypoperfusion, which undertakes a role in the Aβ accretion. Protracted and grave hypoxia can cause memory impairment and neuronal loss. Inordinate ROS causes tribulations with the modules of the cell, comprising atomic DNA, mitochondrial DNA, RNA, lipids, proteins, and finally transport about neurotransmitter impairment and at such a point it creates the clinical manifestations of AD [41-45]. Another aspect in this context, suggested by various researchers, is the role of the human microbiota, which is considered to be a vital aspect. Despite extensive research on a biomedical and clinical point, the investigation, and rehabilitation for important neurological diseases are possibly multifaceted and this multifaceted association amid our gut microbiota and the CNS creates the gut microbiota–brain axis. Scientific researchers have informed on the complication fronting the influences concerning the gut microbiota with the central nervous system, that summarize the gut microbiota– brain axis. Epidemiological surveys smear the first steps to evaluate whether, and to what magnitude, the gut microbiota–brain axis apprises human neurological disease. The innovative exploration nucleuses on the role of gut microorganisms on two classes of cells postulate an imperative role in the microglia and astrocytes. For cells to endure the mugging of ROS and RNS effectively, the generation of molecules equipped with anti-oxidant properties and possibly anti-apoptotic activities are obligatory. Enzymes such as glutathione peroxidases, superoxide dismutase, heat shock protein-32, and catalase deliver cells with the aptitude to battle with the RNS and ROS. Further that, the endogenous antioxidants, exogenous antioxidants such as vitamins A, C, and E and bio-macromolecules are amongst candidates capable with persuasive anti-oxidant properties [46]. Drugs presently accessible in the market incorporate inhibitors of acetylcholinesterase (AChE) and N-methyl D-aspartate-receptor antagonists (NMDA). Most of the FDA-endorsed synthetic drugs for AD act by countering the cholinergic deficiency related to the psychological dysfunction and are based on the inhibition of AChE. These drugs help in enhancing cognitive functions such as memory and thoughts and are operative in patients with moderate AD. All the more as of late, the uncompetitive NMDA memantine that improves functioning and conduct side effects in patients with AD has been affirmed [47]. These drugs improve the function of yet flawless neurons, yet don't restrain the ongoing degenerative process prompting neuronal cell passing and cause adverse reactions as depicted in Table 1.1. Scientists are at present investigating natural products that may give help and stop the progression of dementia with less or no adverse effects. There have been reports on the memory-enhancing effectiveness of probiotics [48].

1.2 TRADITIONAL CLAIM OF PLANTS USED FOR THE TREATMENT OF ALZHEIMER'S DISEASE

Traditionally, natural products used by the tribal folklores of Asia and Europe for the treatment of neurological disorders contain an appreciable amount of AChE inhibitory efficacy. Compounds derived from plant, such as terpenoids, polyphenols, alkaloids, glycosides, saponins, and steroids, which are regulators of neurotrophin-mediated neuroprotection. These novel classes of natural compounds would have a better safety profile since these acquire lesser side-effects as compared with synthetic compounds. Several herbs used in traditional systems of medicine, that are under preclinical and clinical

trials against AD and other CNS diseases are *Dipsacus asper* Wall. (Family: Caprifoliaceae), *Curcuma longa* Linn. (Family: Zingiberaceae), *Coriandrum sativum* Linn. (Family: Apiaceae), *Ginkgo biloba* Linn. (Family: Ginkgoaceae), *Commiphora mukul* Arn. (Family: Burseraceae), *Commiphora wightti* Arn. (Family: Burseraceae), *Commiphora molmol* Arn. (Family: Burseraceae), *Mellisa officinalis* Linn. (Family: Lamiaceae), *Evolvulus alsinoides* Linn. (Family: Convolvulaceae), *Bacopa monnieri* Linn. (Family: Scrophulariaceae), *Centella asiatica* Linn. (Family: Apiaceae), *Punica granatum* Linn. (Family: Punicaceae), *Myristica fragrans* Houtt. (Family: Myristicaceae), *Valeriana officinalis* Linn. (Family: Caprifoliaceae), *Salvia officinalis* Linn. (Family: Lamiaceae), *Huperzia serrata* (Thunb. ex Murray) Trevis, (Family: Lycopodiaceae), *Galanthus woronowii* Losinsk. (Family: Amaryllidaceae), *Lycoris radiate* (L′ Heritier) (Family: Amaryllidaceae), Lycoris aruea (L′ Heritier) (Family: Amaryllidaceae), *Lycoris squamigeric* (L′ Heritier) (Family: Amaryllidaceae), *Polygala tenuifolia* Wild. (Family: Polygalaceae), Uncaria rhynchophylla Havil., (Family: Rubiaceae), *Withania somnifera* Fam., (Family: Solanaceae), *Convolvulus pluricaulis* Choisy., (Family: Convolvulaceae), *Rosemarinus officinalis* Linn. (Family: Lamiaceae), *Matricaria recutita* Linn. (Family: Asteraceae), *Panax ginseng* Linn. (Family: Araliaceae), *Panax notoginseng* Burk. (Family: Araliaceae), *Acorus calamus* Linn. (Family: Araceae), *Collinsonia Canadensis* Linn. (Family: Lamiaceae), *Bertholettia excelsa* Humb. & Bonpl. (Family: Lecythidaceae), *Angelica archangelica* Linn. (Family: Umbelliferae), *Urtica dioica* Linn. (Family: Clusiaceae), *Tinospora cordifolia* Wild. (Family: Menispermaceae), *Magnolia officinalis* Linn., (Family: Magnoliaceae), *Dipsacus asper* Wall (Family: Caprifoliaceae), *Paeonia suffruticosa* Andr. (Family: Paeoniaceae), *Radix salvia* miltiorrhizae Bunge. (Family: Labiatae), *Crocus sativus* Linn. (Family: Iridaceae), *Murraya koenigii* Linn. (Family: Rutaceae), *Desmodium gangeticum* Linn. (Family: Fabaceae), *Cassia obustifolia* Linn. (Family: Fabaceae), *Lycium barbarum* Linn. (Family: Solanaceae), *Juglans regia* Linn. (Family: Juglandaceae), *Emblica officinalis* Gaertn (Family: Phyllanthaceae), *Desmodium gangeticum* Linn. (Family: Fabaceae), *Piper nigrum* Linn. (Family: Piperaceae), *Ficus religiosa* Linn. (Family: Moraceae), *Cuminum cyminum* Linn. (Family: Apiaceae), *Pelargonium graveolens* Linn. (Family: Geraniaceae), *Pistacia vera* Linn. (Family: Anacardiaceae), *Rheum officinale* Linn. (Family: Polygonaceae), *Rosa damascene* Mill. (Family: Rosaceae), *Salix alba* Linn. (Family: Salicaceae), *Zizyphus vulgaris* Lam. (Family: Rhamnaceae), *Cleome gynandra* Linn., (Family: Cleomaceae), *Rheum officinale* Baill. (Family: Polygonaceae), *Parquet inanigrescens* Baill. (Family: Asclepiadaceae), *Angraecum eichlerianum* Kraenzl. (Family: Orchidaceae), *Bacopa floribunda* (R. Br.) Wettst. (Family: Plantaginaceae), *Canna indica* Linn. (Family: Cannaceae), *Citrus aurantifolia* (Christm.) Swingie (Family: Rutaceae), *Brassica nigra* Linn. (Family: Cruciferae), *Theobroma cacao* Linn. (Family: Malvaceae), *Khaya ivorensis* A. Chev (Family: Meliaceae), *Cucumeropsis mannii* N. (Family: Cucurbitaceae), *Ocimum basilicum* Linn. (Family: Lamiaceae), *Spondia smombin* Linn. (Family: Anacardiaceae), and many more [58-61]. Some of these pharmacologically effective plants have been developed into herbal formulations in a pharmaceutically adequate dosage as a memory enhancer and in the treatment of dementia. Various herbal formulations are currently undergoing clinical trials, such as, Danggui-Shaoyao-San (DSS), which is also known as

Dangguijakyak-san (DJS) or Toki-shakuyaku-san (TJ23) is a traditional herbal formulation that constitutes *Angelica sinensis* (Oliv.) Diels (Family: Umbelliferae), *Ligusticum chuanxiong* Hort. (Family: Umbelliferae), *Paeonia lactiflora* Pall. (Family: Paeoniaceae), Poria cocos (Schw.) Wolf (Family: Polyporaceae), *Alisma orientalis* (Sam.) Juzep. (Family: Alismataceae), and *Atractylodes macrocephala* Koidz. (Family: Compositae); Kami-kihi-to is composed of *Angelica acutiloba* Kitagawa (Family: Apiaceae), *Astragalus membranaceus* Bge. (Family: Fabaceae), *Atractylodes lancea* DC. (Family: Asteraceae), *Bupleurum falcatum* L. (Family: Apiaceae), *Gardenia jasminoides* Ellis. (Family: Rubiaceae), *Panax ginseng* C.A. Mey. (Family: Araliaceae), *Glycyrrhiza uralensis* Fisch. (Family: Fabaceae), *Poria cocos* Wolf. (Family: Polyporaceae), *Euphoria longana* Lam. (Family: Sapindaceae), Polygala tenuifolia Wild. (Family: Polygalaceae), *Saussurea lappa* Clarke. (Family: Asteraceae), *Zingiber officinale* Rosc. (Family: Zingiberaceae), *Zizyphus jujuba* Mill. var. inermis Rehd. (Family: Rhamnaceae), *Zizyphus jujuba* Mill. var. spinosa (Family: Rhamnaceae); Yokukansan is another herbal formulation that comprises of *Uncaria rhynchophylla* Schreb. (Family: Rubiaceae), *Angelica acutiloba* L. (Family: Umbelliferae), *Cnidium officinale* Makino. (Family: Umbelliferae), *Glycyrrhiza uralensis* (Family: Leguminosae), *Atractylodes lancea* DC. (Family: Compositae), *Bupleurum falcatum* L. (Family: Umbelliferae), *Poria cocos* Wolf. (Family: Polyporaceae); Chongmyeong-tang is composed of *Polygala tenuifolia* Wild. (Family: Polygalaceae), *Poria cocos* Wolf. (Family: Polyporaceae), *Acorus gramineus* Linn. (Family: Acoraceae); Palmul-chongmyeong-tang is a composition of *Panax ginseng* Linn. (Family: Araliaceae), *Atractylodes macrocephala* Koidz. (Family: Asteraceae), *Poria cocos* Wolf. (Family: Polyporaceae), *Glycyrrhiza uralensis* (Family: Leguminosae), *Angelica gigas* Nakai. (Family: Apiaceae), *Ligusticum chuanxiong* Hort. (Family: Umbelliferae), *Rehmannia glutinosa* Libosch. (Family: Orobanchaceae), *Paeonia albiflora* Pall. (Family: Paeoniaceae), *Acorus gramineus* Linn. (Family: Acoraceae), *Polygala tenuifolia* Wild. (Family: Polygalaceae); Guibi-tang comprises of *Panax ginseng* Linn. (Family: Araliaceae), *Astragalus membranaceus* Bge. (Family: Fabaceae), *Poria cocos* Wolf. (Family: Polyporaceae), *Zizyphus jujuba* Mill. (Family: Rhamnaceae); *Astragalus membranaceus* Bge. (Family: Fabaceae), *Angelica sinensis* (Oliv.) Diels (Family: Umbelliferae), *Euphoria longana* Lam. (Family: Sapindaceae), *Polygala tenuifolia* Wild. (Family: Polygalaceae), *Saussurea lappa* Clarke. (Family: Asteraceae), *Glycyrrhiza uralensis* Fisch. (Family: Fabaceae); LMK03- Jangwonhwan comprises of *Poria cocos* Wolf. (Family: Polyporaceae), *Angelica gigas* Nakai. (Family: Apiaceae); LMK03-Jangwonhwan is composed of *Poria cocos* Wolf. (Family: Polyporaceae), *Angelica gigas* Nakai. (Family: Apiaceae), *Acorus gramineus* Linn. (Family: Acoraceae), *Panax ginseng* Linn. (Family: Araliaceae), *Thuja orientalis* Linn. (Family: Cupressaceae), *Ophiopogon japonicas* Thunb. (Family: Asparagaceae), *Scrophularia buergeriana* Miquel (Family: Scrophulariaceae); ESP-102 (Jamdanggwi) is a composition of *Angelica gigas* Nakai. (Family: Apiaceae), *Saururus chinensis* Baill. (Family: Saururaceae), *Schizandra chinensis* Turcz. (Family: Schisandraceae); BT-11 is a formulation of ethanolic root extract of *Polygala tenuifolia* Wild. (Family: Polygalaceae); EGB761 is composed of standardized extract of *Ginkgo biloba* Linn. (Family: Ginkgoaceae); GK501 is composed of standardized extract of *Ginkgo biloba* Linn. (Family: Ginkgoaceae); G115 is a formulation of

standardized extract of *Panax ginseng* Linn. (Family: Araliaceae); INM 176 (K-1107) is composed of *Angelica gigas* Nakai. (Family: Apiaceae); another formulation as a memory enhancer in AD was developed that comprised of *Tinospora cordifolia* Wild. (Family: Menispermaceae), *Withania somnifera* Fam., (Family: Solanaceae), *Centella asiatica* Linn. (Family: Umbelliferae), *Curcuma longa* Linn. (Family: Zingiberaceae), *Mucuna pruriens* Linn. (Family: Fabaceae). Herbal treatment reduces the symptoms of AD and thus controls the disease progression. Such a non-toxic therapy would be a potential choice as an alternation in disease management and some are under clinical trials [62, 63, 64].

CONCLUSION

India and specifically North eastern India has a rich biodiversity of medicinal plants and traditional healing practices. But, recent urbanization in the geographical hotspots of these plants, different construction projects, and unplanned use and deforestation are affecting these valuable resources. Proper planning for saving those and study to know their benefits should be carried out to use them for development of mankind. As it has been known that around 70% of the allopathic medicines are also based on these ethnomedicinal plants, those species having high market value should be cultivated using modern agro-technology for better yield. The local communities should be educated on conservation, proper cultivation and on the market values of those medicinal plants.

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