



Investigations on anti-diabetic medicinal plants used by Sugali tribal inhabitants of Yerramalais of Kurnool district, Andhra Pradesh, India.

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ABSTRACT

An Ethno-botanical survey was carried out among the Sugali tribes in Yerramalais of Eastern Ghats, Kurnool District, Andhra Pradesh for the exploration of antidiabetic herbal remedies. Diabetes mellitus is one of the common metabolic disorders with micro-and macrovascular complications that results in significant morbidity and mortality. It is considered as one of the five leading causes of death in the world. In Allopathy medicine no satisfactory effective therapy is still available to cure diabetes mellitus. There is increasing demand by patients to use natural products with antidiabetic activity due to side effects associated with the use of insulin and oral hypoglycemic agents. The art of herbal treatment has very deep roots in Indian culture. Even today in most of the rural areas people are depending on herbal drug systems for primary health care. The indigenous knowledge of local traditional healers and native plants used for the treatment of diabetics related health disorders were collected through questionnaire and personal interviews. A total of 10 informants with in the age group of 50 to 68 were interviewed, among them two were tribal practitioners. A total of 21 genera and 18 families were identified which are being used for the treatment of diabetes. Results depict that fresh plant materials were invariably preferred for the treatment of long term complications associated with diabetics. Anti-diabetic medicinal plants used by Sugalis have been listed along with plant parts used. The collected information's are arranged in the alphabetic order of the plant botanical name, family with the local (or) common name, and mode of use is listed.

Keywords: Sugali tribes, Ethnobotanical, Eastern Ghats, Yerramalais, Diabetes Mellitus.

INTRODUCTION

Human culture has been augmented by plant and plant products since time immemorial. Ethno-medicinal plants play a significant role in the folk culture of different tribal and herbal practitioners. Since the dawn of civilization man has been in the race to find cure for his ailments. Traditional knowledge is a record of human achievements in comprehending the

complexities of life and survival in often unfriendly environment. India holds a credibility of diverse social, cultural and medical heritage with an unbroken tradition coming down across millennia. Though, medical heritage is centuries old, millions people in rural area still depend on traditional medicine to congregate their healthcare needs. Collection of information and documentation of traditional knowledge plays an important role in scientific research on drug development (Ragupathy et al., 2008). A study of World Health Organisation depicts that over 80% of world's population depends on biological resources for their primary

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healthcare demands (WHO, 2000). Plants have been used in traditional medicine for several thousand years (Abu-Rabia, 2005). The knowledge of medicinal plants has been accumulated in the course of many centuries based on different medicinal systems such as Ayurveda, Unani and Siddha. In India, it is reported that traditional healers use 2500 plant species and 100 species of plants serve as regular sources of medicine (Pei, 2001). The plant-based traditional medical systems continue to provide the primary health care to more than three-quarters of the world's populace. Indigenous herbal treatment is a part of the culture and dominant mode of therapy in most of the developing countries. Ethnobotanical research can provide a wealth of information regarding both past and present relationships between plants and the traditional societies. Diabetes mellitus is the major endocrine disorder (Burke JP 2003) responsible for renal failure, blindness or diabetic cataract (Thylefors et al., 1990) poor metabolic control (Donnelly et al., 2000), increased risk of cardiovascular disease including atherosclerosis and AGE (advanced glycation end) products. (Yozawa et al., 2004). Antioxidants play an important role to protect against damage by reactive oxygen species and their role in diabetes has been evaluated. Many plant extracts and products were shown to possess significant antioxidant activity (Sabu et al., 2002).

The International Diabetes Federation estimates that the number of diabetic patients in India more than doubled from 19 million in 1995 to 40.9 million in 2007. It is projected to increase to 69.9 million by 2025. Currently, up to 11 per cent of India's urban population and 3 per cent of rural population above the age of 15 has diabetes (Saikat Neogi, 2007). Every fifth patient visiting a consulting physician is a diabetic and every seventh patient visiting a family physician is a diabetic (Abid et al., 2010). Keeping in view the alarming increases in the incidence and prevalence of diabetic in India, the WHO has declared India as the Diabetic capital of the world. Studies have shown that increasing patient knowledge regarding disease and its complications has significant benefits with

regard to patient compliance to treatment and decreasing complications associated with the disease.

"Diabetes" is a metabolic syndrome of multiple etiologies characterized by chronic hyperglycemia with abnormalities in carbohydrate, fat and protein metabolism due to defect in insulin secretions. Different types of diabetes have been identified and categorized as Type I Diabetes, Type II Diabetes and Gestational Diabetes. Type 1 diabetes develops because the body immune system mistakenly destroys the beta cells in the islet tissue of the pancreas that produce insulin. Diabetes mellitus is one of the most common metabolic diseases in the world. It is a group of disorders that are associated with high blood sugar levels which often leads to complications such as retinopathy (total blindness), neuropathy and (circulatory problem), myopathy (coronary heart disease), kidney failure, that may result in ambulation nerve problem and premature death. It is also associated with health complications including renal failure with risk of foot ulcers, including sexual dysfunction, heart disease and stroke. Diabetes is due to deficiency of Insulin hormone. Insulin is a protein hormone secreted by groups of cells within in pancreas called islet cells. Medicinal plants used to treat diabetic conditions are of considerable interest and a number of plants have shown varying degrees of hypoglycemic and antihyperglycemic activity (Ignacimuthu et al., 2006). Since antiquity, diabetes has been treated with plant medicines. Ethnobotanical studies of traditional herbal remedies used for diabetes around the world have identified more than 1,200 species of plants with hypoglycemic activity (Babu et al, 2006). Natural medicines used in the traditional Chinese medical system for therapy of diabetes mellitus (Li et al., 2004). In India, indigenous remedies have been used in the treatment of Diabetes mellitus since the time of Charaka and Sushruta 6th century BC (Grover and Vats, 2001). Ayurveda and other Indian traditional medicine use plants in treatment of diabetics (Chopra et al, 1986). However, traditional knowledge, derived empirically, has to be supported by scientific testing.

Modern therapies are far too costly and also they are beyond the reach of tribal people to be practiced for the majority of diabetes researchers; so the ethnopharmacological use of herbal remedies for the treatment of diabetes is an area of study, which ripe with potential as a starting point in the development of alternative, in-expensive therapies. Several herbs have shown anti-diabetic activity when assessed with the available experimental techniques (Mukherjee et al., 2006). Wide array of plant derived compounds with consistent antidiabetic activity have proven their possible use in the treatment of DM (Farnsworth, 1998). Plants like *Allium cepa*, *Allium sativum*, *Aloe vera*, *Cajanus cajan*, *Coccinia indica*, *Caesalpinia bonducella*, *Ficus bengalensis*, *Gymnema sylvestre*, *Momordica charantia* (Grover et al., 2002, Satyanarayana et al., 2010), *Ocimum sanctum*, *Pterocarpus marsupium*, *Swertia chirayita*, *Syzigium cumini*, *Tinospora cordifolia* and *Trigonella foenumgraecum* (Prasanth and Kumar, 2009) have been studied in relation to diabetes and their complications. *Asparagus racemosus*, *Butea monosperma*, *Catharanthus roseus*, and *Coccinia indica* are consistently used by the tribal communities for the treatment of diabetes (Rana et al., 1999) as well as in modern medicine. However, these plants have shown varying degree of hypoglycemic and anti-hyperglycemic activity.

Quite a handful of tribes reside in every nook corners of Eastern Ghats of the state Andhra Pradesh. Sugalis tribal community is one of the nomadic tribes who have settled down in Yerramalai in isolated villages called Thandas. Thndas like Gummitham thanda, Sugali Lobai are visited. The historical evidences reveal that they associated themselves with the forest which provides them all their day-to-day requirements. The present paper deals with the Sugalis (also called as Banjaras or Lambadies), one of the largest and advanced tribes of Andhra Pradesh, inhabiting the Yerramalais range of Eastern Ghats of Kurnool District of Andhra Pradesh.

The main objective of this paper is to analyze how these tribal pastoralists and peasants,

agriculturists have interacted with the forest medicinal plants in utilizing them for diabetes. Sugalis are still using the natural resources available in their surrounding to treat many diseases and accidental derangements. The main objective of this study was to assess the diversity of ethnomedicinal plants used by Sugalis and document the traditional medical practices followed in healing complications associated with diabetics. Similar ethnobotanical studies have been elsewhere to document the traditional knowledge that has been vanishing. Therefore, documenting indigenous knowledge is important from the view point of conservation of biological resources and their sustainable utilization in the management of Diabetics and its related complications. Traditional phototherapeutic treatment may provide the voluble clues for the development of new oral hypoglycemic agents and simple dietary adjuncts. Considering this we want to bring a awareness in urban people how diabetes disorders are prevented by tribal people.

MATERIAL AND METHODS

Study area

Kurnool district is present in Andhra Pradesh, situated between eastern longitudes of 76 58'-78 56' and northern latitudes of 14 54'-16 14'. The district is bounded by Prakasam district on the east, Anantapur and Kadapa district on the south while Bellary district of Karnataka state forms the western boundary. Yerramalais forest consists of 75% weathered rocks and remaining 25% forest is green and are scattered, not in continuous range. Yerramalais forest covers over 1 lakh of the 4 laks hectares of forest in Kurnool district. Yerramalais receives very low rainfall and they come under the Sothern thorn forest. The vegetation is varied depending upon the climate and edaphic factors. Some parts of the forest show valleys with streams in Owk, Maddilet, Racherla, North Dhone, Gani and Lanjabanda forest showing slightly degraded deciduous type of vegetation.

Ethnobotanical Survey

Frequent field surveys were conducted

throughout the Yerramalis forest of Eastern Ghats of Kurnool district during February 2008 to Mar 2010. The data were collected from traditional healers, vaidyas and elder sugalis following the methodology of (Jain and Goel, 1995). The study was conducted during 2008-2010 visiting regularly Sugali thandas and Lobais. The information regarding the usage of antidote medicinal plants available in the local thandas for treating various poisonous bites was collected directly by contacting the herbal doctors called local Vaidhyas or traditional healers, villagers and housewives. About 15 thandas were interviewed. During the interview the 10 informants whose age ranged from 50 to 80 years old, displayed specimens of antidiabetic medicinal plants. Some informants were taken to the forest to locate the plants. First hand information on their traditional medicine was recorded; repeated enquiries were made to understand their knowledge, and methods of diagnosis and treatment. Data were collected on the specific part of the plants used collection, method of usage of the drug and dosage of the drug, dosage of administration. The medicinal plants are identified with the help Flora of Presidency of Madras (Gamble, 1935) and Flora of Kurnool District (Raju et al., 1985) and finally confirmed with the herbarium of S.K. University, Anantapur. The collected plants are stored in the herbarium Osmania College, Kurnool. Present study was carried out in Yerramalais forest of Kurnool district during Feb 2008 to March 2010. The ethnobotanical data were collected through interviews, discussions and observations. Information was recorded specially from people who were familiar with herbal medicines.

RESULTS AND DISCUSSION

A total of 21 plant species belonging to 18 families have been recorded in the present study (Table 1). However, plants like *G. sylvestre*, *M. indica*, *M. charantia*, *M. koeingii*, *S. cumini*, and *T. foenum-graecum* were more frequently used by the people in the area. Plant species belonging to families of

Fabaceae (2), Annonaceae (2), Acanthaceae (1), Asclepiadaceae (1), Anacardiaceae (1), Cucurbitaceae (2), Myrtaceae (1), Combretaceae (1), Eupherbiaceae (1), Apocynaceae (1), Cyperaceae (1), Moraceae (1), Sterculiaceae (1), Menispermaceae (1), Oxalidaceae (1), Asteraceae (1), Nyctaginaceae (1), and Caesalpiniaceae (1). In addition, to the plants documented in the present study, many other plants have shown excellent positive outcomes in respect to diabetic complications such as diabetic nephropathy, fructose induced insulin resistance, and cataract. Recently, efficacies of *T. foenum graecum*, *O. sanctum*, *P. marsupium*, *M. koeingii* and *B. juncea* have been proven effective in the management of Diabetics and its related complications (Jung et al., 2006, Modak et al, 2007). The tribe Sugali preferred to use a diversity of native plants with medicinal utility. The chemical analysis of these plants showed that they contain antioxidants compounds especially; flavonoids and phenolics have been reported to enhance insulin secretion and scavenge free radicals that are generated during diabetic state (Marles and Farnsworth, 1995), which may play a vital role in reducing sugar levels. Flavonoids are well known to regenerate the damaged beta cells in the diabetic rats while phenolics are found to be effective antihyperglycemic agents (Chakravarthy et al., 1980; Manickam et al., 1997). During the study, a total of 21 species distributed among 21 genera belonging to 18 families used in the treatment of diabetes were identified and the plants have been collected in their flowering and fruiting stages as far as possible from the natural habitat. As far as plant part utility is concerned, leaves are used commonly, followed by stem bark, seeds and rhizome. The remedies are prepared in the form of extract/ juice followed by decoction, powder form and from raw plant parts. The present study perceived that the local people always prepare single plant to treat diabetes or the different parts of the same plant. To make better acceptability of herbal remedies that are taken orally, additives are not taken. The prepared herbal medicines are given as an antidiabetic only after the conditions of the patients are actually observed.

Table 1: List of antidiabetic Medicinal Plants used By Sugali Tribes.

S.No	Scientific name	Family	Local name	Mode of use
1	<i>Abrus precatorius</i> L.	Fabaceae	Guruninda	Leaf juice (2 teaspoon) given orally twice a day till cure.
2	<i>Annona squamosa</i> L.	Annonaceae	Sitphalam	leaves (25 g) are taken with milk orally daily in the morning
3	<i>Andrographis paniculata</i> (Burm. f.)	Acanthaceae	Neela vemu	Decoction of the leaves (50 ml) is prescribed thrice a day after food or fresh raw leaves eaten every day.
4	<i>Coccinia grandis</i> (L.)	Cucurbitaceae	Donda	Leaf juice and mucilage from immature fruits (2 teaspoon) are given twice or thrice a day after food
5	<i>Pongamia glabra</i>	Fabaceae	Ganuga	Tender leaves are mixed with turmeric and made into small round structures called gulicalu and taken early morning with empty stomach.
6	<i>Mangifera indica</i>	Anacardiaceae	Mameedi	Young brown rusty leaves are taken taken early morning with empty stomach.
7	<i>Annona Squamosa</i>	Annonaceae	Seetaphalam	Young leaves are taken early morning
8	<i>Tinospra cordifolia</i>	Menispermaceae	Teepateega	Bark extract is taken early morning
9	<i>Momordica charantia</i>	Cucurbitaceae	Kakara	Leaf juice mixed with cucumber taken orally
10	<i>Gymnema sylvistre</i> (Retz.)	Asclepiadaceae	Podapthri	Leaf juice is taken early morning with empty stomach
11	<i>Bougainvillea spectabilis</i> Willd	Nyctaginaceae	Kagithal puvvu	Young tender leaves are taken early morning.
12	<i>Biophytum sensitivum</i> (L.)	Oxalidaceae	Pedda atipati	Leaf juice is taken early morning with empty stomach
13	<i>Cassia auriculata</i>	Caesalpiniaceae	Thngedu	Root extract is taken orally.
14	<i>Eugenia jambolana</i>	Myrtaceae	Naeraedu,	Seed powder is taken
15	<i>Terminalia bellirica</i>	Combretaceae	thani	dried fruit is taken
16	<i>Ricinus communis</i>	Euphorbiaceae	Amudamu	Dried root powder is taken early morning.
17	<i>Vernonia anthelmintica</i>	Asteraceae	shadevi	Seed powder is taken
18	<i>Vinca rosea</i>	Apocynaceae	Billa Ganneru	Dried whole plant extract is taken.
19	<i>Cyperus rotundus</i> L.	Cyperaceae	Tunga musti	dry tuber powder is administered daily twice
20	<i>Ficus hispida</i>	Moraceae	Bommidi	ripe fruits are consumed daily, stem bark is used
21	<i>Helicteres isora</i>	Sterculiaceae	Malikaya	Root extract is taken orally.

Herbal remedies are considered the oldest forms of health care known to mankind on this earth. Prior to the development of modern medicine, the traditional systems of medicine that have evolved over the centuries within various communities, are still maintained as a great traditional knowledge base in herbal medicines (Mukherjee and Wahil, 2006). Traditionally, this treasure of knowledge has

been passed on orally from generation to generation without any written document (Samy and Ignacimuthu, 2000) and is still retained by various indigenous groups around the world.

CONCLUSION

The claims emanating from the present survey need to be subjected to pharmacochemical studies in order to discover their true potential, as it is very difficult to judge the effectiveness of herbal medicine. The data collected shows that majority of the remedies are taken orally. Herbal medicines prescribed by tribal people are either preparation based on single plant or a combination of several plant parts. Most of the reported preparations are drawn from a single plant; mixtures are used rarely. The fresh plant parts are used for the preparation of medicine. When fresh plant parts are unavailable, dried parts are also used. Generally, the people of the study area still have a strong belief in the efficacy and success of herbal medicine. The results of the present study provide evidence that medicinal plants continue to play an important role in the healthcare system of this tribal community. The data recorded can possibly be used as the potential source for discovering modern medicine. Studies on new medicinal plants can serve as substitutes for other plants with high demand and also for threatened plants. Many plants used for the treatment of diabetes contain substances like glycosides, alkaloids, terpenoids, flavonoides. However, more investigations must be carried out to evaluate the mechanism of action with antidiabetic effects.

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