

Research Article



An Inventory of Traditional Herbal Medicines Used in Management of Diabetes Mellitus II by Ethnic People of South-East Rajasthan (India)

Asha Arora*, Vinita Paliwal, Hetal Jain

Department of Biotechnology, B.N.P.G. College Udaipur 313001 (Rajasthan) India.

*Corresponding author's E-mail: araudr@gmail.com

Accepted on: 10-11-2014; Finalized on: 31-12-2014.

ABSTRACT

Stress leads to disease and disease leads to stress, this bidirectional poking relationship urges for the development of stress busters or ailment regulators which can sooth lives. Ethnic groups of south east Rajasthan inherit a vast pharmacopoeia and ingredient/s sourced from the same, forms a baseline of numerable commercial drugs. Present study was an attempt to inventorize the hypoglycemic plants and their formulations used by tribals to regulate the blood glucose levels. Crisscross transactional interaction with local healers and ethnic groups of both gender and various age groups reveal use of 41 plants and 8 formulations for DM II management. Among documented ethno phyto drugs 8 were used as food while 16 as protective source to delay the onset of DM II. 34 plants were used as curative agents i.e. to regulate the glucose levels. Enlisted data includes mode of usage, usage time tenure, quantity and use value (UV) of documented ethno hypoglycemic plants.

Keywords: Stress, Hypoglycemic plants, Diabetes Mellitus II, South east Rajasthan, Use value.

INTRODUCTION

With the onset of civilization stress has encountered lives. Struggle for existence, fulfillment of basic necessities and consensus of emotional paradigm has always been a stress booster pan. Individuals under its threat are more prone to diseases as the state of mind imparts itself as a physiological expression. Prolonged stress wreaks havoc as it threatens homeostasis¹ and different stressors tend to elicit different pattern/s of biological responses i.e. stereotypy². Among different array, metabolic entities related to energy count especially to glucose are more important as they lead to other stress sub-clauses as depression, anxiety, phobia, nervousness etc. Prolonged glyceic disturbances are attributes of many ailments among which diabetes i.e. DMII is utmost. Diabetes itself also leads to stressful state as it demands change in life style and diet, regular clinical investigation and medications; moreover a socio-psychological impact of being a patient of non-curable, lifelong drug dependent disease. This psychological state dumps QOL (Quality of life)³ and HRQOL (Health related quality of life)⁴. Traditionally DM II is dealt in two ways-(1) By reducing stress through fun and frolic, societal interaction, physical exercises, yoga, meditation, self hypnosis etc. and (2) By regulation and maintenance of glucose levels through indigenous drugs. Stress coefficient varies among individuals so busters cannot be universally designed but indigenous herbal drugs can be evaluated and transformed as medications.

Rajasthan ranks fifth in tribal population forming 12.5% of state's total population. These tribes are chiefly distributed in three main regions viz. south-eastern zone, southern zone and western zone. Maximum ethnic groups reside in south-eastern zone and therefore it

forms an ideal region for ethno-medicinal studies with special reference to hypoglycemic plants. It encompasses Udaipur, Banswara, Dungarpur, Chittorgarh, Rajsamand and Bhilwara districts which are pre-dominantly inhabited by Bhils, Meenas, Banjara, Gadia-Lohar, Kalbelia, Rebari, Jogi, Bori, Kanjer, Sansi, Bhat and Masani as chief communities⁵. Despite availability of health care network by Government and other social health agencies most of the people are partially or totally dependent on local traditional medicinal system. These system encompasses both preventive and curative methods through nutritional/dietary measures and medications⁶. These indigenous practices are inherited by various tribal healers viz.-Bhopa (ritual therapeutic), Jhankar/ Jhangar (herbalist), Devala (grain diviner), Khoonth (priest) and Guni (herbal practitioner). Along with these practitioners remedial actions are also performed by senior/aged persons of family. Prior to present study many ethno-botanical enumerations of this region has been documented⁷⁻¹¹. However, data on this specified ailment/s i.e. is bare and use value (UV) of hypoglycemic plants is still not enumerated. In present study an attempt was made to document the hypoglycemic plants and to evaluate their use value so that they can be subjected for further screening to be formulated as low risk safe herbal drug.

MATERIALS AND METHODS

For documentation of hypoglycemic plants, field surveys were carried out in different seasons, from 2010 to 2013 in various tribal pockets. The pockets were selected randomly and were emphasized to cover nearly all ethnic groups. For the documentation, field interviews were made from different practitioners - Bhopa (ritual therapeutic), Jhankar/ Jhangar (herbalist), Devala (grain diviner), Khoonth (priest) and Guni (herbal practitioner)



through local transcends to avoid language ambiguity. For the authentication of plant usage crisscross check was made, either by showing them plants or by making a tour with them to a forest array. According to CBD guidelines prior informant consent (PIC) was obtained and inscribed for usage, dose, mode of dose, tenure/ time interval etc. In case of poly-herbal preparation ratio of respective drug/s and mode of usage was specifically noted. As some of the herbs prevents usage of other food/s and supplements/s as they directly or passively interacts with others, in such cases special notes were made for check modes. Plant specimens were collected and were followed by herbarium preparation with citation of all related information. Plants were identified up to species level through flora of region and prior work^{12,13}. Herbarium sheets were deposited in Department of Biotechnology, B.N. P.G. College, Udaipur (Raj.) for further reference. The use value (UV)¹⁴ was calculated as-

$$UV = \Sigma U / n$$

(UV = use value of a species; U = number of citations per species; n = number of informants)

The importance of plant and its use was signified according to the calculated use value.

RESULTS AND DISCUSSION

Ethno-traditional medicinal system of south-east Rajasthan functions on three arrays viz.-(a) Regulation of ailment through nutritional supplement. (b) Prohibitory supplements to delay the consequence of ailments and (c) Use of local herbs/resources to cure and regulate the ailment¹⁵. Inventoried ethno-medicinal data reveals use of *Allium cepa*, *Aloe barbadensis*, *Capparis decidua*, *Feronia limonia*, *Leptadenia pyrotechnica*, *Momordica charantia*, *Phyllanthus embilica* and *Trigonella foenum graecum* as food supplements to regulate glycemic loads. Traditional healers are aware of heritable nature of DMII and therefore recommend protective herbs and formulations to hyperglycemic prone families as they

believe that these agents can delay the onset of diabetes. It enlists *Aerva lanata*, *Allium cepa*, *Aloe barbadensis*, *Asparagus racemosus*, *Capparis decidua*, *Cassia fistula*, *Catharanthus roseus*, *Cinnamomum aromaticum*, *Citrullus colocynthis*, *Commiphora wightii*, *Feronia limonia*, *Ficus bengalensis*, *Leptadenia pyrotechnica*, *Momordica charantia*, *Phyllanthus embilica* and *Syzygium cumini*. Patients recognized for DMII are subjected to various curative herbal doses. Dosage and duration for ingestion is considered to be totally dependent on intensity of disease and age of patient (Table 1).

Curative herbal source include *Acacia senegal*, *Aegle marmelos*, *Aerva lanata*, *Aloe barbadensis*, *Andrographis paniculata*, *Annona squamosa*, *Asparagus racemosus*, *Boerhavia diffusa*, *Caesalpinia bonducella*, *Cassia sophera*, *Catharanthus roseus*, *Cayratia trifolia*, *Citrullus colocynthis*, *Coccinia grandis*, *Cocculus hirsutus*, *Costus speciosus*, *Cyamopsis tetragonoloba*, *Dalbergia sissoo*, *Feronia limonia*, *Gymnema sylvestre*, *Hemidesmus indicus*, *Mitragyna parvifolia*, *Momordica charantia*, *Mukia maderaspatana*, *Murraya koenigii*, *Phyllanthus embilica*, *Ptreocarpus marsupium*, *Syzygium cumini*, *Terminalia alata*, *Terminalia bellerica*, *Trichosanthes cucumerina*, *Tridax procumbens*, *Trigonella foenum graecum* and *Withania somnifera*.

Aerva lanata, *Aloe barbadensis*, *Asparagus racemosus*, *Catharanthus roseus*, *Citrullus colocynthis*, *Feronia limonia*, *Momordica charantia*, *Phyllanthus embilica* and *Syzygium cumini* are considered to be protective as well as curative. Ethno-hypoglycemic formulations are generally prescribed by Guni/s (herbal practitioner) and include either combination of glycemic regulators or curative agents along with protective agents of other DMII associated ailments. All formulation ingredients are stored as dried powder and are used accordingly except if deployed as food/vegetable (Table 2).

Table 1: Enumeration of Ethno-Hypoglycemic Plants

Botanical name; family (local name) (UV) Herbarium acc. No.	Plant part/s used	Form of usage	Usage time / Tenure	Usage amount
<i>Acacia senegal</i> (L.) Willd; Mimosaceae (Kumatio) (0.42) BNC/01/2011/50	Gum	Masticatory	-	-2-5 g
	Pods	Vegetable	-	-
	Root/Stem bark	Decoction of -10-15 g of dried powder	Early morning; empty stomach	-20-50 ml
(Usage of Gum is recommended only by Bhopas of Udaipur región)				
<i>Aegle marmelos</i> (L.) Correa ex Roxb.; Rutaceae (Bel-patra, Bila) (0.61) BNC/01/2011/41	Leaves	Infusion of 5-7 leaves	Once early morning	-50 ml
	Stem bark	Decoction of -10 g of dried powder	Twice a day before meals	-50 ml
<i>Aerva lanata</i> (L.) Juss.ex Schult; Amaranthaceae (Kalibui) (0.58) BNC/01/2010/27	Whole plant	Infusion of - 50 g fresh plant	Twice a day-before meals	One cup
<i>Allium cepa</i> L.; Liliaceae (Kanda) (0.32) BNC/01/2010/30	Bulb	1-2 Fresh bulbs	-	-



Botanical name; family (local name) (UV) Herbarium acc. No.	Plant part/s used	Form of usage	Usage time / Tenure	Usage amount
(Used as a part of salad and is preferred with butter milk)				
<i>Aloe barbadensis</i> Miller; Liliaceae (Gawarpatha) (0.69) BNC/01/2011/81	Leaf	Pulp /Juice with turmeric powder	Daily- early morning	~50 ml
(Leaves and inflorescence are used as vegetable)				
<i>Andrographis paniculata</i> (Burm.f.)Wall. ex Nees ; Acanthaceae (Kalmegh) (0.65) BNC/01/2010/24	Leaves	Decoction	Varies with patients physiology	~100 ml
(In Kathodia and Bhil Meena tribes decoction of panchang is preferred)				
<i>Annona squamosa</i> L.; Annonaceae (Sitaphal) (0.54) BNC/01/2010/1	Seeds	Decoction of 10-15 g dried seed powder	Twice a day	One cup
<i>Asparagus racemosus</i> Willd.; Liliaceae(Shatawari)(0.65) BNC/01/2012/120	Tubers	Powder	At night with milk	One tea spoon
(It is not preferred for male patients)				
<i>Boerhavia diffusa</i> L. ; Nyctaginaceae (Puraliyo) (0.52) BNC/01/2011/67	Leaves	Infusion of 10-12 leaves	Once a day	~50-60 ml
<i>Caesalpinia bonducella</i> (L.) Roxb; Caesalpinaceae (Katkaranj) (0.58) BNC/01/2011/51	Seeds	Decoction is prepared from 5-7 dried seeds	-	One Cup
<i>Capparis decidua</i> (Forssk.) Edgew ; Capparaceae (Ker) (0.45) BNC/01/2011/37	Fruits	Vinegar based pickles	As prescribed by healer/s	~20 g
<i>Cassia fistula</i> L.; Caesalpinaceae (Amaltas) (0.45) BNC/01/2010/11	Fruits	Pulp	Before meals	Half tea spoon
(Its use is preferred with Bajra - <i>Pennisetum</i> sp.)				
<i>Cassia sophora</i> L.; Caesalpinaceae (Kasunda) (0.52) BNC/01/2010/102	Bark	Decoction of ~10 gm bark powder	Twice a day-before meals	~50 ml
	Seeds	Powder	Early morning empty stomach	~5 gm
<i>Catharanthus roseus</i> (L.) G.Don.; Apocynaceae (Sadabhar, Baramasi) (0.68) BNC/01/2010/29	Leaves and/ or Flowers	Raw	Once a day; early morning, empty stomach	2-3
<i>Cayratia trifolia</i> (L.) Domin.; Vitaceae (Talpatiya) (0.60) BNC/01/2011/145	Roots	Extract	Before meals	Half teaspoon
<i>Cinnamomum aromaticum</i> Ness.; Lauraceae(Kasia)(0.32) BNC/01/2011/87	Bark	Powder	Twice a day	~5 mg
(Practiced only in Sahariya tribe.)				
<i>Citrullus colocynthis</i> (Linn.) Schrad ; Cucurbitaceae (Gavakshi)(0.62) BNC/01/2010/14	Fruit	Extract / Infusion of one fruit	Once a day	-
<i>Coccinia grandis</i> (L.) Voigt; Cucurbitaceae (Tindori) (0.38) BNC/01/2012/106	Whole plant	Powder	Once /Twice a day as recommended	~ 10-20 g
<i>Cocculus hirsutus</i> (L.) Diels; Menispermaceae(Bajarbel) (0.42) BNC/01/2011/36	Leaves	Extract of 2-3 leaves	Before meals	-
<i>Commiphora wightii</i> (Arn.) Bhandari ; Burseraceae (Gugal) (0.38) BNC/01/2011/43	Gum	Dried Gum	Twice a week	~ 2-5 mg
<i>Costus speciosus</i> (Koen.) ex Retz.; Costaceae (Mahalakdi) (0.50) BNC/01/2012/124	Rhizome	Powder	Once a day	One teaspoon
(Its use is forbidden in Leucorrhoea patients)				
<i>Cyamopsis tetragonoloba</i> (L.)Taub.; Fabaceae (Gawar)(0.68) BNC/01/2011/46	Seeds	Decoction of 20-30 seeds	Early morning, empty stomach	~ 40-50 ml
<i>Dalbergia sissoo</i> Roxb. ex DC; Fabaceae (Pai, Talli) (0.60) BNC/01/2012/198	Leaves	Infusion	Twice a day	2-3 leaves
<i>Feronia limonia</i> Swingle ; Rutaceae (Kotbadi) (0.62) BNC/01/2011/42	Fruits pulp	Juice	Thrice a week	~ 100 ml
(It's use is strictly denied in patients suffering from stone problems)				
<i>Ficus bengalensis</i> L.; Moraceae (Bargad) (0.20) BNC/01/2011/86	Stem bark	Decoction of ~ 10-15 g dried bark powder	As prescribed by healer	-
(For better result goat milk is preferred.)				
<i>Gymnema sylvestre</i> R.Br.ex Schultz; Asclepiadaceae (Halda) (0.66) BNC/01/2011/59	Leaves	Powder	Daily-once	2 g powder

Botanical name; family (local name) (UV) Herbarium acc. No.	Plant part/s used	Form of usage	Usage time / Tenure	Usage amount
<i>Hemidesmus indicus</i> (L.)R.Br.; Asclepiadaceae (Dawri) (0.58) BNC/01/2012/114	Roots	Extract	Daily –once ; at night after half an hour of meals	~ 10 ml
<i>Leptadenia pyrotechnica</i> (Forssk.) Decne; Asclepiadaceae (Khip) (0.42) BNC/01/2010/21	Leaves Fruits	Raw Vegetable	- -	2-3 leaves
<i>Mitragyna parvifolia</i> (Roxb.) Korth; Rubiaceae (Kadamb) (0.60) BNC/01/2012/111	Stem bark	Decoction of 10-15 g fresh bark	Once/twice	-
<i>Momordica charantia</i> L. ; Cucurbitaceae (Jangli Karela) (0.74) BNC/01/2011/54	Fruits	Juice	Twice a day before meals	~ 50-100 ml
(Empty stomach- its use is prohibited)				
<i>Mukia maderaspatana</i> (L.) Cogn.; Cucurbitaceae (Sirvi) (0.68) BNC/01/2012/108	Seeds	Powder	Twice a day	Half-one teaspoon
<i>Murraya koenigii</i> (L.) Spreng; Rutaceae (Kaad) (0.60) BNC/01/2011/42	Leaves	Infusion of 3-5 leaves	Before meals	Half glass
<i>Phyllanthus embilica</i> L.; Euphorbiaceae (Amla) (0.62) BNC/01/2011/79	Fruits	Powder / Juice	Once early morning	10 g/10 ml
<i>Pterocarpus marsupium</i> Roxb.; Fabaceae (Bijal-Sal) (0.72) BNC/01/2010/11	Bark	Infusion (Super soaked)	Once-empty stomach	One cup
<i>Syzygium cumini</i> (L.) Skeels; Myrtaceae (Jangli jamun) (0.70) BNC/01/2012/107	Leaves & Seeds	Powder	Twice a day before meals	One teaspoon
(Along with it, use of lemon and gram powder is preferred)				
<i>Terminalia alata</i> Heyne ex Roth.; Combretaceae (Sadad) (0.20) BNC/01/2012/103	Stem bark	Powder	Once early morning	Half teaspoon
<i>Terminalia bellerica</i> (Gaertn.) Roxb.; Combretaceae(Bahera) (0.50) BNC/01/2010/60	Fruits	Decoction of 10-20 g Dried seed powder	Once early morning	~40-50 ml
<i>Trichosanthes cucumerina</i> L. ; Cucurbitaceae (chichinda) (0.18) BNC/01/2012/113	Seeds	Decoction of ~ 10 g dried seed powder in milk	Once early morning	~50 ml
<i>Tridax procumbens</i> L. ; Asteraceae (Pabalo) (0.54) BNC/01/2011/57	Leaves	Infusion of 3-5 leaves in butter milk	As recommended	-
<i>Trigonella foenum graecum</i> L.; Papilinoideae (Methidana) (0.76) BNC/01/2011/49	Seeds	Powder	Once-empty stomach	~5-10 g
	Leaves	Vegetable	-	-
<i>Withania somnifera</i> L.; Solanaceae (Ashwagandha)(0.53) BNC/01/2011/60	Leaves	Infusion of 3-7 leaves	Once-empty stomach Before meals	One cup
	Root	Powder		~10-15 g

Table 2: Enumeration of Ethno-Hypoglycemic Formulations

1	2 g dried leaf powder of each <i>Abrus precatorius</i> , <i>Andrographis paniculata</i> and <i>Gymnema sylvestre</i> are mixed and is ingested before meals twice a day. (Use of mustard oil is prohibited)
2	The leaf powder of <i>Adhatoda vasica</i> and <i>Catharanthus roseus</i> are used in infusion preparation and is utilized accordingly as per patients health status. It is especially recommended for diabetic patients prone to cold and cough.
3	Dried fruit pulp of <i>Aegle marmelos</i> and powder of <i>Coriandum sativum</i> is used as 1:1 for making infusion. This infusion is ingested for 10-15 days as prescribed by practitioner/s. This preparation is proscribed during menstrual cycles.
4	40-50 ml of decoction prepared from ~5 g dried tuber of <i>Asparagus racemosus</i> and ~5g bark of <i>Azadirachta indica</i> is prescribed before meals.
5	Leaves of <i>Solanum nigrum</i> , <i>Raphanus sativus</i> , <i>Spinacia oleracea</i> , <i>Catharanthus roseus</i> and <i>Chenopodium alba</i> are used in equal ratio to prepare panch saag. This vegetable is preferred during high glycemic loads.
6	Dried powder of <i>Cayratia trifolia</i> bark and <i>Trifolium repens</i> seeds is used in 1:1 ratio.5-10 g of this mixture is used for decoction preparation which is ingested as ~50 ml before meals.
7	Equal amount of bark powder of <i>Butea Monosperma</i> , <i>Ougenia oogensis</i> , <i>Pterocarpus marsupium</i> and leaves of <i>Tinospora cordifolia</i> and <i>Catharanthus roseus</i> are mixed and this mixture is consumed with buttermilk before meals.
8	Leaf powder of <i>Tridax procumbens</i> , <i>Cicer arietinum</i> and stem bark powder of <i>Aegle marmelos</i> are mixed in 2:2:1 ratio and this mixture is in turn used for the preparation of Chapatti(bread).During dysentery this usage is prohibited.

CONCLUSION

In the present study 41 plants were enumerated for their anti hyperglycemic potential. Akin to prior studies¹⁶ use of some plants was confined to specific tribe and hence was not cited frequently and the use value (UV) of such plants was too low. Plants with UV more than 0.5 include *Aegle marmelos*, *Aerva lanata*, *Aloe barbadensis*, *Andrographis paniculata*, *Annona squamosa*, *Asparagus racemosus*, *Boerhavia diffusa*, *Caesalpinia bonducella*, *Cassia sophera*, *Catharanthus roseus*, *Cayratia trifolia*, *Citrullus colocynthis*, *Costus speciosus*, *Cyamopsis tetragonoloba*, *Dalbergia sissoo*, *Feronia limonia*, *Gymnema sylvestre*, *Hemidesmus indicus*, *Mitragyna parvifolia*, *Momordica charantia*, *Mukia maderaspatana*, *Murraya koenigii*, *Phyllanthus embilica*, *Ptreocarpus marsupium*, *Syzygium cumini*, *Terminalia bellerica*, *Tridax procumbens*, *Trigonella foenum graecum* and *Withania somnifera*. Among these plants *Momordica charantia*, *Ptreocarpus marsupium*, *Syzygium cumini* and *Trigonella foenum graecum* have already been established as commercial herbal drugs therefore, remaining plants should be subjected for further clinical screening to be formulated as newer safer herbal drugs.

REFERENCES

1. Selye H, *The stress of Life*, McGraw-Hill Publication, New York, 1956.
2. Lacey JL and Lacey BC, Verification and extension of the principle of autonomic response stereotyping, *Am. J. Psychol.*, 71, 1958, 50-73.
3. Brown GC, Brown MM, Sharma S, Brown H, Gozun H and Denton P, Quality of life associated with diabetes mellitus in an adult population, *J. Diabetes Complications*, 14, 2000, 18-24.
4. Westway MS, Rheeder P and Gumedé T, The effect of type 2 diabetes mellitus on health related quality of life (HRQOL), *Curationis*, 24, 2001, 74-78.
5. Salvi LL, Major Tribes of Rajasthan and Their Economy, *Int. Res. and Rev.*, 1(1), 2012, 69-70.
6. Menghani E, Pareek A, Negi RS and Ojha CK, Antidiabetic potentials of various ethno-medicinal plants of Rajasthan, *Ethnobotanicals Leaflets*, 14, 2010, 578-83.
7. Katewa SS and Arora A, Some plants in folk medicine of Udaipur(Raj.), *Ethnobotany*, 9, 1997, 45-51.
8. Katewa SS, Chaudhary BL and Jain A, Folk herbal medicines from tribal area of Rajasthan, India. *Journal of Ethnopharmacology*, 92, 2004, 41-46.
9. Choudhary K, Singh M and Pillai U, Ethnobotanical Survey of Rajasthan – An Update, *American-Eurasian Journal of Botany*, 1(2), 2008, 38-45.
10. Jain A, Katewa SS, Galav PK and Nag A. Some therapeutic uses of biodiversity among the tribals of Rajasthan, *Indian Journal of Traditional Knowledge*, 7 (2), 2008, 252-262.
11. Meena KL and Yadav BL. Some traditional ethnomedicinal plants of southern Rajasthan, *Indian Journal of Traditional Knowledge*, 9 (3), 2010, 471-474.
12. Hooker JD, *Flora of British India*, Vol 1-7, (L Reeve & Co, NR Ash Food, Kent) 1872-1897.
13. Singh V and Shetty BV, *Flora of Rajasthan*, Vol I-III, (BSI, Kolkotta) 1987-1993.
14. Philips O, Gentry AH, Reynel C, Wilki P and Gavez-Durand CB, Quantative ethnobotany and Amazonian conservation. *Conservation Biology*, 8, 1994, 225-248.
15. Arora A, Paliwal V and Jourwal J, Evaluation of Hypoglycemic potential of three ethno-herbs in streptozotocin induced diabetic rats, *Life Science leaflets*, 6, 2013, 49-54.
16. Arora A and Paliwal V, Diversified hypoglycemic plants and management of Diabetes Mellitus II , *Int. J. of Drug Discovery And Herbal Res.* 3(4), 2013, 687-689.

Source of Support: Nil, Conflict of Interest: None.

