Indian Traditional Systems Used in Treatment of Diabetes Mellitus

Keywords: Diabetes Mellitus, Traditional Systems, Yoga

ABSTRACT

Diabetes Mellitus is most widely spreading disease and become a major problem that responsible for the death of people in developing and developed countries. Diabetes Mellitus cannot treat completely but can be controlled. For treatment of type 2 Diabetes Mellitus mostly synthetic oral hypoglycaemic agents are in use. In India at present status herbal medicines also used on a large scale because of its high potency to treat disease and nontoxicity also, herbal medicines are very cheap in India and preparation methods are very simple. Herbal medicines not only cure disease but also treat the cause of disease and does not have an expiry date because of an active constituent of herb does not lose its potency with an increase in time or duration. Conventional and Alternative Medicines technique is another way to approach therapy in diabetes mellitus treatment. Yogasanas, Hot tub therapy, massage, biofeedback are included in CAM technique. The aim of this review is to approach traditional systems used in India like ayurvedic herbal medicines, CAM.
INTRODUCTION

Diabetes Mellitus is one of the most important non-communicable disease causes transience and morbidity in society. A metabolic disorder Diabetes mellitus is associated with endocrine system. In conjunction with cardiovascular and cerebrovascular cancer diabetes becomes third killer of human being. It is also known as the seventh cause of death in the world. Stress is responsible for impairment of antioxidant defense system by changing antioxidant enzymes, alter the ascorbic acid level and glutathione metabolism. Diabetes has a negative effect in quality of patient life and becomes costly to him. Genetic factor and lack of exercise, obesity like environmental factors are responsible to cause Diabetes Mellitus.

Types of Diabetes Mellitus

Type -I Insulin-Dependent Diabetes Mellitus

Known as juvenile-onset, occurs due to T- Cell-mediated immune attack causes damage of beta cells of pancreas due to which decrease in lifetime of pancreatic cells occurs in conjugation with ketoacidosis in body fluid and tissues.

Type-II Non-insulin Dependent Diabetes Mellitus

Known as Adult-onset, occurs due to being deficient in insulin secretion, reduced insulin sensitivity, insulin tolerance, decreased no. of β-cells sand decreased glucose metabolism in peripheral tissues.

Gestational Diabetes Mellitus (GDM)

Characterized by decrease in the use of insulin. In pregnancy hormonal changes occurs which are responsible for inability of the body to use insulin which results in the development of carbohydrate intolerance. GDM disappears after childbirth.

Therapy for type 2 diabetes includes

1) Dietary modification,
2) Insulin and/or oral hypoglycemic agents,
3) Exercising regularly and self-monitoring to maintain good glycaemic control.

Citation: Patwekar S.L et al. Ijprr.Human, 2016; Vol. 6 (1): 289-299.
Thus changes in diet pattern, increased physical activity and weight control are become effective for patients with type 2 diabetes.

**Blood glucose lowering mechanisms of medicines**

1) Increase insulin release by stimulating beta cells of pancreatic islet. 2) Reduce glycogen synthesis. 3) Increase insulin receptor sensitivity. 4) Increase glucose uptake of tissue and organ. 5) Body microcirculation increase. 6) Clear lipid and protein metabolism problem. \(^{2,12}\)

**History of Diabetes Mellitus**

Hindu scholars documented description of diabetes so long as in 1500. Apollonius of Memphis is a founder of word diabetes around 250. Diabetes made the urine sweet so subsequently “mellitus” is used along with word diabetes. Diabetes to glycogen metabolism is correlated in beginning research. German medical student Paul Langerhans found islet cells of pancreas. In 1916, Sharpey-Shafer found “insulin”. The word insulin arised from the German word Insel, which is used for an islet or island. Insulin is extracted from the pancreas of experimental dogs by E.L. Scott and NikolaePaules. \(^{18,19,20}\)

**Traditional / Ayurvedic drugs**

**Ayurvedic Rasausadhies for treatment of Madhumeha**

Rasausadhies use organometallic formulations for treatment of Diabetes Mellitus which and comes under ayurvedic technique. Sodhan is purification and detoxification process; Marana is incineration process which is used to convert metals and minerals into easily delicate form, Murchana is a process of triturating drug to a fine powder state. Aushadha, linga and hetu is trisutra on which ayurveda system is based. Animals, plants, and minerals are sources of ayurvedic drugs. Madhu and meha is an expression about sweet substance which secretes through the urinary system.

Nidan (etiology)- Etiological factors of madhumeha are Increased sleep, extreme physical and mental work, sedentary habit and lack of exercise. \(^{21,22}\) Purvarupa (sign and symptoms)- Increased thirst, burning sensation, sweetness in mouth, increased sweating, feeling of lazy and tiredness are the symptoms. \(^{21, 22, 23}\) Lakshana and samprapti (signs-symptoms and pathogenesis)
- Disturbance of vata is a main cause of madhumeha. Vata converts into the unsympathetic taste and takes into urinary bladder which causes madhumeha. Upadravas (Complications)- Problems like cough, loss of sleep, Dryness of mouth and throat, pain in abdomen and heart region etc. Complications indicate diabetes mellitus. (23) Rasausadhies is one of the most effective ayurvedic medicine type used in madhumeha with no or few complications.

**Indian Medicinal Plants used as antidiabetics**

<table>
<thead>
<tr>
<th>Name of Drug</th>
<th>Family</th>
<th>Plant &amp; Part Used</th>
<th>Mechanism</th>
<th>Type of Animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrographis paniculata&lt;sup&gt;(24)&lt;/sup&gt;</td>
<td>Acanthaceae</td>
<td></td>
<td>Prevent absorption of glucose from gut</td>
<td>Normal and streptozotocin induced diabetic rat</td>
</tr>
<tr>
<td>Mangifera indica&lt;sup&gt;(25)&lt;/sup&gt;</td>
<td>Anacardiaceae</td>
<td>Leaves</td>
<td>Reduce intestinal glucose absorption</td>
<td>Rats</td>
</tr>
<tr>
<td>Annona squamosa&lt;sup&gt;(26)&lt;/sup&gt;</td>
<td>Annonaceae</td>
<td>Leaf</td>
<td>Blood Glucose level lower to normal.</td>
<td>Streptozotocin in diabetic rats and alloxanized rabbits</td>
</tr>
<tr>
<td>Catharanthus roseus&lt;sup&gt;(27)&lt;/sup&gt;</td>
<td>Apocynaceae</td>
<td>Leaves</td>
<td>Reduce sugar level in blood</td>
<td>Normal rats</td>
</tr>
<tr>
<td>Cocos nucifera&lt;sup&gt;(28)&lt;/sup&gt;</td>
<td>Arecaceae</td>
<td></td>
<td>Lowers glycemic level -Fecal excretion of Cu, Cr, Mn, Mg, Zn and C increase</td>
<td>Rats fed 5%, 15% and 30% glucose</td>
</tr>
<tr>
<td>Areca catechu&lt;sup&gt;(29)&lt;/sup&gt;</td>
<td>Arecaceae</td>
<td>Alkaloid fraction of Areca catechu</td>
<td>Hypoglycemic effect for 4_/6 h</td>
<td>Alloxanized rabbit</td>
</tr>
<tr>
<td>Gymnema sylvestre&lt;sup&gt;(30)&lt;/sup&gt;</td>
<td>Asclepiadaceae</td>
<td>Leaves</td>
<td>Tissue glycogen content decreases by leaf extract</td>
<td>Normal and glucose fed Hyperglycaemic rats</td>
</tr>
</tbody>
</table>

Citation: Patwekar S.L et al. Ijprr.Human, 2016; Vol. 6 (1): 289-299.
<table>
<thead>
<tr>
<th><strong>Plant</strong></th>
<th><strong>Family</strong></th>
<th><strong>Part</strong></th>
<th><strong>Active Compound</strong></th>
<th><strong>Activity</strong></th>
<th><strong>Rats</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Bombax ceiba</em>&lt;sup&gt;(31)&lt;/sup&gt;</td>
<td>Bombacaceae</td>
<td></td>
<td>C-flavonolglucoside from <em>Bombax ceiba</em></td>
<td>Reduce glycaemia</td>
<td>In Sprague-Dawley rats</td>
</tr>
<tr>
<td><em>Brassica juncea</em>&lt;sup&gt;(32)&lt;/sup&gt;</td>
<td>Brassicaceae</td>
<td>Leaf Mustar</td>
<td></td>
<td>Activity of glycogen synthetase increase and lowers gluconeogenic and glycogenolysis, activity of glycogen phosphorylase and gluconeogenic enzymes lowers</td>
<td>In rats</td>
</tr>
<tr>
<td><em>Salacia reticulata</em>&lt;sup&gt;(33)&lt;/sup&gt;</td>
<td>Celastaceae</td>
<td>Root bark -natural α-glycosidase inhibitors such as kotalanol and salacinol</td>
<td>Inhibit sucrose synthesis</td>
<td></td>
<td>Overnight fasted rats</td>
</tr>
<tr>
<td><em>Salacia oblonga</em>&lt;sup&gt;(34)&lt;/sup&gt;</td>
<td>Celastaceae</td>
<td>Root bark -aqueous extract -petroleum ether extract -aqueous methanolic extract</td>
<td>-serum glucose level decreases</td>
<td>-albino rats - streptozotocin induced diabetic rat - sucrose and maltose loaded rats</td>
<td></td>
</tr>
<tr>
<td><em>Beta vulgaris</em>&lt;sup&gt;(35)&lt;/sup&gt;</td>
<td>Chenopodiaceae</td>
<td>Leaf beet</td>
<td>Skin proteins glycosylation increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Artemisia pallens</em>&lt;sup&gt;(36)&lt;/sup&gt;</td>
<td>Compositae</td>
<td>Aerial parts</td>
<td>Peripheral glucose utilization</td>
<td>Alloxan-induced diabetic rats</td>
<td></td>
</tr>
<tr>
<td>Common Name</td>
<td>Family</td>
<td>Synonym</td>
<td>Effect</td>
<td></td>
<td></td>
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<td>---------------------------------</td>
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<td>----------------------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>Ipomea batatas (white skinned sweet potato)(^{(37)})</td>
<td>Convolvulaceae</td>
<td></td>
<td>Increase or glucose re-absorption in the proximal tubules inhibited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citrullus colocynthis(^{(38)})</td>
<td>Cucurbitaceae</td>
<td>Fruit - aqueous extract</td>
<td>Hyperinsulinemia reduces - Lipid metabolism normalize and regranulation of pancreatic islet B-cells produce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coccina indica(^{(39)})</td>
<td>Cucurbitaceae</td>
<td>Leaves</td>
<td>Insulin release from isolated islets increases - plasma glucose reduce</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-normal rabbits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Normal-fed and 48 h Fasted rats</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Syzygium cumini

**Family:** Myrtaceae

**Synonym:** Jambul, Jamukoli

All parts of plant like leaf, seed, and bark have active constituent for antidiabetic activity. Ascorbic acid, vitamin A, thiamine, riboflavin, Niacin are active constituents present in the plant. Rather than antidiabetic activity this plant is also used as astringent, diuretic, antibacterial.\(^{(40)}\)

### Momordiaca charantia [Bitter Melon]

**Family:** Cucurbitaceae

**Synonym:** Bitter Gourd, Karela

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* Citation: Patwekar S.L et al. Ijppr.Human, 2016; Vol. 6 (1): 289-299. *
All parts of plant like roots, leaves, fruits and vines have active constituent for antidiabetic activity. Triterpenoids and related glycosides are major constituents of bitter melon fruit.\(^{(41)}\)

*Ficus religiosa*

**Family:** Moraceae

**Synonym:** Peepal

All parts of plant contain active constituents like carbohydrate, tannins, alkaloid, phenolics, gum, amino acids. Leaf juice is used in treatment of diabetes, diarrhoea, asthma, migraine, gonorrhoea, toothache.\(^{(42)}\)

**Conventional and Alternative Medicinal treatment**

**Yoga**

Yoga based on a principle which believes there is a relationship between body and mind. In yoga breathing exercise and body posture improves blood flow, hormonal functions, oxygen uptake, muscle strength and flexibility. Yoga exercise affects haemodynamic and lipid profile, glycemic control when performed along with oral hypoglycemic agents. Reduction in fasting and postprandial blood glucose level and HbA1c\% occur in a diabetic patient. Also, occurs a reduction in lipid parameters like total cholesterol, LDL, triglycerides, VLDL. Yoga causes relaxation and stress management also shows improvement in systolic and diastolic blood pressure.\(^{(43)}\)

Type 2 diabetes is one of the major spates in both developing and developed countries and in India. Diabetes mellitus is responsible for the development of dyslipidemia and hypertension whose Poor control leads to the development vascular complications. Diabetic factors like levels of triglycerides, cholesterol, increased body mass index (BMI), hypertension, low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL), cholesterol increase chances of development of coronary artery disease.
Name and duration of various yogasanas & pranayamas Used In DM

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kapal- bhati</td>
<td>5-10 mins per day</td>
</tr>
<tr>
<td>2</td>
<td>Bhashrika- pranayama</td>
<td>3-5 mins per day</td>
</tr>
<tr>
<td>3</td>
<td>Bhashrika- pranayama</td>
<td>5 times a day</td>
</tr>
<tr>
<td>4</td>
<td>Bhramari</td>
<td>5 times a day</td>
</tr>
<tr>
<td>5</td>
<td>Anulom-viloma</td>
<td>5-10 mins per day</td>
</tr>
<tr>
<td>6</td>
<td>Surya namakar</td>
<td>3-7 turns of each, the pose being</td>
</tr>
<tr>
<td>7</td>
<td>Tadasana</td>
<td>¼ minute to one minute for adding ¼ minute per week.</td>
</tr>
<tr>
<td>8</td>
<td>Shavasana</td>
<td>2-5 minutes, adding 1 minute per week</td>
</tr>
<tr>
<td>9</td>
<td>Bhujangasana</td>
<td>3-7 turns of each, the pose hold for 10 seconds adding one turn each, every fortnight</td>
</tr>
<tr>
<td>10</td>
<td>Pashimottanasana</td>
<td>one minute for each side, increasing ¼ minute per week</td>
</tr>
<tr>
<td>11</td>
<td>Trikona-asana</td>
<td>¼ minute to one minute for each side, adding ¼ minute per week</td>
</tr>
</tbody>
</table>

**Acupuncture**

Manually or electrically manipulated solid, thin, metallic needles are prick at different points of skin. Acupuncture technique used to improve insulin resistance and reduce hyperglycemia. Acupuncture lowers blood glucose level by increasing target cell receptors, increase glucose uptake, stimulate pancreatic beta cells to synthesis insulin.\(^{(45)}\)

**Massage**

Massage of connective tissue and muscle promotes their relaxation and improve function. It also improve blood circulation, pancreatic function and metabolism. In type 1 Diabetes Mellitus massage at the site of infection increases short term absorption and blood level of insulin. With
inducing relaxation response control counter-regulatory stress hormones and insulin is more effectively used by body.\textsuperscript{(46,47)}

**Hot tub therapy**

Hemoglobin A1c (HbA), fasting plasma glucose and in body weight decreased in hot tub therapy. Increase glucose uptake and blood flow by immersion in hot water after exercise.\textsuperscript{(45)}

**Biofeedback**

Biofeedback increase positive image which causes relax and ultimately reduce stress. Thus reduction of stress helps to manage diabetes Mellitus. Stress is responsible for poor glycemic control and glucose intolerance. Biofeedback informs about getting control on stress response and muscle tension, skin temperature like psychological activities.\textsuperscript{(48)}

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