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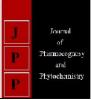
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Ethnomedicinal plants with anti-diabetic property used by tribes of Nagaland, India: A review

Chitta Ranjan Deb and T Ibeeka Sharma

Abstract

Nagaland is a state of North Eastern region of India and a part of Indo-Myanmar biodiversity hotspot. The state is very rich in flora and fauna due to favorable agro-climatic condition. Tribes of Nagaland have been using various plants to treat different kind of diseases including diabetes. Since herbal drugs have lesser or no side effect, plant based herbal drugs are very popular in the state. This communication intended to review of the past researches in the state on use of different plant and plant parts for treating/controlling diabetes. Systematic review of literatures reveals that till date a total of 47 plants belonging to 29 families are used as anti-diabetic by different tribes in the state. Though, these plants/parts are being used for anti-diabetic ethnomedicinal purpose, there is no or very limited information available on characterization of anti-diabetic potential active molecules/compounds from these plants, thus warrants isolation and identification of anti-diabetic compounds from these plants.

Keywords: Ethnomedicinal plants, tribes, diabetes, Nagaland

1. Introduction

Diabetes is a chronic, complex metabolic disorder with numerous acute and chronic consequences ^[1]. The body cells cannot metabolize carbohydrate properly and there is abnormal increase in blood sugar level resulting from insulin deficiency. The pathogenic process of development of diabetes includes autoimmune destruction of beta cells of pancreas and abnormalities in metabolism ^[2]. Failure of organ systems such as heart, blood vessels, eyes, kidney and nerves are the long-term effect of diabetes which can ultimately leads to death ^[3]. Sign and symptoms of diabetes include weight loss, polyuria, hypertension, blurred vision, polydipsia, polyphagia, tachycardia ^[4]. Here are two type of diabetes: Type 1 is absolute deficiency of insulin. Here, Islets of Langerhans in pancreas that produce β cell are destructed autoimmune. Type 2 is relative deficiency resulting from impaired insulin secretion and resistance its action ^[5]. By 2020, 34.2 million have been diagnosed with Diabetes ^[6]. The severe complicacy as a result of diabetes includes cardiovascular diseases, retinopathy, nephropathy, peripheral vascular disease, neuropathy, stroke etc. Out of 14166 patient, a total of 356 death occurred every year ^[7]. According Centers for Disease Control and Prevention, the cause for Type 1 diabetes is unclear but a having them in family history is a risk factor and there are no preventive measures for Type 1 diabetes. For type 2 diabetes, risk factors include overweight, older than 45 year, physically inactive for less than 3 times a week or have a history of diabetes in the family. Type 2 diabetes can be prevented with losing weight, eating healthier and getting regular physical exercise. By the year 2000, India has the highest record in diabetes with 31.7 million diabetes patients [8].

The underlying goal of all diabetes treatment and management is to maintain an adequate blood glucose concentration. Type 1 is usually treated with exogenous insulin and Type 2 with oral hypoglycaemic agents ^[9]. Plants based diet are rich in fiber, antioxidants and they reduce insulin resistance, inhibit glucose absorption, enhance glucose uptake and also promote weight loss. Limiting the intake of red meat and increasing plant in diet reduce the risk of cardiovascular disease leading from diabetes and since they are low in saturated fat, accumulation of toxic fat in hepatic and muscle cells that cause impairment in insulin signaling is also reduced ^[10]. Herbal drugs have lesser or no side effects and are less expensive as compared to synthetic drugs. Herbal medicinal plants with antidiabetic properties can induce release of insulin in Islets of Langerhans in pancreas and also act as insulin sensitizer ^[11]. Therefore, identification and isolation of anti- hyperglycemic compounds from the plants has become more and more important these days. The ethno-botanical information reports about 800 plants that may possess anti-diabetic potential ^[12]. Several anti-diabetic plants has been confirm for its hypoglycemic effect and mechanism of hypoglycemic effect are being studied ^[13]. Glycosides, alkaloids, terpenoids, flavonoid, carotenoids etc. are frequently implicated to

be the reason of anti-diabetic in medicinal plants ^[14]. Treatments of diabetes with oral hypoglycaemic drugs has many side effects and treatment's expenditure is also very costly. So utilizing herbal drugs with significant potency can decrease the side effects to negligible amount.

Nagaland, home to a rich variety of flora and fauna is a state in Northeastern India. It is bordered by Assam to its west, Arunachal Pradesh to the north, Sagaing region of Myanmar to the east and Manipur to the south. Its area is cover by tropical, sub-tropical forest and temperate hills. There are 12 districts in Nagaland viz: Dimapur, Kiphire, Kohima, Longleng, Mokokchung, Mon, Peren, Phek, Tuensang, Wokha, Zunheboto, Noklak. The state is inhibited by 16 major tribes: Angami, Ao, Chakhesang, Chang, Kachari, Khiamniungan, Konyak, Kuki, Lotha, Phom, Pochury, Rengma, Sangtam, Sumi, Yimchunger, Zeliang. Some other minor tribes include Garo, Mikir, Chirr, Makury, Rongmei and Tilchir. Forests of Nagaland receive abundant rainfall (1,800mm to 2,500 mm annually) which makes the state suitable for a vast variety of flora and fauna [15]. Over 80% of the population lives in remote rural areas and depends on plant based drugs for ailments of different diseases including diabetes. In the past many researchers have published numerous papers on the use of different plants and parts for treatment of this deadly disease. The aim of research was to make a comprehensive review on the use of different plants and their part, mode of uses for treatment of diabetes by the 'Local Healers/ Rural Medicine Persons' which are being used and knowledge has been passed from generation to generation.

2. Materials and methods

This review article is compiled on the anti-diabetic plants through literature survey and compilation of data on ethnobotanical work reported in various scientific journals, books on Nagaland. This survey was conducted during the period from March to October, 2021. The published literatures were collected from papers available online from www.sciencedirect.com; www.plantsjournal.com, www.researchgate.net; www.phytojournal.com; www.elsevier.com; www.academicjournal.org; www.scholarsresearchlibrary.com, etc. The collected data is presented in table 1 and tables contains the relevant ethno medicinal information with name of the plant family and species arranged in alphabetical orders along with its local name, part used and method of using it. Only the accepted names of the plant species were used to avoid repetition of species name of same plant.

3. Results

From various journals on the use of ethnomedicinal plants by various tribes of Nagaland, 47 plants belonging to 29 families are reported to use specially as anti-diabetic. *Albizia lebbeck* Linn. Benth., *Catharanthus roseus* (Linn.) G. Don, *Cissampelos pareira* Linn., *Clerodendron colebrookianum* D. Don, *Debregeasia longifolia* (Burm. f.) Wedd., *Eucalyptus globulus* Labill., *Gynura crepidioides* Benth. *Tithonia diversifolia* (Hemsl.) A. Gray, *Urtica dioica* L., *Zanthoxylum rhetsa* (Roxb.) DC. are 10 medicinal plants used by the

Chungtia tribe for the treatment of diabetes ^[16]. Kalanchoe *pinnata* is used by Phom tribe as anti-diabetic ^[17]. Chang tribe use Discentra scandens, Momordica balsaminaas antidiabetic ^[18]. Asparagus racemosus Willdenow, Catharanthus roseus Linnaeus is used as anti-diabetic by Phom tribe [19]. Angami tribe uses Passiflora edulis Sims., Potentilla fulgens Wall. Medicinal plants as anti-diabetic ^[20]. Panax ginseng C.A. Meyer is also reported to used as anti-diabetic in Folk Medicinal Plants of the Nagas in India by Changkija^[21]. Shankar et al. [22] reported Catharanthus roseus (L.) G. Don., Azadirachta indica A. Juss., Coccinia indica W. & A., Ecliptap rostrata Roxb., Momordica dioica Roxb. Will., Momordica charantia L., Ocimum sanctum L., Scoparia dulcis L., Syzygium cumini (L.) Skeels., Tamarindus indica L. as anti-diabetic medicinal plants in conservation of some pharmaceutically important medicinal plants from Dimapur district of Nagaland. Local traditional healers and collectors for trading widely used these medicinal plants. Some of the cultivars are also practicing cultivation for some of the medicinal plants ^[22]. While species like Abroma augusta (L.) L.f., Bauhinia variegata L., Cajanas cajan (L.) Millsp., Cinnamomum tamala (Buch-Ham.) T. Nees & C.H. Eberm., Juniperus racemosa Risso., Melothria heterophylla (Lour.) Cogn., Ocimum tenuiflorum L., Tinspora cordifolia are the antidiabetic medicinal plants found in Kohima, Mokokchung, Tuensang and Zunheboto districts of Nagaland ^[15]. Sumi Naga tribe are using Bauhinia variegata Linn., Dioscorea alata Linn., Passiflora edulis Sims., as remedy for by diabetes patient ^[23]. Solanum nigrum and Emblica officinalis are antidiabetic medicinal plants used by Chakhesang tribe of Nagaland ^[24]. Fruits extract of *Emblica officinalis* Gaertn. is used to treat diabetes by Lotha tribe ^[25]. *Paederia foetida* L., *Phlogacanthus thtyrsi* Florus Nees., *Perilla jrutescens* (L.) Britt., Punica granatum L. are anti-diabetic plants used by Ao Naga tribe ^[26].

4. Discussion

In the present review paper, total of 47 plants belonging to 29 families are reported as antidiabetic plants used by the tribes of Nagaland. This plants list is not completely comprehensive as more information and plants could be added through more detail investigation of the region. Since, there is cultural diversity and there are rich ethnobotanically important plants in Nagaland, ethnobotanical field exploration is still necessary. Sharing methods of used of folklore medicinal plants from older generation to younger generation are endangered nowadays ^[15]. Therefore, compilation and documentation of ethnomedicinal used is very important before the complete loss of this valuable information.

It is evident that there are various reports on ethnomedicinal importance and phytochemical analysis on various antidiabetic plants species has been done in different part of the world. However, there are very limited information on the molecular characterization and phytochemical analysis of the native genus with antidiabetic values occurring in Nagaland. Thus, this review article will be the based platform to analyses the biochemical properties and establishing possible mode of anti-diabetic action withhold by the above mentioned native plants of Nagaland.

Table 1: List of anti-diabetic potential ethnomedicinal plants used by the local healers and various ethnic tribes of Nagaland, India

Sl. No.	Scientific Name	Family	Local Name	Habit	Parts used	Method of use
1.	Abroma augusta (L.) L. f.	Malvaceae	Ulatkambal	Shrub	Fresh leaf	Decoction of fresh leaf
2.	Albizia lebbeck Linn.	Fabaceae	Moang (Ao tribe)	Tree	Stem and its bark	Dried powder of stem and bark are boiled

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	47.		Rutaceae			Leaves and fruits	Leaves and fruits are chewed
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5. Conclusion

The study shows that herbs (specially the leaf part of the plant) are mainly used by tribe of Nagaland. Cucurbitaceae, Fabaceae and Lamiaceae are some of the most common occurring families with anti-diabetic properties. Many bioactive drugs have been isolated from the plants which have hypoglycemic effect and have shown effective for the treatment of diabetes. However many other bioactive agents obtained from the plant is still yet to be characterized. To establish the safety and effectiveness of reported plant species, phytochemical analysis of the mentioned plant needs to be done. It will also increase the awareness among the younger generation about the need of preserving these important floras which otherwise will be lost because of deforestation. Therefore there is urgent need for the management of these anti-diabetic plants with the establishment of its chemical profiling and their anti-diabetic mode of action. The toxicity effect of these plants also needs to be elucidated.

6. Conflict of Interest: Authors declare that there is no conflict of interest.

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