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 homeostasis and different stressors tend to elicit different pattern/s of biological responses i.e. stereotype. 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 glycemc disturbances are attributes of many ailments among which diabetes i.e. DM II is utmost. Diabetes itself also leads to stressful state as it demands change in lifestyle 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) and HRQOL(Health related quality of life). 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 communities. 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 medications. 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 documented. However, data on this specified ailments/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) was calculated as-

\[ UV = \frac{\Sigma U}{n} \]

(\(UV = \) 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
ailment[15]. Inventoried ethno-medicinal data reveals use
of Allium cepa, Aloe barbadensis, Capparis decidua,
Feronia limonia, Leptadenia pyrotechnica, Momordica
charantia, Phyllanthus emblica 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
colocythis, Commiphora wightii, Feronia limonia, Ficus
bengalensis, Leptadenia pyrotechnica, Momordica
charantia, Phyllanthus emblica 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, Cryatru trifolia, Citrullus
colocythis, Coccinia grandis, Cocculus hirustus, Costus
speciosus, Cyamopsis tetragonoloba, Dalbergia sissoo,
Feronia limonia, Gymnema sylvestre, Hemidesmus
indicus, Mitragyna parvifolia, Momordica charantia,
Mukia maderaspatana, Murraya koeinjii, Phyllanthus
emblica, Pterocarpus marsupium, Syzygium cumini,
Terminalia alata, Terminalia bellerica, Trichosanthes
cucumerina, Tridax procumbens, Trigonella foenum
graecum and Withania sominifera.

Aerva lanata, Aloe barbadensis, Asparagus racemosus,
Catharanthus roseus, Citrullus colocythis, Feronia
limonia, Momordica charantia, Phyllanthus emblica and
Syzygium cumini are considered to be protective as well
as curative. Ethno-hypoglycemic formulations are
generally prescribed by Gunis/ (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>
<thead>
<tr>
<th>Botanical name</th>
<th>family (local name)</th>
<th>(UV)</th>
<th>Plant part/s used</th>
<th>Form of usage</th>
<th>Usage time / Tenure</th>
<th>Usage amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia senegal</td>
<td>Mimosaceae (Kumatio)</td>
<td>(0.42) BNC/01/2011/50</td>
<td>Gum</td>
<td>Masticatory, Vegetable</td>
<td>-</td>
<td>~2-5 g</td>
</tr>
<tr>
<td>Aegle marmelos</td>
<td>Rutaceae (Bel-patra, Bila)</td>
<td>(0.61) BNC/01/2011/41</td>
<td>Leaves</td>
<td>Infusion of 5-7 leaves, Decocion of ~10 g of dried powder</td>
<td>Once early morning; empty stomach</td>
<td>~50 ml</td>
</tr>
<tr>
<td>Aerva lanata</td>
<td>Amaranthaceae (Kali bu)</td>
<td>(0.58) BNC/01/2010/27</td>
<td>Whole plant</td>
<td>Infusion of ~50 g fresh plant</td>
<td>Twice a day before meals</td>
<td>One cup</td>
</tr>
<tr>
<td>Allium cepa</td>
<td>Liliaceae (Kanda)</td>
<td>(0.32) BNC/01/2010/30</td>
<td>Bulb</td>
<td>1-2 Fresh bulbs</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Botanical name; family (local name)</td>
<td>Herbarium acc. No.</td>
<td>Plant part/s used</td>
<td>Form of usage</td>
<td>Usage time / Tenure</td>
<td>Usage amount</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>Aloe barbadensis Miller; Liliaceae (Gawarpatha)</td>
<td>(0.69) BNC/01/2011/81</td>
<td>Leaf</td>
<td>Pulp / Juice with turmeric powder</td>
<td>Daily-early morning</td>
<td>~50 ml</td>
<td></td>
</tr>
<tr>
<td>Andrographis paniculata (Burm.f.) Wall. ex Nees; Acantaceae (Kalmegh)</td>
<td>(0.65) BNC/01/2010/24</td>
<td>Leaves</td>
<td>Decoction</td>
<td>Varies with patients physiology</td>
<td>~100 ml</td>
<td></td>
</tr>
<tr>
<td>Annona squamosa L.; Annonaceae (Sitaphal)</td>
<td>(0.54) BNC/01/2010/1</td>
<td>Seeds</td>
<td>Decoction of 10-15 g dried seed powder</td>
<td>Twice a day</td>
<td>One cup</td>
<td></td>
</tr>
<tr>
<td>Boerhavia diffusa L.; Nyctaginaceae (PuraliyO)</td>
<td>(0.52) BNC/01/2011/67</td>
<td>Leaves</td>
<td>Infusion of 10-12 leaves</td>
<td>Once a day</td>
<td>~50-60 ml</td>
<td></td>
</tr>
<tr>
<td>Cassia fistula L.; Ker</td>
<td>(0.45) BNC/01/2011/37</td>
<td>Tubers</td>
<td>Powder</td>
<td>At night with milk</td>
<td>One tea spoon</td>
<td></td>
</tr>
<tr>
<td>Cassia sophera L.; Caesalpiniaceae (Kasunda)</td>
<td>(0.52) BNC/01/2010/102</td>
<td>Bark</td>
<td>Decoction of ~10 gm bark powder</td>
<td>Twice a day-before meals</td>
<td>~50 ml</td>
<td></td>
</tr>
<tr>
<td>Cetharantus roseus (L.) G.Don.; Apocynaceae (Sadabhar, Baramasi)</td>
<td>(0.68) BNC/01/2010/29</td>
<td>Leaves and/or Flowers</td>
<td>Raw</td>
<td>Once a day; early morning, empty stomach</td>
<td>2-3 gm</td>
<td></td>
</tr>
<tr>
<td>Ceyratia trifolia (L.) Domin.; Vitaceae (Talpatiya)</td>
<td>(0.60) BNC/01/2011/145</td>
<td>Roots</td>
<td>Extract</td>
<td>Before meals</td>
<td>Half teaspoon</td>
<td></td>
</tr>
<tr>
<td>Cinnamomum aromaticum Ness.; Lauraceae(Kasia)</td>
<td>(0.32) BNC/01/2011/87</td>
<td>Bark</td>
<td>Powder</td>
<td>Twice a day</td>
<td>~5 mg</td>
<td></td>
</tr>
<tr>
<td>Citrullus colocynthis (Linn.) Schrad.; Cucurbitaceae (Gavakshi)</td>
<td>(0.62) BNC/01/2010/14</td>
<td>Fruit</td>
<td>Extract / Infusion of one fruit</td>
<td>Once a day</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Coccinia grandis (L.) Voigt; Cucurbitaceae (Tindori)</td>
<td>(0.38) BNC/01/2012/106</td>
<td>Whole plant</td>
<td>Powder</td>
<td>Once /Twice a day as recommended</td>
<td>~10-20 g</td>
<td></td>
</tr>
<tr>
<td>Cuculus hirustus (L.) Diels; Menispermacae(Bajarbel)</td>
<td>(0.42) BNC/01/2011/36</td>
<td>Leaves</td>
<td>Extract of 2-3 leaves</td>
<td>Before meals</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Commiphora wightii (Arn.) Bhandari; Burseraceae (Gugal)</td>
<td>(0.38) BNC/01/2011/43</td>
<td>Gum</td>
<td>Dried Gum</td>
<td>Twice a week</td>
<td>~2-5 mg</td>
<td></td>
</tr>
<tr>
<td>Costus speciosus (Koen.) ex Retz.; Costaceae (Mahalakdi)</td>
<td>(0.50) BNC/01/2012/124</td>
<td>Rhizome</td>
<td>Powder</td>
<td>Once a day</td>
<td>One teaspoon</td>
<td></td>
</tr>
<tr>
<td>Cyamopsis tetragonoloba (L.) Taub.; Fabaceae (Gawar)</td>
<td>(0.68) BNC/01/2011/46</td>
<td>Seeds</td>
<td>Decoction of 20-30 seeds</td>
<td>Early morning, empty stomach</td>
<td>~40-50 ml</td>
<td></td>
</tr>
<tr>
<td>Dolbergia sissou Roxb. ex DC.; Fabaceae (Pai, Talli)</td>
<td>(0.60) BNC/01/2012/198</td>
<td>Leaves</td>
<td>Infusion</td>
<td>Twice a day</td>
<td>2-3 leaves</td>
<td></td>
</tr>
<tr>
<td>Feronia limonia Swingle; Rutaceae (Kotbadi)</td>
<td>(0.62) BNC/01/2011/42</td>
<td>Fruits pulp</td>
<td>Juice</td>
<td>Thrice a week</td>
<td>~100 ml</td>
<td></td>
</tr>
<tr>
<td>Gymnema sylvestre R.Br.ex Schultz; Asclepiadaceae (Halda)</td>
<td>(0.66) BNC/01/2011/59</td>
<td>Leaves</td>
<td>Powder</td>
<td>Daily-once</td>
<td>2 g powder</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Enumeration of Ethno-Hypoglycemic Formulations

<table>
<thead>
<tr>
<th>Botanical name; family (local name) (UV)</th>
<th>Plant part/s used</th>
<th>Form of usage</th>
<th>Usage time / Tenure</th>
<th>Usage amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murraya koenigii (L) Spreng.; Rutaceae (Kaad) (0.60) BNC/01/2011/42</td>
<td>Leaves</td>
<td>Infusion of 3-5 leaves</td>
<td>Before meals</td>
<td>Half glass</td>
</tr>
<tr>
<td>Pteryopus moruspermum Roxb.; Fabaceae (Bijal-Sal) (0.72) BNC/01/2010/11</td>
<td>Bark</td>
<td>Infusion (Super soaked)</td>
<td>Once-empty stomach</td>
<td>One cup</td>
</tr>
<tr>
<td>Syzygium cumini (L) Skeels; Myrtaceae (Jangli jamun) (0.70) BNC/01/2012/107</td>
<td>Leaves &amp; Seeds</td>
<td>Powder</td>
<td>Twice a day before meals</td>
<td>One teaspoon</td>
</tr>
</tbody>
</table>

(Along with it, use of lemon and gram powder is preferred)

<table>
<thead>
<tr>
<th>Botanical name; family (local name) (UV)</th>
<th>Plant part/s used</th>
<th>Form of usage</th>
<th>Usage time / Tenure</th>
<th>Usage amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminalia alata Heyne ex Roth.; Combretaceae (Sadad) (0.20) BNC/01/2012/103</td>
<td>Stem bark</td>
<td>Powder</td>
<td>Once early morning</td>
<td>Half teaspoon</td>
</tr>
<tr>
<td>Terminalia bellercia (Gaertn.) Roxb.; Combretaceae(Bahera) (0.50) BNC/01/2010/60</td>
<td>Fruits</td>
<td>Decoction of 10-20 g Dried seed powder</td>
<td>Once early morning</td>
<td>40-50 ml</td>
</tr>
<tr>
<td>Trichosanthus cucumerina L. ; Cucurbitaceae (chichinda) (0.18) BNC/01/2012/113</td>
<td>Seeds</td>
<td>Decoction of ~ 10 g dried seed powder</td>
<td>Once early morning</td>
<td>~50 ml</td>
</tr>
<tr>
<td>Tridax procumbens L. ; Asteraceae (Pabalo) (0.54) BNC/01/2011/57</td>
<td>Leaves</td>
<td>Infusion of 3-5 leaves in butter milk</td>
<td>As recommended</td>
<td>-</td>
</tr>
<tr>
<td>Withania somnifera L.; Solanaceae (Ashwagandha)(0.53) BNC/01/2011/60</td>
<td>Leaves</td>
<td>Infusion of 3-7 leaves</td>
<td>Once-empty stomach</td>
<td>One cup</td>
</tr>
</tbody>
</table>

Leaf powder of Tridax procumbens, Cicer arietinum and stem bark powder of Aegle marmelos 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 studies 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, Cyanopsis tetragonoloba, Dalbergia sissoo, Feronia limonia, Gymnema sylvestre, Hemidesmus indicus, Mitragyna parvifolia, Momordica charantia, Mukia maderaspatana, Murraya koenigii, Phyllanthus emblica, Pterocarpus marsupium, Syzygium cumini, Terminalia bellerica, Tridax procumbens, Trigonella foenum graecum and Withania somnifera. Among these plants Momordica charantia, Pterocarpus 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