

**Prameha in terms of Diabetes Mellitus, Metabolic syndrome and Obesity with recent advances in its management**

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# Definition of Prameha

**Tatravilprabhutmutralakshanah Sarva eva Prameha**

(Sushruta, Nidan 6/6)

**Samanyam lakshanam tesham prabhutavilmutrata**

**Doshadushyavisheshepi tatsamyog visheshatah,**

**Mutravarnadibheden medo mehesu kalpate.**

(Ashtanghridaya Nidan 10/7)

In ayurvedic texts Prameha is defined to be characterized with excessive urination (both in frequency & quantity) and turbidity. The nature of the turbidity may vary depending upon the body reaction with the doshas.

# Etiological Factors

**Asyasukham swapnasukham dadhini  
gramyodakanuprasah payansi,  
Navannapanam gudvaikratam ch  
Pramehahetuh kaphakrichh sarvam.**

(Charak, Chikitsa 6/4)

Addiction to the pleasures of lounging and sleeping, the excessive use of curds, meat juice of domestic, aquatic and wet-land animals, milks, new grains and drinks & products of gur and all things that increase kapha are the causative factors of Prameha.

# Purvarupa (Premonitory Symptoms) of Prameha

**Swedoangagandhah shithilangata ch**

**shayyasanswapnasukhe ratishch, hrinetraajivhashravanopadeho  
ghanangata keshanakhativridhih sheetapriyatvam galatalushosho  
madhuryamasye karpadadahah bhavishyato mehagadasyarupam  
mutre bhidhavanti pipilikashcha**

(Charak, Chikitsa 6/13-14)

Excessive sweating with foetid odour, flabbiness of body, inclination to lie down, sedentary habits, excessive mucosal discharge, obesity and flabbiness, rapid growth of hairs and nails, thirst, sweetness of mouth, burning sensation in hands & feet, swarming of ants on the urine.

# Classification of Prameha (Diabetes Mellitus)

## Etiological Classification (Sushrut)

### 1. Sahaja Prameha (Growth onset/Juvenile/IDDM)

- ⊙ Family history
- ⊙ Early onset
- ⊙ Asthenic constitution
- ⊙ Prone to complications

### 2. Apathyanimittaja Prameha (NIDDM)

- ⊙ Over nutrition
- ⊙ Sedentary habits
- ⊙ Obese
- ⊙ Manageable with diet control and Herbo-mineral treatment (Apatarpana Chikitsa)

# Clinico-pathological Classification

1. **Kaphaja Prameha -10 (Early Diabetes)**
  - ⊙ **Overweight with Mild Hyperglycemia**
  - ⊙ **Polyuria/Glycosuria**
2. **Pittaja Prameha -6 (Acute Diabetes)**
  - ⊙ **Loss of weight**
  - ⊙ **Hyperglycemia and Glycosuria**
  - ⊙ **Urinary Tract Infection**
3. **Vataja Prameha -4 (Chronic Diabetes)**
  - ⊙ **Severe Hyperglycemia with Glycosuria**
  - ⊙ **Cachexia**
  - ⊙ **Nephropathy, Neuropathy**
  - ⊙ **Retinopathy**
  - ⊙ **Cardio Respiratory Complication**
  - ⊙ **Gangrene**

# Therapeutic classification based on body constitution (Charak)

## **Sthul Pramehi (Obese- NIDDM)**

- **Manageable with diet control and exercises**

## **Krisha Pramehi (Asthenic- IDDM)**

- **Not manageable with diet control alone rather requires nutritive treatment (Bringhana chikitsa)**

# Prognostic classification

## 1. Sadhya (Manageable)

- ☐ Apathyanimittaja Prameha (NIDDM)
- ☐ Kaphaja Prameha (Early Diabetes)
- ☐ Sthula Pramehi (Obese Diabetics)

## 2. Yasya (Palliative)

- ☐ Pittaja Prameha (Acute Diabetes)

## 3. Asadhya (Unmanageable)

- ☐ Sahaja Prameha (IDDM)
- ☐ Vataja Prameha (Chronic Diabetes)
- ☐ Krisha Pramehi ( Asthenic Diabetics)

# Prameha – Correlation with Diabetes, Metabolic syndrome and Obesity

Understanding of prameha is not merely related only to the pathophysiology and clinical picture of Diabetes mellitus. From the etiology pathology to the state of complications prameha has much in common to share with obesity and metabolic syndrome.

- **Involvement of meda, kleda ,kapha, vata and agni**
- **Ama (toxic intermediary products of digestion and metabolism) – A contributing factor to obesity, metabolic syndrome and diabetes**
- **Hyperinsulinemia and Insulin resistance**

# Metabolic syndrome

- Central obesity
- High cholesterol
- High triglycerides
- Low HDL cholesterol
- Hypertension
- Insulin resistance
- Hyperglycemia.

# Obesity

- Obesity is a state of increased body weight, due to adipose tissue accumulation, that is of sufficient magnitude to produce adverse health effects. Central or visceral obesity is associated with a much higher risk for several disorders and diseases, including diabetes, hypertension, hypertriglyceridemia, decreased high-density lipoprotein (HDL) cholesterol, proteinuria, osteoarthritis, pancreatitis, gallstones, fatty change in the liver, hypoventilation syndrome, etc.

# Diabetes mellitus

- Diabetes mellitus is a chronic disorder of carbohydrate, fat, and protein metabolism, with a relative or absolute deficiency in insulin secretory response resulting in hyperglycemia. Insulin resistance is a major factor in the development of Type 2 diabetes, which is seen in obese patients.

# Diagnostic criteria

## Diabetes

- Fasting plasma glucose  $\geq 7.0$ mmol/l (126mg/dl) **or**
- 2-h plasma glucose\*  $\geq 11.1$ mmol/l (200mg/dl)

## Impaired Glucose Tolerance (IGT)

- Fasting plasma glucose  $< 7.0$ mmol/l (126mg/dl) **and**
- 2-h plasma glucose\*  $\geq 7.8$  and  $< 11.1$ mmol/l  
(140mg/dl and 200mg/dl)

## GLYCATED HAEMOGLOBIN (HbA1c)

- An HbA1c of 6.5% is recommended as the cut point for diagnosing diabetes. A value of less than 6.5% does not exclude diabetes diagnosed using glucose tests.

(Use of Glycated Haemoglobin (HbA1c) in the Diagnosis of Diabetes Mellitus, World Health Organization 2011, *Abbreviated Report of a WHO Consultation*)

# Diabetes as Prameha & Madhumeha

Sarva ev Pramehastu Kalena parti karinah  
Madhumehatvamayanti Tadasadhya bhavantihi  
(Sush. Nidana 6/29)

Jatah Pramehi Madhumehinova na Sadhyauktah  
sahi Beejadoshat.

Ye chapī kechitkulaja vikara bhavantitamstan  
Pravadantya sadyan (Ch.Chi. 6)

# Diabetes as Prameha & Madhumeha

Upekshayasya jayante pidaka Madhumehikah  
(Ch.Su.17)

Madhumehe madhusam jayate sa kildwidha

Kruddhe dhatukshayadyayau  
doshavrittpatheathva

Avritto doshalingani soanimittam pradarshyan

Kshanatksheenah Kshanatpurno bhajate

Krichra sadhyatam

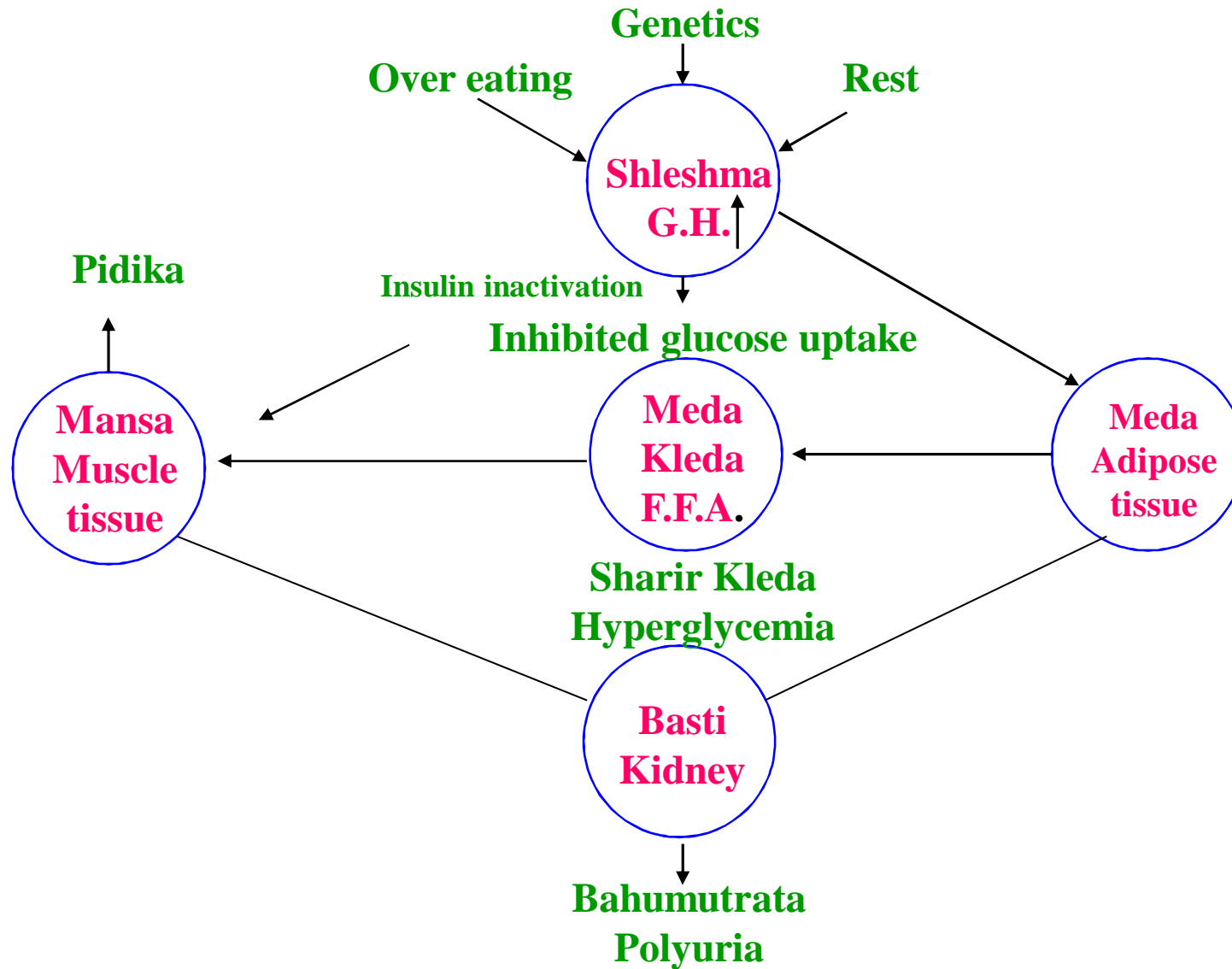
(Madh. Pram. Ni 24-25)

# Diabetes as Prameha & Madhumeha

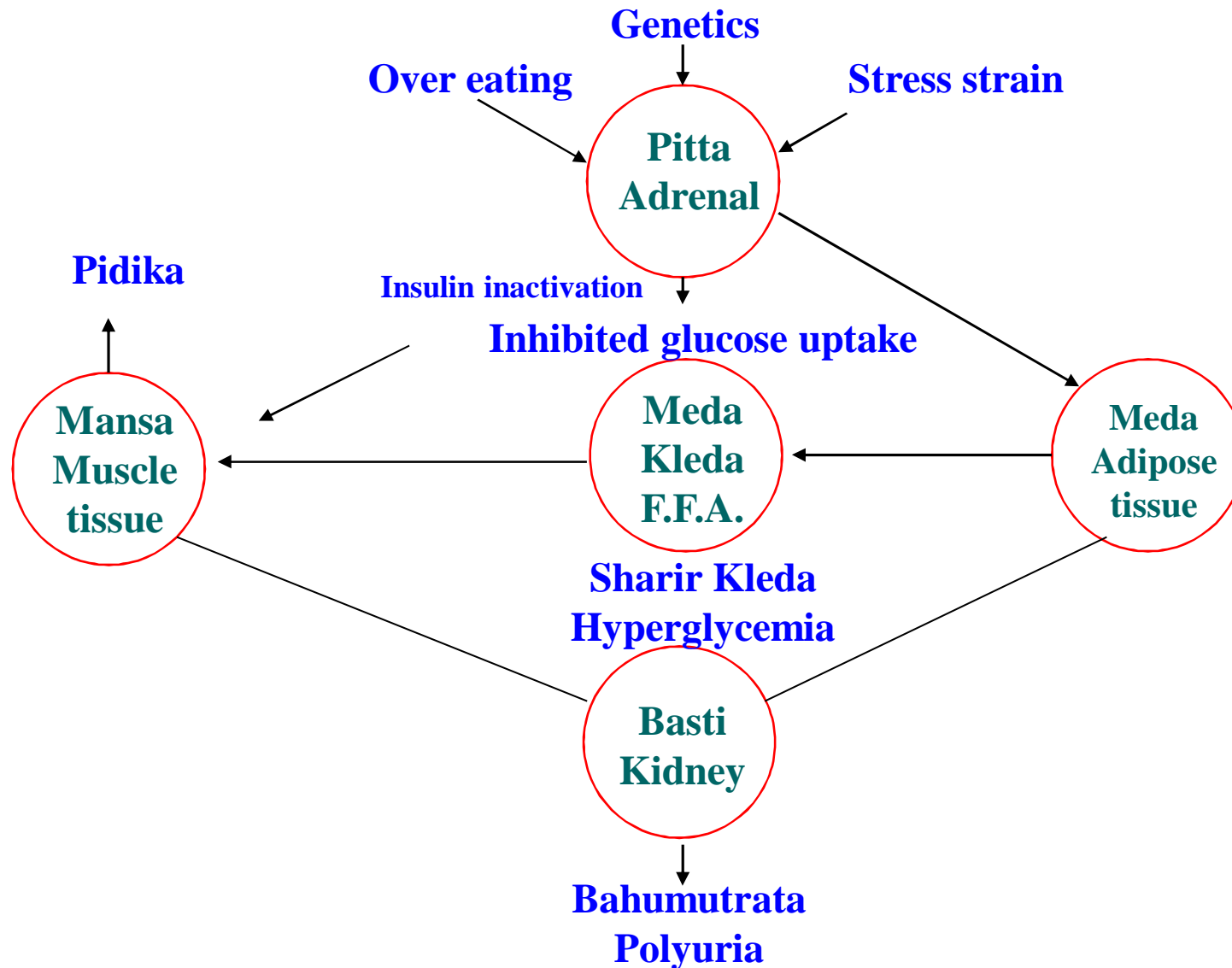
Madhuram yacch mehesu prayo madhviv  
mehati

Sarveapi madhumehakhya madhuryacch  
tanoratah (Vag. Nidan 10/Madh. Pram. Nidan 26)

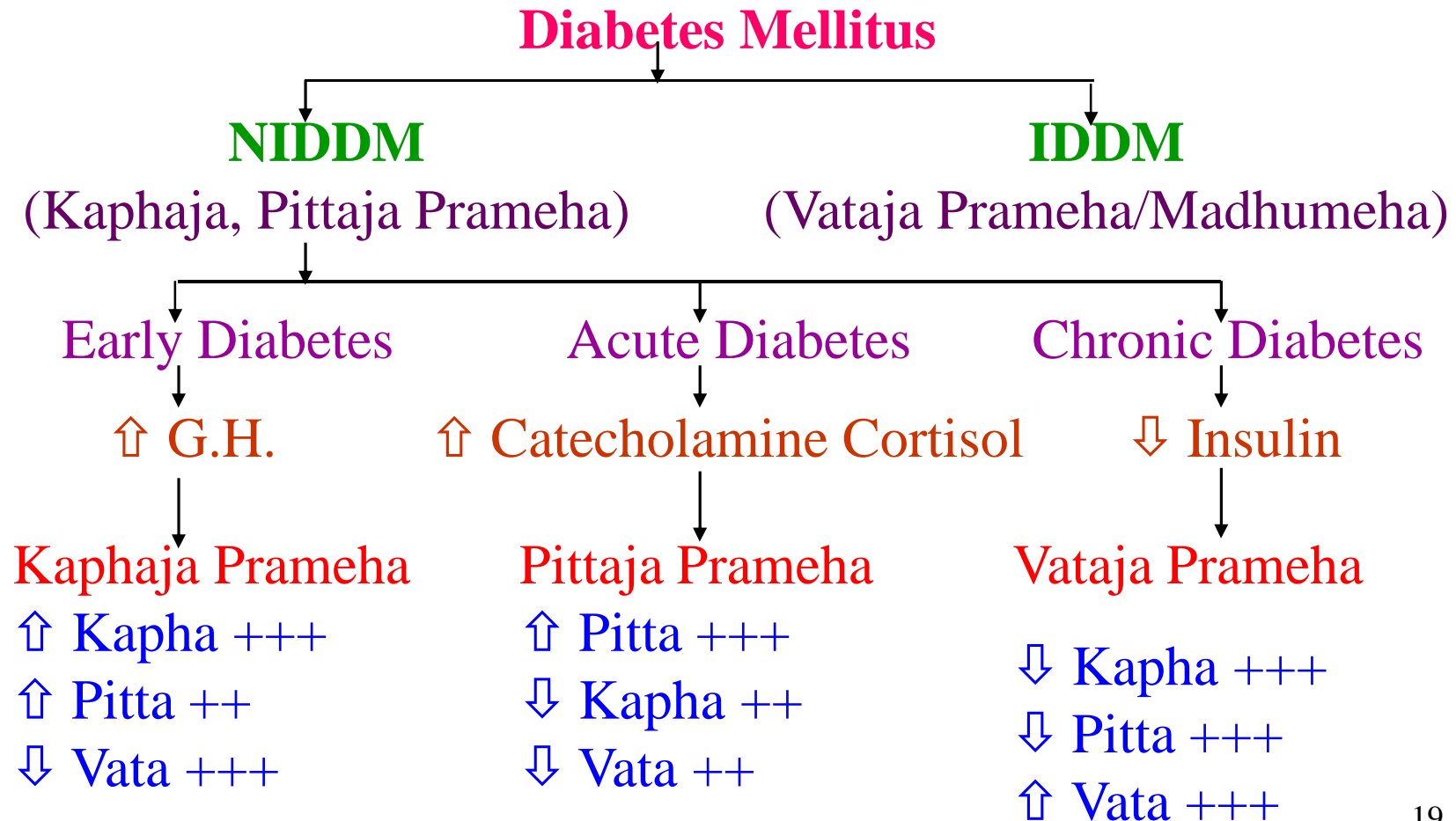
# Pathogenesis of Kaphaja Prameha



# Pathogenesis of Pittaja Prameha



# Schema showing correlation of different types/stages of Prameha with Diabetes Mellitus



# Dosha-Dushya Samgraha

- Ayurveda describes 20 subtypes of Prameha as different clinico-pathological conditions produced out of specific Doshas and Dushyas, showing gross urinary characteristics and clinical manifestations.
- The fractional changes in dushyas namely Meda, Mamsa, Kleda, Shukra, Shonita, Vasa, Majja, Lasika, Rasa & Oja, in association with three morbid doshas manifests different subtypes of prameha.

# Early diabetes (Kaphaja Prameha)

- **Udakameha-** Clear urine in larger quantity without odour, feels cold sensation while passing urine.
- **Ikshuvalikameha** – Very sweet urine, cold, slightly turbid due to slimy substances and like crushed cane sugar.
- **Sandrimeha** – Precipitate is deposited in the pot, if urine is kept overnight.
- **Sandra Prasadmeha-** Described as Surameha by Sushruta & Vagbhata. Literally, sandraprasad means -some portion of urine is turbid & some is clean like un-distilled alcohol (Sura).

## Early diabetes (Kaphaja Prameha) contd..

- **Shuklameha** – Urine seems to be mixed with some paste. While passing urine patient feels erection of body hairs. It is described as Pistameha by Sushruta.
- **Shukrameha**, – Patient passes urine similar to quality of semen or semen itself may be mixed with urine.
- **Sheetameha**–Urine is very sweet & enormous with low temperature.
- **Siktameha** - Patient start passing small particles like sand in urine.
- **Sanairmeha**- Flow of urine becomes slow & patient feels difficulty in passing urine.
- **Lalameha** –Quality of urine is turbid & slimy. It is sticky & threads may be demonstrated like gum.

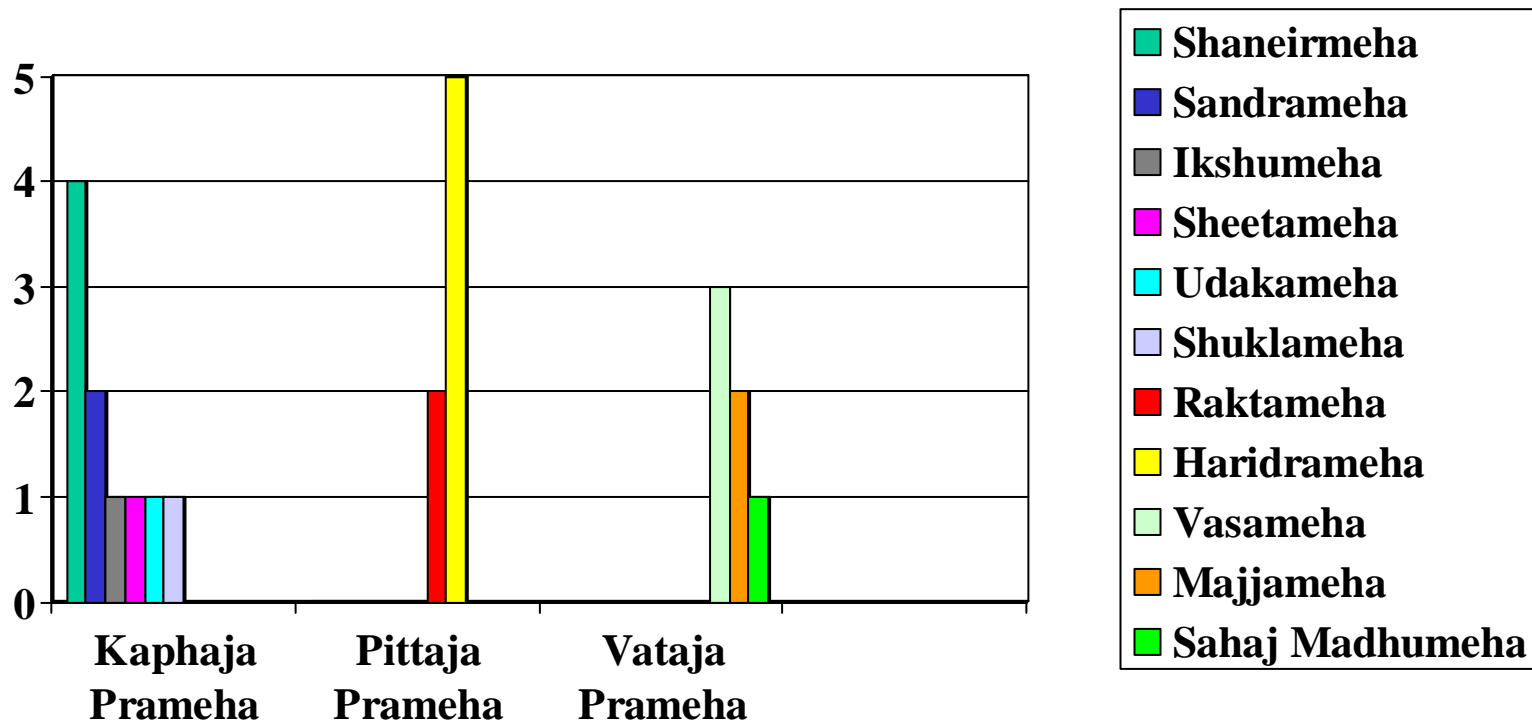
# Acute diabetes (Pittaja Prameha)

- **Kalameha** –Urine is blackish.
- **Nilameha** –Urine is bluish.
- **Lohitameha** –Urine contains blood and saltish in taste with putrid odour. It is described as Shonitmeha by Sushruta & Raktameha by Vagbhata & Madhava.
- **Manjishthameha** –Urine is pink like decoction of Manjishta having putrid odour.
- **Haridrameha**- Urine is turmeric yellow, pungent & associated with severe burning sensation.
- **Ksharmeha** –Not named on the basis of colour. Urine is like an alkali (ash) solution, in smell, colour and touch.

# Chronic diabetes (Vataja Prameha)

- **Vasameha**- Urine contains fat (vasa).
- **Majjameha** –Urine contains bone marrow (majja). It is described as Sarpimeha by Sushruta.
- **Hastimeha** –Lymph (lasika) is passed in the urine. Flow & frequency of urine is almost continuous (incontinence). Simile of such patients is given with adult elephant as regards passes of urine.
- **Madhumeha** –Essence of body – Oja, is passed in urine and its taste is sweet & little astringent like honey.

# Different subtypes of Prameha Diagnosed by examination of Urine in cases of D.M.



# Investigations

- Fasting Blood Sugar
- Post Prandial Blood Sugar
- Lipid Profile
- Renal Function Test
- S. Insulin
- Glycated Hb (HbA1c)

# Complications of Prameha (A.S)

<b>Kaphaja</b>	<b>Pittaja</b>	<b>Vataja</b>
<p>Pratishyaya (coryza)</p> <p>Sharira shaithilya (laziness)</p> <p>Arochaka (anorexia),</p> <p>Avipaka (indigestion),</p> <p>Praseka (excessive salivation),</p> <p>Chhardi (vomiting)</p> <p>Nidra (hypersomnia),</p> <p>Kasa (cough)</p>	<p>Amlika (hyperacidity)</p> <p>Pipasa (excessive thirst)</p> <p>Jvara (fever)</p> <p>Daha (burning sensation)</p> <p>Murchchha (fainting)</p> <p>Atisara (diarrhea)</p> <p>Pandu (anemia)</p> <p>Vrishanavadaranam (cracking of the scrotal skin)</p> <p>Bastimedhra toda (pain in the penis and bladder region)</p>	<p>Hridgraha (heaviness in the chest)</p> <p>Laulyam (excessive hunger)</p> <p>Anidra (insomnia)</p> <p>Kampa (tremors)</p> <p>Shulam (pain)</p> <p>Baddha purishatvam (constipation)</p> <p>Kasa (cough)</p> <p>Shwasa (dyspnea)</p>

# **Role of Psychosomatic Constitution (Prakriti) in the Progression and Prognosis of Diabetes Mellitus –**

## **Prameha and Response to Treatment**

# Evaluation of Prakriti (Psychosomatic Constitution according to Ayurveda)

## Anthoscopic Examination

<u>Point of Examination</u>	<u>Vataja</u>	<u>Pittaja</u>	<u>Kaphaja</u>
<b>General Body Built</b>	<b>Thin, under developed, weak</b>	<b>Soft tender physique, medium built, moderate strength</b>	<b>Fully grown handsome, strong body.</b>
<b>Complexion</b>	<b>Dusky or dark</b>	<b>Fair, copper coloured</b>	<b>Fair, golden yellow or bluish tinge</b>
<b>Skin</b>	<b>Cold coarse dry</b>	<b>Warm with yellowish patches</b>	<b>Cold, soft, smooth, moist</b>
<b>Wrinkles</b>	<b>Early onset</b>	<b>Early onset</b>	<b>Delayed onset</b>
<b>Veins &amp; tendons</b>	<b>Prominent</b>	<b>Flaccid tendons ligaments</b>	<b>Well covered</b>
<b>Hair</b>	<b>Dry, rough, scanty</b>	<b>Soft brown, early balding &amp; greying</b>	<b>Thick, dense, black hair</b>

<b><u>Point of Examination</u></b>	<b><u>Vataja</u></b>	<b><u>Pittaja</u></b>	<b><u>Kaphaja</u></b>
<b>Forehead</b>	<b>Narrow</b>	<b>Medium</b>	<b>Broad</b>
<b>Eyes</b>	<b>Round, ugly, dull and dusky</b>	<b>Narrow, fissured, tawny unstable</b>	<b>Large white and shiny</b>
<b>Teeth</b>	<b>Small, Thin and irregular</b>	<b>Yellowish, irregular with cavities</b>	<b>Shapely and dense</b>
<b>Chest</b>	<b>Narrow</b>	<b>Medium</b>	<b>Well formed</b>
<b>Nails</b>	<b>Thin, dry, brittle</b>	<b>Thin, smooth pinkish or copper colored</b>	<b>Thick, smooth, shining</b>
<b>Eye-brows</b>	<b>Not regular, thin</b>	<b>Thin</b>	<b>Thick and regular</b>
<b>Calf</b>	<b>Small &amp; hard</b>	<b>Lax and soft</b>	<b>Well formed</b>

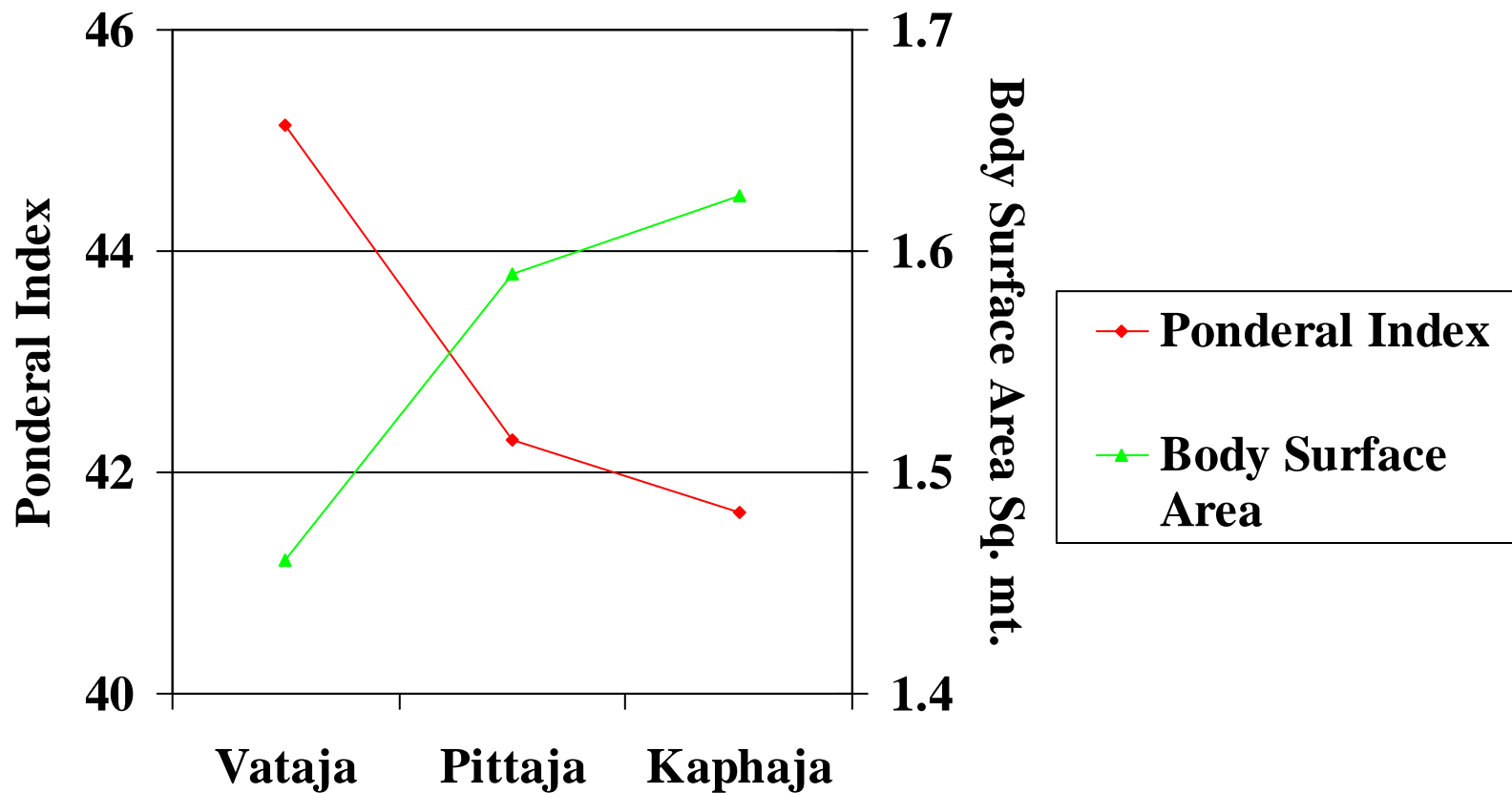
## Physiological Examination

<u>Point of Examination</u>	<u>Vataja</u>	<u>Pittaja</u>	<u>Kaphaja</u>
<b>Appetite, thirst &amp; digestion</b>	<b>Takes meal and water swiftly, constipation</b>	<b>Eats and drinks repeatedly, loose motions</b>	<b>Eats slowly, appetite digestion fair</b>
<b>Dietary likings</b>	<b>Light warm sweet tastes</b>	<b>Sweet bitter astringent and cold food drinks</b>	<b>Hot, bitter scar, food drinks</b>
<b>Perspiration &amp; micturition</b>	<b>Less quantity</b>	<b>Profuse</b>	<b>Moderate</b>
<b>Sexual potency</b>	<b>Poor</b>	<b>Moderate</b>	<b>Strong</b>
<b>Liking for coldness</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Moderate</b>
<b>Tolerance to heat</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Moderate</b>

## Psychological Examination

<u>Point of Examination</u>	<u>Vataja</u>	<u>Pittaja</u>	<u>Kaphaja</u>
Psychic nobility	Minimum	Maximum	Moderate
Piousness	Minimum	Maximum	Moderate
Courage and boldness	Minimum	Maximum	Moderate
Calmness of mind	Minimum	Medium	Maximum
Grasping power	Excellent	Moderate	Medium
Memory	Poor	Excellent	Good

# Ponderal Index and Body Surface Area in Different Constitutions of Diabetics

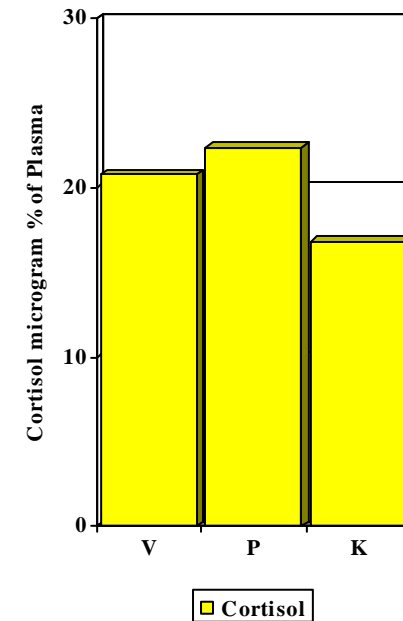
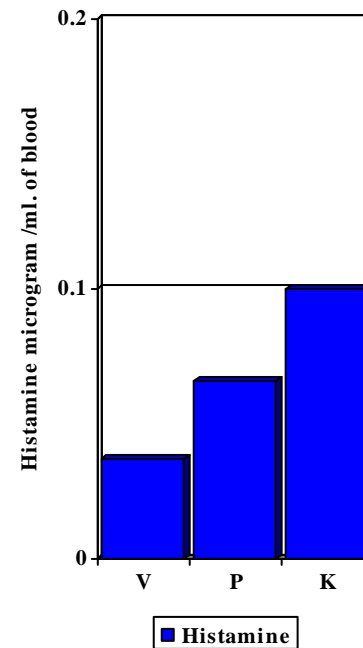
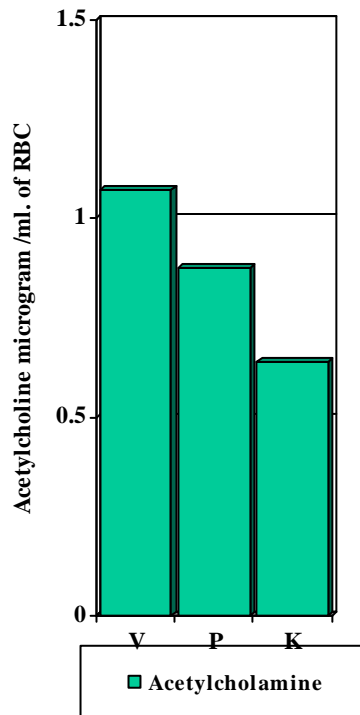


# Management of Diabetes

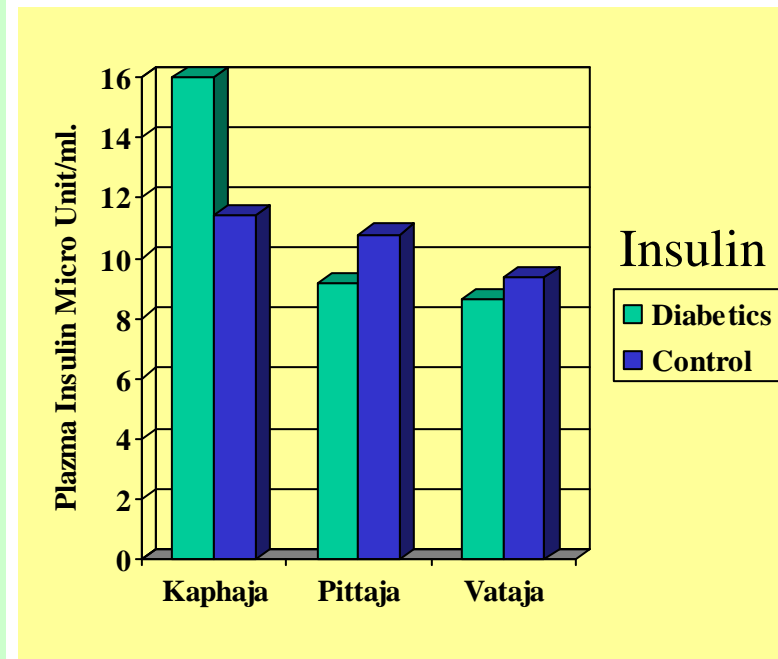
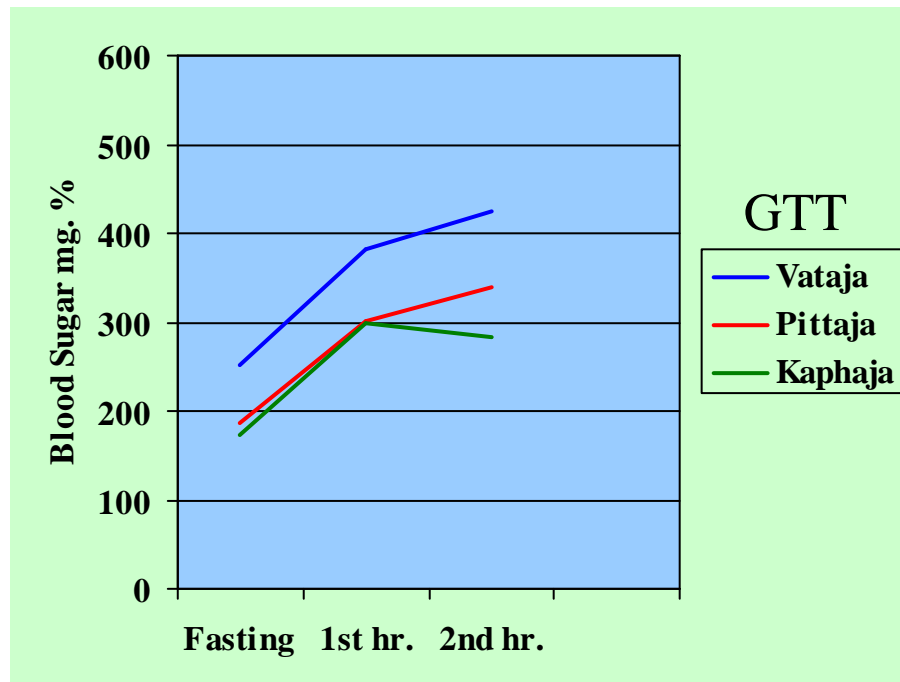
- Bio-purification – for obese patients,
- Pacificatory measures - Diet control, exercise & therapeutic regimen.
- General principle indicated for treatment of Obesity (Medoroga) is also applicable for diabetes (prameha) because primarily fat (meda) and kapha are involved in both the diseases.
- Various ayurvedic drugs as single or polyherbal, herbo-mineral, fermented preparations as Asava & Arishta, Decoction & disease specific medicated ghee, oil etc.

# Neurohumors in different psychosomatic constitutions (Prakriti) of healthy subjects

V- Vataja P- Pittaja K – Kaphaja

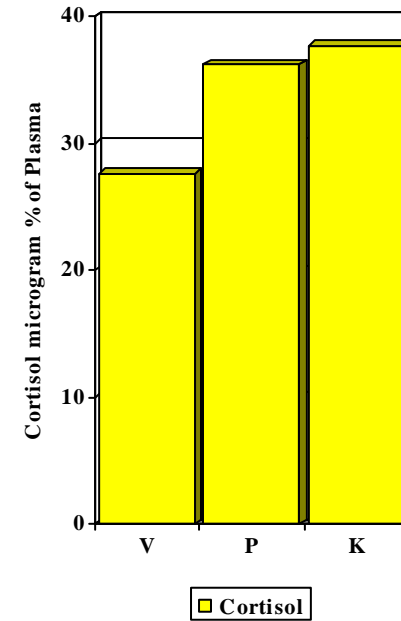
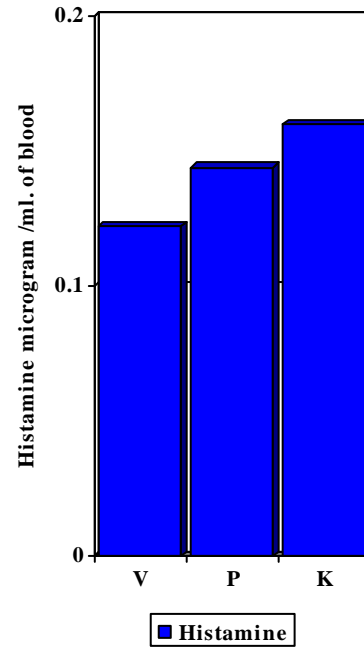
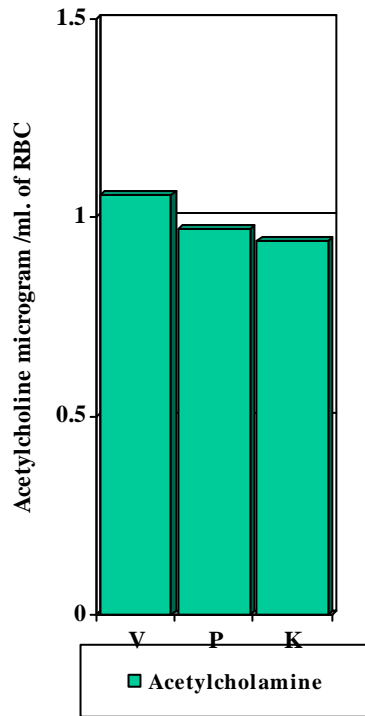


# G.T.T. & Plasma Insulin in different psychosomatic constitutions of Diabetics

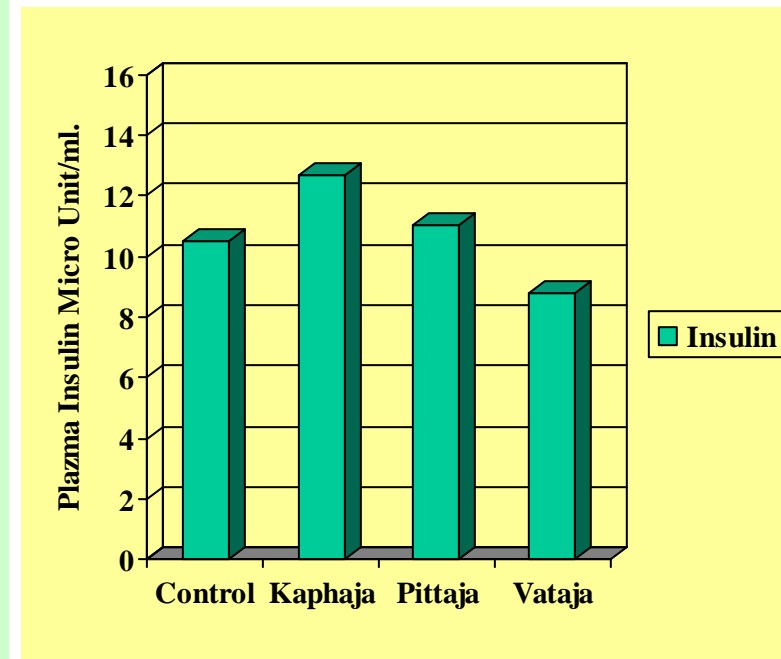
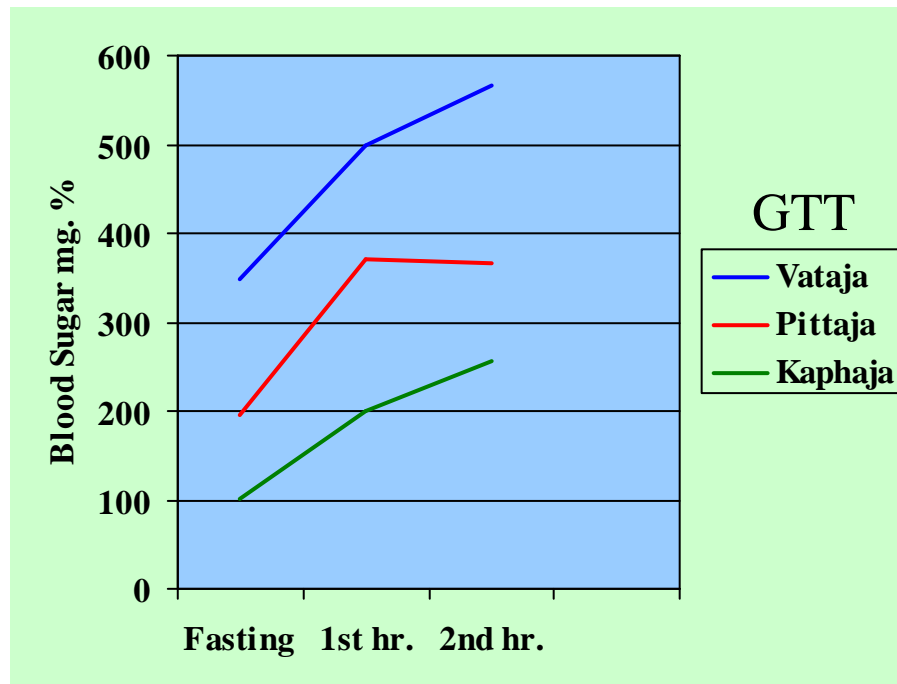


# Neurohumors in different psychosomatic constitutions (Prakriti) of Diabetics

V- Vataja P- Pittaja K – Kaphaja

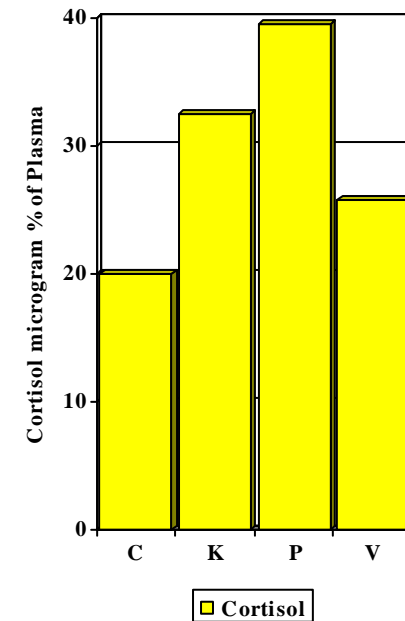
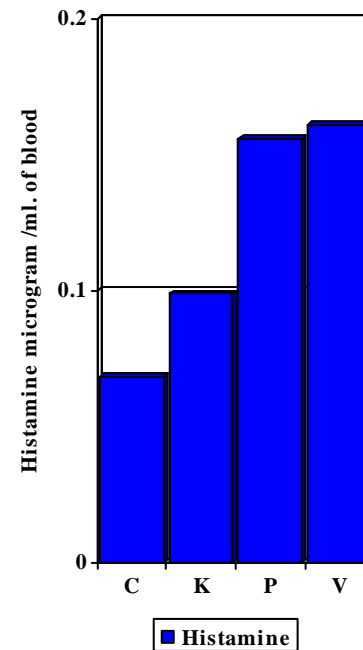
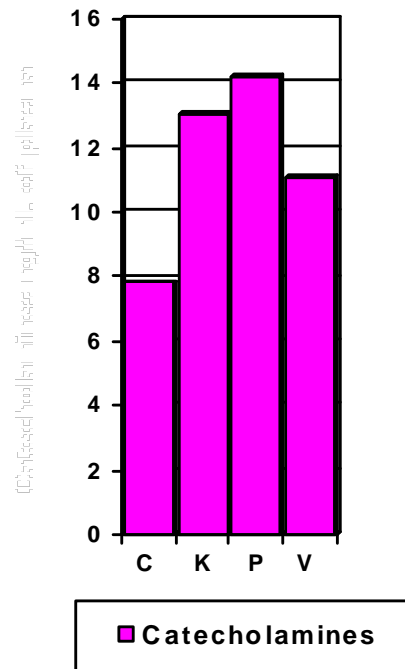
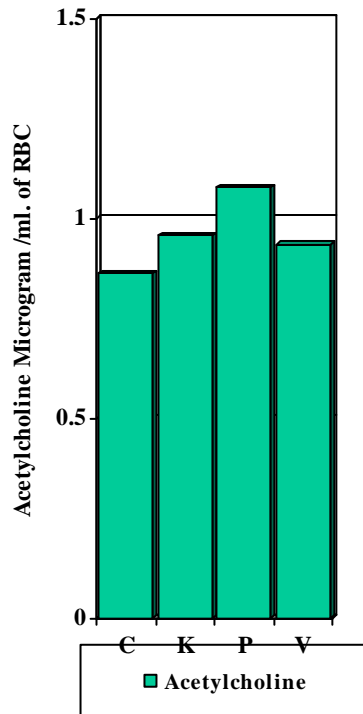


# G.T.T. & Plasma Insulin in different types of Prameha/Stages of D.M.

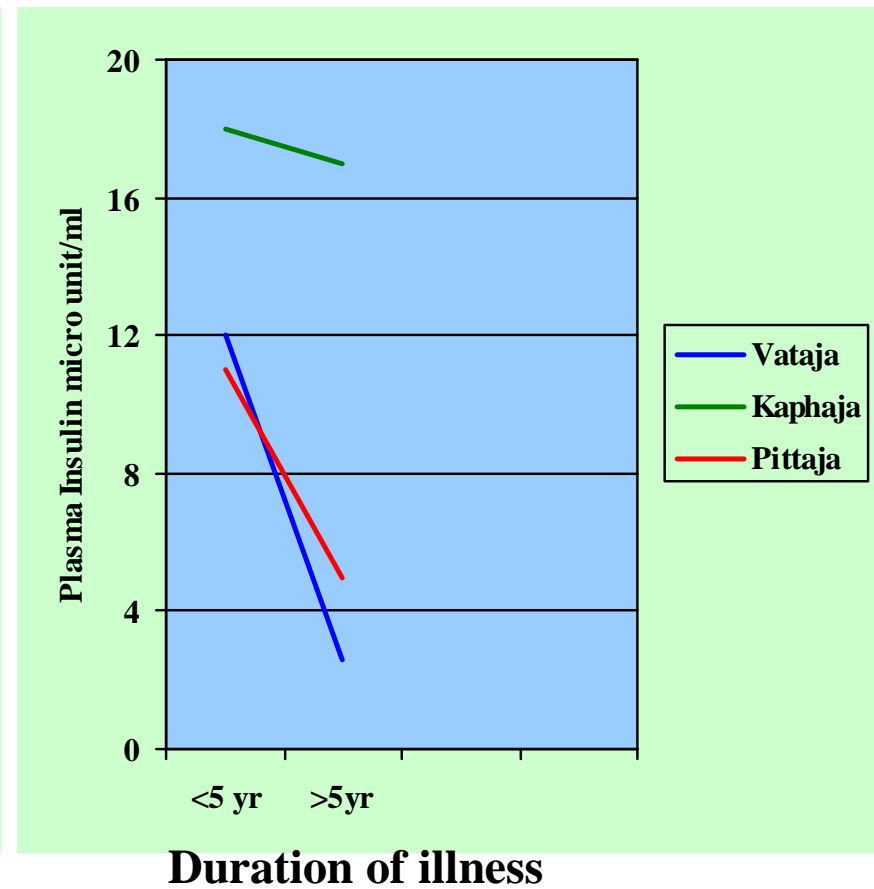
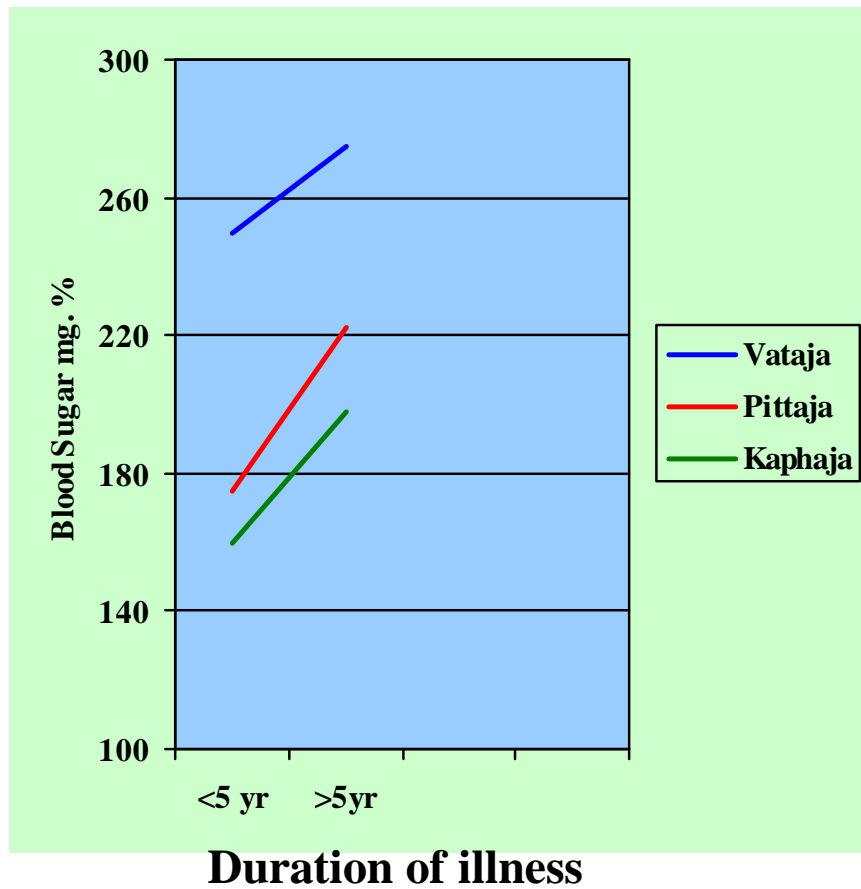


# Variations in Neurohumors in different types of Prameha/Stages of D.M.

C- Control K- Kaphaja P– Pittaja V- Vataja



# Fasting Blood Sugar & Plasma insulin in different body constitutions in diabetics



# Dietary Management

- The best foods to eat are those that are not sweet, not too oily, have the ability to mitigate kapha , meda and are nourishing.
- Ushna (warm) diet is recommended since it will ease Kapha, normalize Vata, and stimulate Pitta to intensify digestion.
- In the diet importance should be given to Yava (Barley).
- Other spices with antidiabetic are Haridra, Dhanyaka, Jeeraka, Rasona, Methika, Cinnamom etc.
- Ayurveda recommends use of Anupana along with diet and any herbs that are being utilized like: Sarodaka, Kushodaka.

# Lifestyle Management

- Patients are advised to avoid laziness and sedentary lifestyle.
- Sushruta emphasizes importance of regular exercise, including brisk walk, jogging, sports and so on.
- Patients are advised to do Yoga, Pranayama, study their respective religion scriptures, which highlight the development of a positive mental attitude and decrease anxiety and stress.

# Pramehahara and Madhumehahara (Anti-diabetic) Drugs in Ayurveda

Sr. No.	Name of the Drug	Latin Name	Charak Samhita	Sushruta Samhita	Astanga Hridaya
1.	Daruharidra	Berberis aristata	+	+	+
2.	Devadaru	Cedrus deodara	+	+	+
3.	Haritaki	Terminalia chebula	+	+	+
4.	Vibhitaki	Terminalia bellirica	+	+	+
5.	Amalaki	Emblica officinalis	+	+	+
6.	Musta	Cyperus rotundus	+	+	+
7.	Haridra	Curcuma longa	+	+	+
8.	Katphala	Myrica esculenta	+	+	+
9.	Lodhra	Symplocos racemosa	+	+	+
10.	Patha	Cyclea peltata	+	+	+

11.	Vidanga	Embelia ribes	+	+	+
12.	Arjuna	Terminalia arjuna	+	+	+
13.	Dhanvana	Grewia tiliaefolia	+	+	-
14.	Tagara	Valeriana wallichii	+	+	+
15.	Kadamba	Anthocephalus indicus	+	-	-
16.	Shalasara	Shorea robusta	+	+	+
17.	Yavani	Trachyspermum ammi	+	+	+
18.	Khadira	Acacia catechu	+	+	+
19.	Dhava	Anogeissus latifolia	+	+	+
20.	Kustha	Saussurea lappa	+	+	+
21.	Aguru	Aquilaria agallocha	+	+	-
22.	Chandana	Santalum album	+	+	+
23.	Agnimantha	Premna integrefolia	+	+	+
24.	Murva	Marsdenia tenacissima	+	+	+
25.	Gokshura	Tribulus terrestris	+	-	-

26.	Ushira	<i>Vetiveria zizanoidis</i>	+	+	+
27.	Guduchi	<i>Tinospora cordifolia</i>	+	+	+
28.	Chavya	<i>Piper retrofractum</i>	+	-	-
29.	Chitraka	<i>Plumbago zeylanica</i>	+	+	+
30.	Saptaparna	<i>Alstonia scholaris</i>	+	+	+
31.	Patola	<i>Trichosanthes dioica</i>	+	+	+
32.	Nimba	<i>Azadirachta indica</i>	+	+	+
33.	Padmaka	<i>Prunus cerasoides</i>	+	+	-
34.	Kutaja	<i>Holarrhena antidysenterica</i>	+	+	+
35.	Dhataki	<i>Woodfordia fruticosa</i>	+	+	+
36.	Utpala	<i>Nymphaea stellata</i>	+	+	+
37.	Shirisha	<i>Albizia lebbeck</i>	+	+	+
38.	Sarja	<i>Vateria indica</i>	+	+	+
39.	Nagakesara	<i>Messua ferra</i>	+	+	+
40.	Priyangu	<i>Callicarpa macrophylla</i>	+	+	+

41.	Palasa	<i>Butea monosperma</i>	+	+	+
42.	Aswatha	<i>Ficus religiosa</i>	+	+	+
43.	Asana	<i>Pterocarpus marsupium</i>	+	+	+
44.	Vetasa	<i>Salix caprea</i>	+	+	+
45.	Kampillaka	<i>Mallotus philippinensis</i>	+	+	-
46.	Rohitaka	<i>Tecoma undulata</i>	+	+	-
47.	Kapitha	<i>Feronia elephantum</i>	+	-	-
48.	Asmantaka	<i>Ficus rumphii</i>	+	-	-
49.	Soma	<i>Ephedra gerardiana</i>	+	+	+
50.	Ativisha	<i>Aconitum heterophyllum</i>	+	+	+
51.	Vacha	<i>Acorus calamus</i>	+	-	+
52.	Manjistha	<i>Rubia cordifolia</i>	+	+	+
53.	Sati	<i>Hedychium spicatum</i>	+	+	+
54.	Pushkaramula	<i>Inula racemosa</i>	+	+	+
55.	Kramuka	<i>Areca catechu</i>	+	+	+

56.	Kiratatika	Swertia chirayita	+	+	+
57.	Katurohini	Picrorhiza kurroa	+	+	+
58.	Bharangi	Clerodendrum serratum	+	+	+
59.	Pippali	Piper longum	+	+	+
60.	Indruvaruni	Cirullus colocynthis	+	+	+
61.	Vyaghranakha	Capparis horrida	+	-	-
62.	Tejapatra	Cinnamomum tamala	+	+	+
63.	Maricha	Piper nigrum	+	+	+
64.	Danti	Baliospermum montanum	+	+	+
65.	Bhallataka	Semecarpus anacardium	+	+	+
66.	Aragvadha	Cassia fistula	-	+	+
67.	Madanaphala	Randia spinosa	-	+	+
68.	Vikankata	Flacourtia ramontchi	-	+	+
69.	Patala	Stereospermum suaveolens	-	+	+
70.	Kuruntaka	Barleria prionitis	-	+	+

71.	Gunja	<i>Abrus precatorius</i>	-	+	+
72.	Kakajangha	<i>Peristrophe bicalyculata</i>	-	+	-
73.	Karanja	<i>Pongamia pinnata</i>	-	+	+
74.	Chirabilva	<i>Holopte lea integrifolia</i>	-	+	+
75.	Karavellaka	<i>Momordia charantia</i>	-	+	+
76.	Kadara	<i>Acacia suma</i>	-	+	+
77.	Bhurja	<i>Betula utilis</i>	-	+	+
78.	Shyonaka	<i>Oroxylum indicum</i>	-	+	+
79.	Meshashrangi	<i>Gymnema sylvestre</i>	-	+	+
80.	Tinisa	<i>Ougenia oojenensis</i>	-	+	+
81.	Raktachandana	<i>Pterocarpus santalinus</i>	-	+	+
82.	Shinshapa	<i>Dalbergia sissoo</i>	-	+	+
83.	Talamuli	<i>Curculigo orchioides</i>	-	+	+
84.	Shaka	<i>Tectona grandis</i>	-	+	+
85.	Aswakarna	<i>Dipterocarpus turbinatus</i>	-	-	+

86.	Mushkaka	<i>Schrebera swietenoides</i>	-	+	+
87.	Snuhi	<i>Euphorbia nerifolia</i>	-	+	+
88.	Sunthi	<i>Zingiber officinale</i>	-	+	+
89.	Paribhadra	<i>Erythrina variegata</i>	-	+	+
90.	Sheivalam	<i>Ceratophyllum demersum</i>	-	+	+
91.	Jalakumbhika	<i>Pistia stratiotes</i>	-	+	+
92.	Durva	<i>Cynodon dactylon</i>	-	-	+
93.	Kaseruka	<i>Scirpus grossui</i>	-	-	+
94.	Vata	<i>Ficus bengalensis</i>	-	+	+
95.	Tinduka	<i>Diospyros peregrina</i>	-	+	+
96.	Kasmarya	<i>Gmelina arborea</i>	-	-	+
97.	Kharjura Beeja	<i>Phoenix sylvestris</i>	-	-	+
98.	Hingu	<i>Ferula narthex</i>	-	-	+
99.	Duralabha	<i>Fagonia cretica</i>	-	-	+
100.	Sariva	<i>Hemidesmus indicus</i>	-	-	+

101.	Yuthika	Rhinacanthus nasuta	-	-	+
102.	Madayantika	Lawsonia inermis	-	-	+
103.	Dadima	Punica granatum	-	-	+
104.	Shalaparni	Desmodium gangeticum	-	-	+
105.	Mushali	Asparagus adscendens	-	-	+
106.	Punaga	Colopfiyllum inophyllum	-	-	+
107.	Shalmali	Salmalia malabarica	-	-	+
108.	Bakula	Mimusops elengi	-	-	+
109.	Shrangataka	Trapa natans	-	-	+
110.	Aralu	Ailanthus excelsa	-	-	+
111.	Kasa	Saccharum spontaneum	-	-	+
112.	Madhuka	Glycyrrhiza glabra	-	-	+
113.	Amra	Mangifera indica	-	-	+

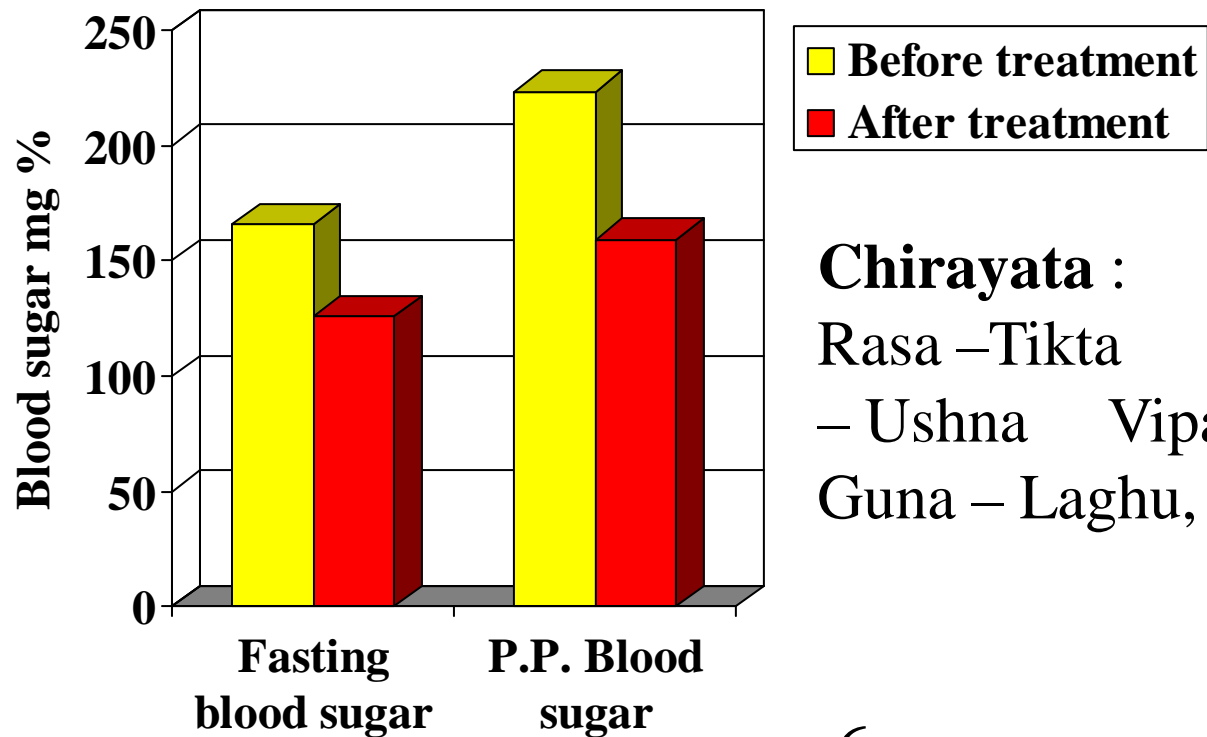
## Recent advances

- *Shilajit* (*Asphaltum punjabinum*) is an established treatment option for Prameha, Sthaulya, Hridroga etc, that not only mitigates Kapha and Meda, but also has *Rasayana* (Rejuvenating) property.
- In a clinical study on patients with diabetes, *Shilajit* significantly reduced lipid peroxidation and significantly increased levels of catalase, an antioxidant enzyme.

Aqueous and alcoholic extract of *Guduchi* (*Tinospora cardofolia* (Willd)) reduced glucose levels in rats with alloxan induced diabetes. The antihyperglycemic effect may be due to pancreatic islet free-radical-scavenging activity. This herb also reduces the levels of tissue and serum cholesterol, phospholipids and free fatty acids.

- ***Meshasringi (Gymneme sylvestre (Tetz))*** targets several of etiological factors associated with diabetes, including chronic inflammation, obesity and pancreatic  $\beta$ -cell function.
- **In a study on rats with streptozotocin-induced diabetes, *G. sylvestre* treatment resulted in 30% increase in total pancreatic weight, and a significant increase in the number of  $\beta$ -cells per islet. The regenerated pancreatic tissue resulted in complete control of fasting blood glucose levels within 20-60 days.**
- **Several clinical trials have demonstrated that this drug is; effective in decreasing blood glucose, glycosylated hemoglobin, and glycosylated plasma proteins.**

# Effect of Swertia chirata in maturity onset diabetes



**Chirayata :**

Rasa – Tikta                      Veerya  
– Ushna      Vipaka – Katu  
Guna – Laghu, Ruksha

n= 6

**Chirayata ghanavati : Swertia chirata**

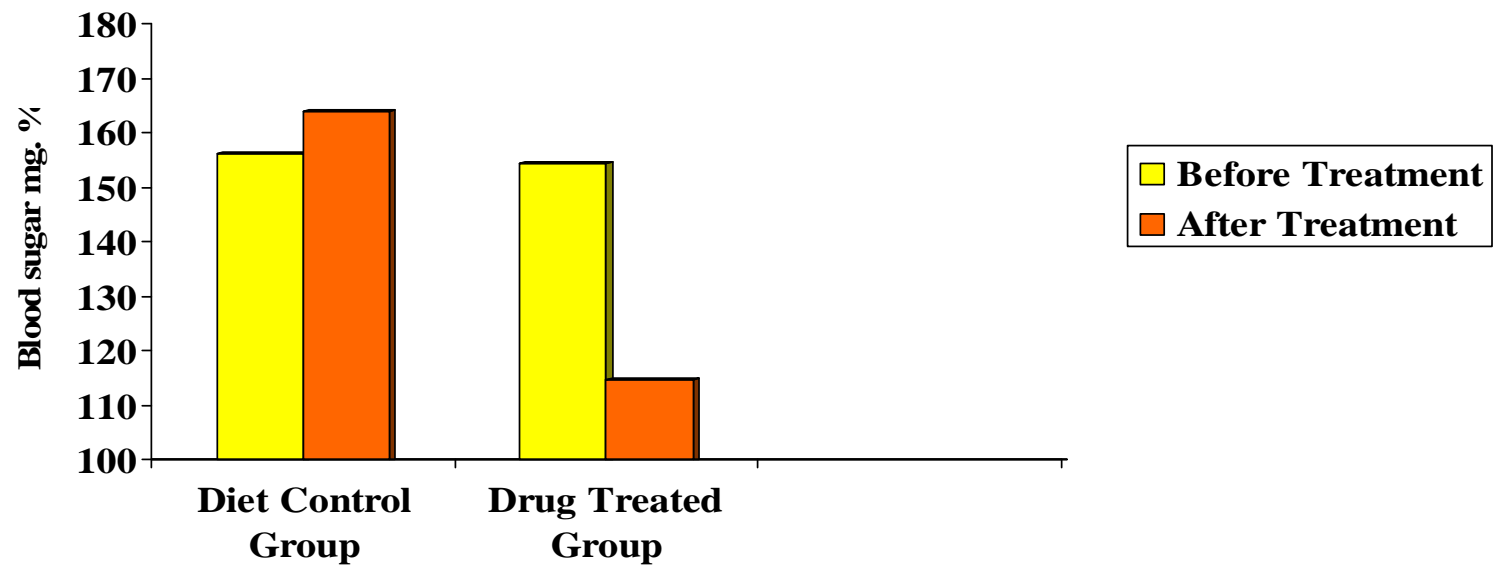
**Dose: 1 gm. tid, Duration 2 months, n:9**

*(Bhatia S., Chandola H.M.2001)*

# C.tamala (Tejapatra)

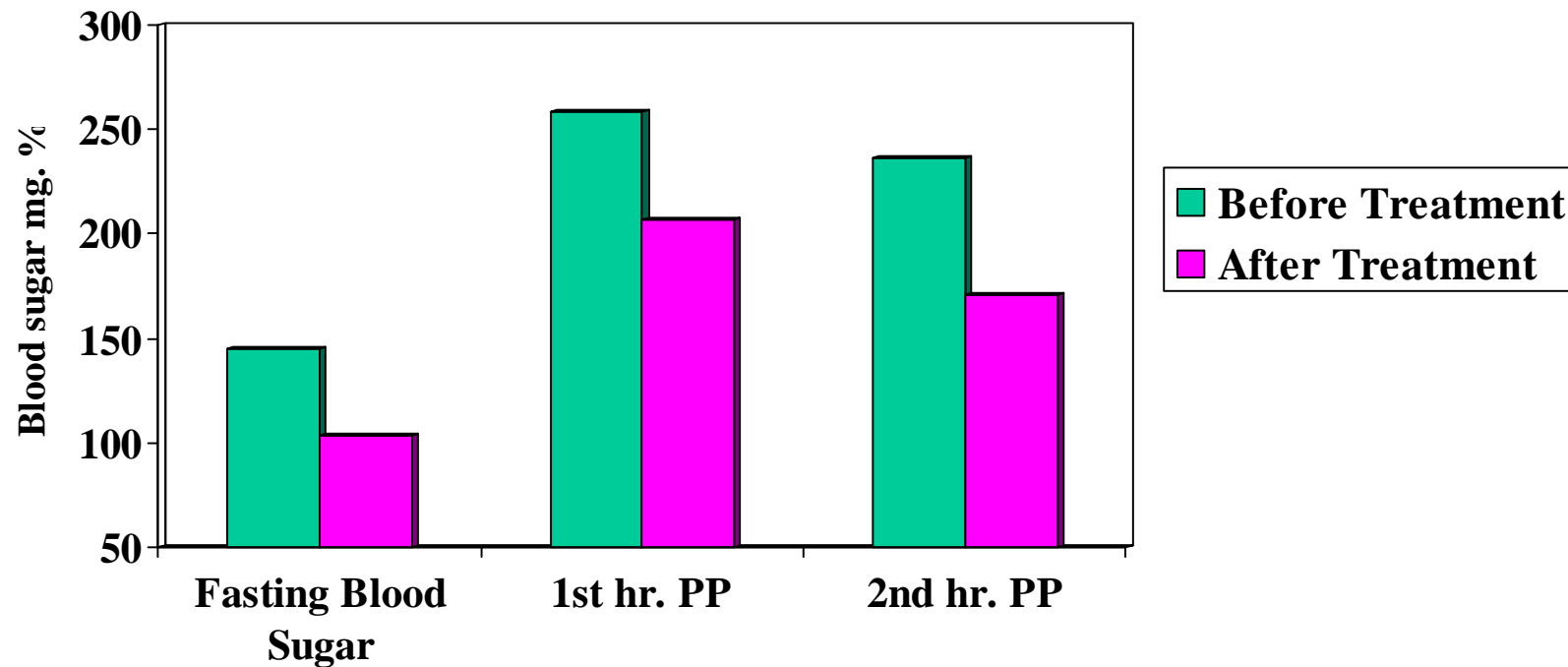


# Effect of *C. tamala* (Tejpatra) on fasting blood sugar in maturity onset diabetes



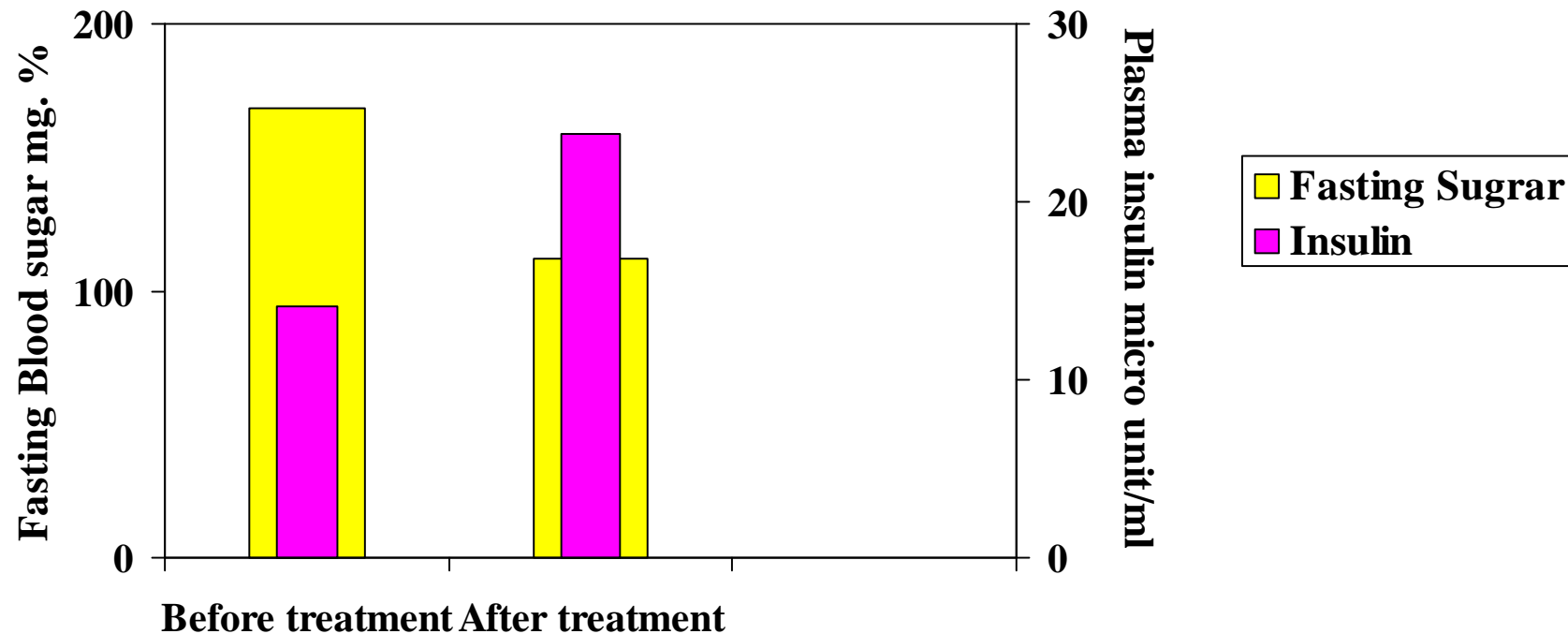
n - 32

# Effect of *C. tamala* (Tejpatra) on Fasting & P.P. blood sugar in maturity onset diabetes

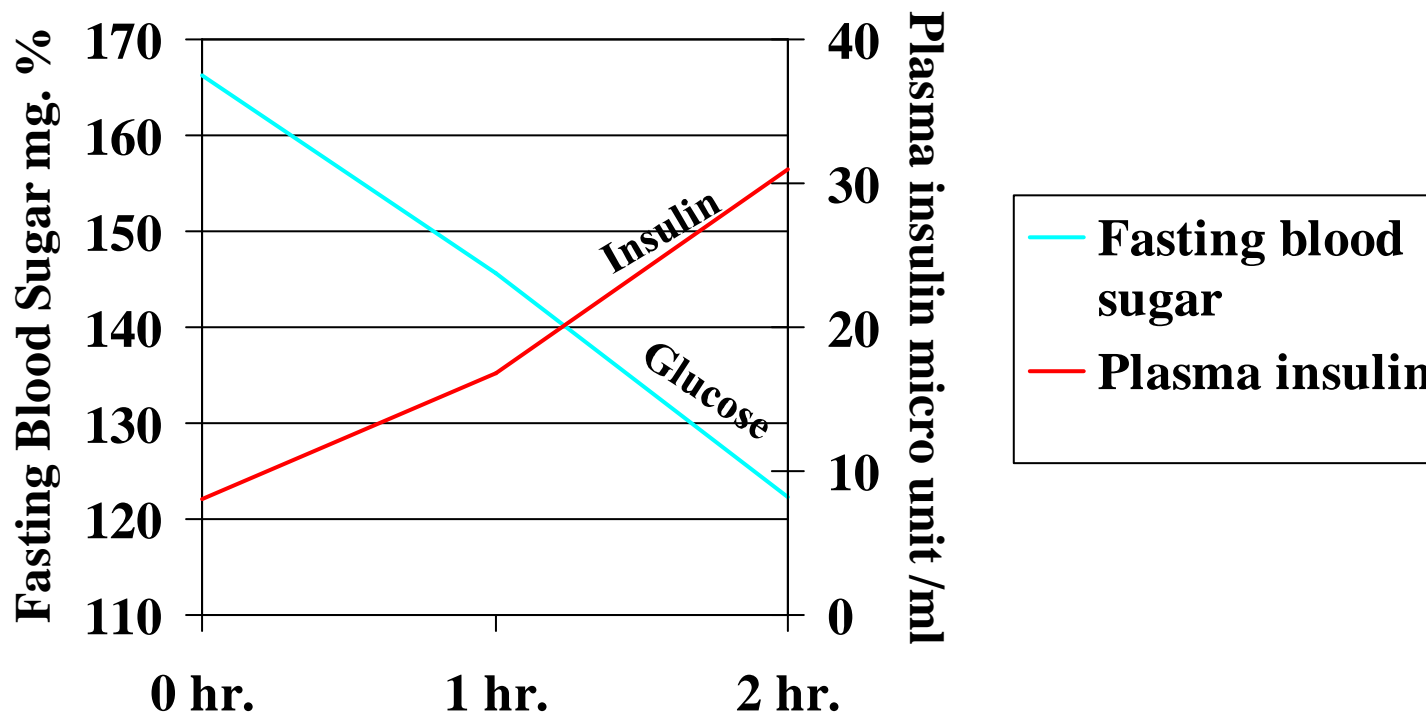


n - 25

# Effect of *C. tamala* on fasting blood sugar and plasma insulin in diabetes



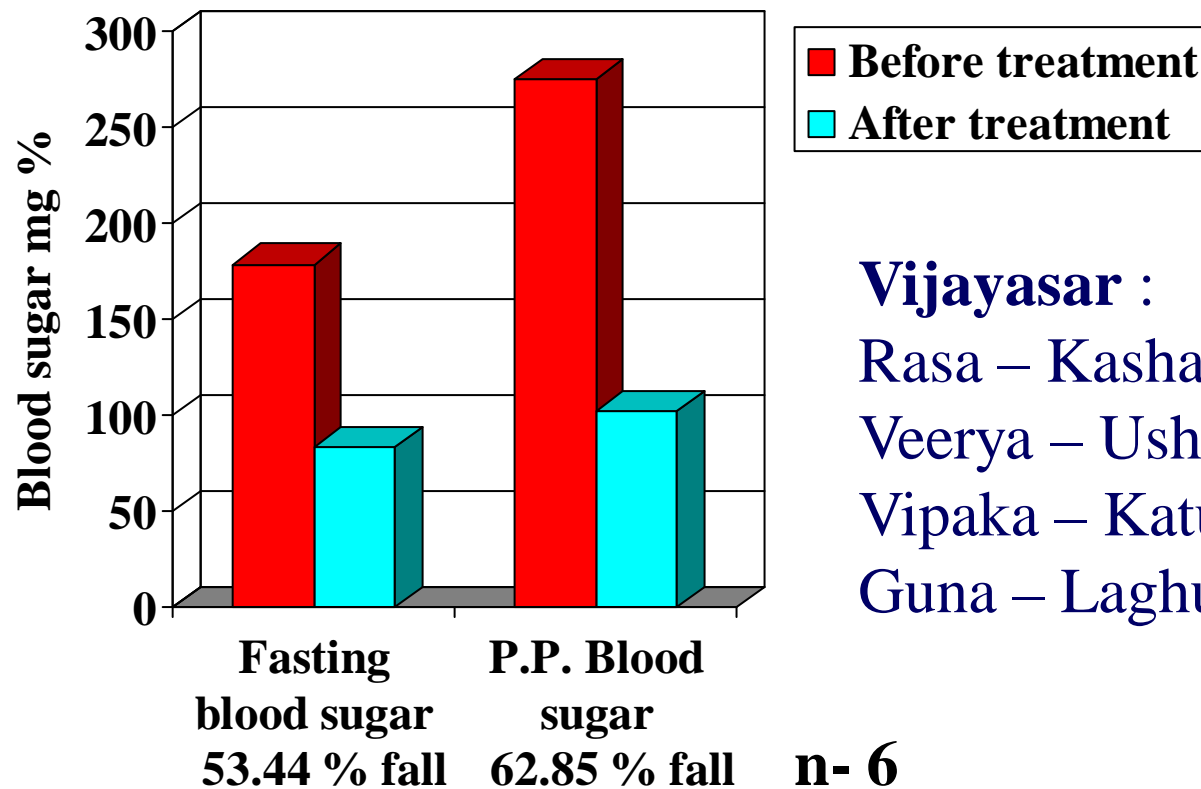
# Immediate effect of *C. tamala* on fasting blood sugar cum plasma insulin in diabetics



# Pterocarpus marsupium (Vijayasara)



# Effect of Pterocarpus marsupium in maturity onset diabetes



**Vijayasar :**

Rasa – Kashaya, Tikta

Veerya – Ushna

Vipaka – Katu

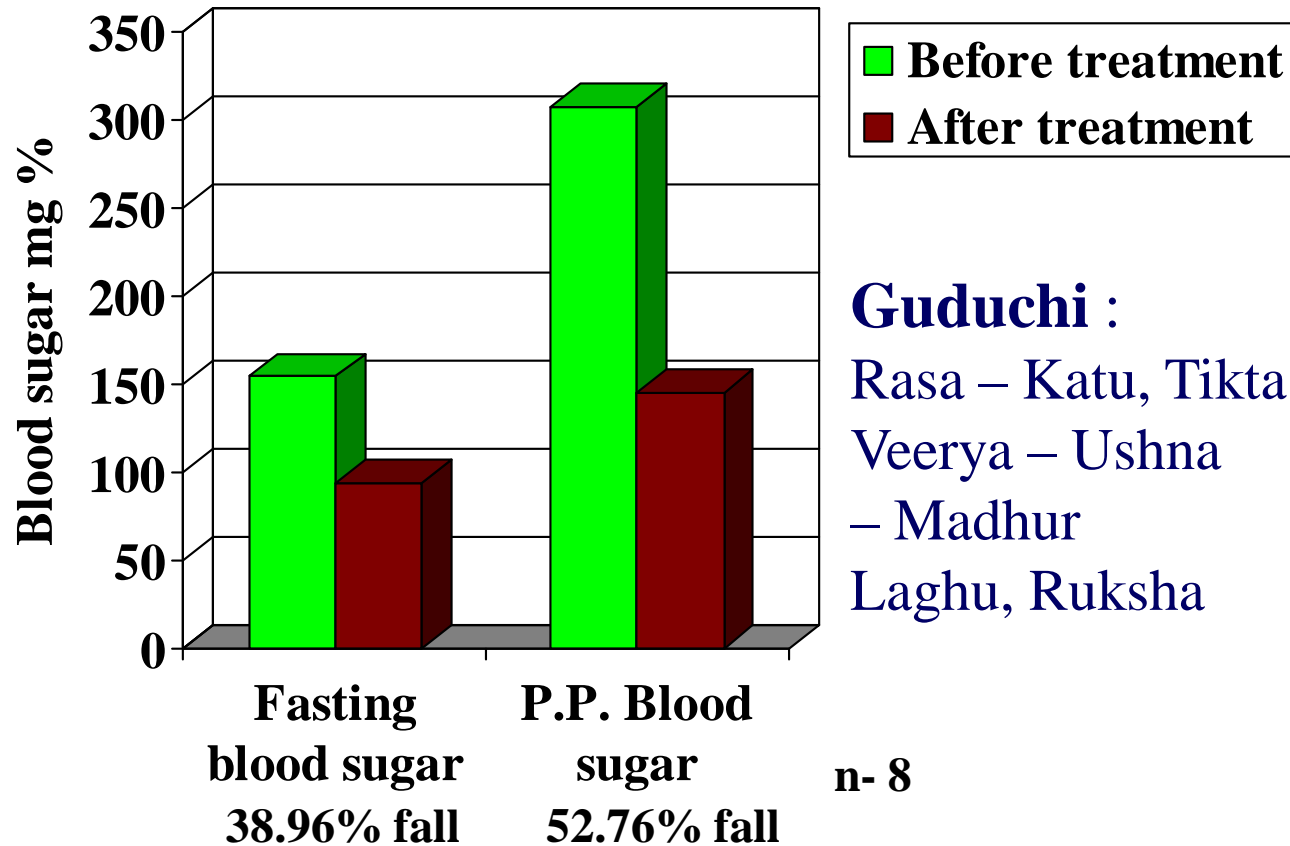
Guna – Laghu, Ruksha

# Tinospora cordifolia (Guduchi)



GUDUCHI (*Tinospora cordifolia*)

# Effect of Pterocarpus marsupium along with Tinospora cordifolia in maturity onset diabetes



## Guduchi :

Rasa – Katu, Tikta, Kashaya

Veerya – Ushna

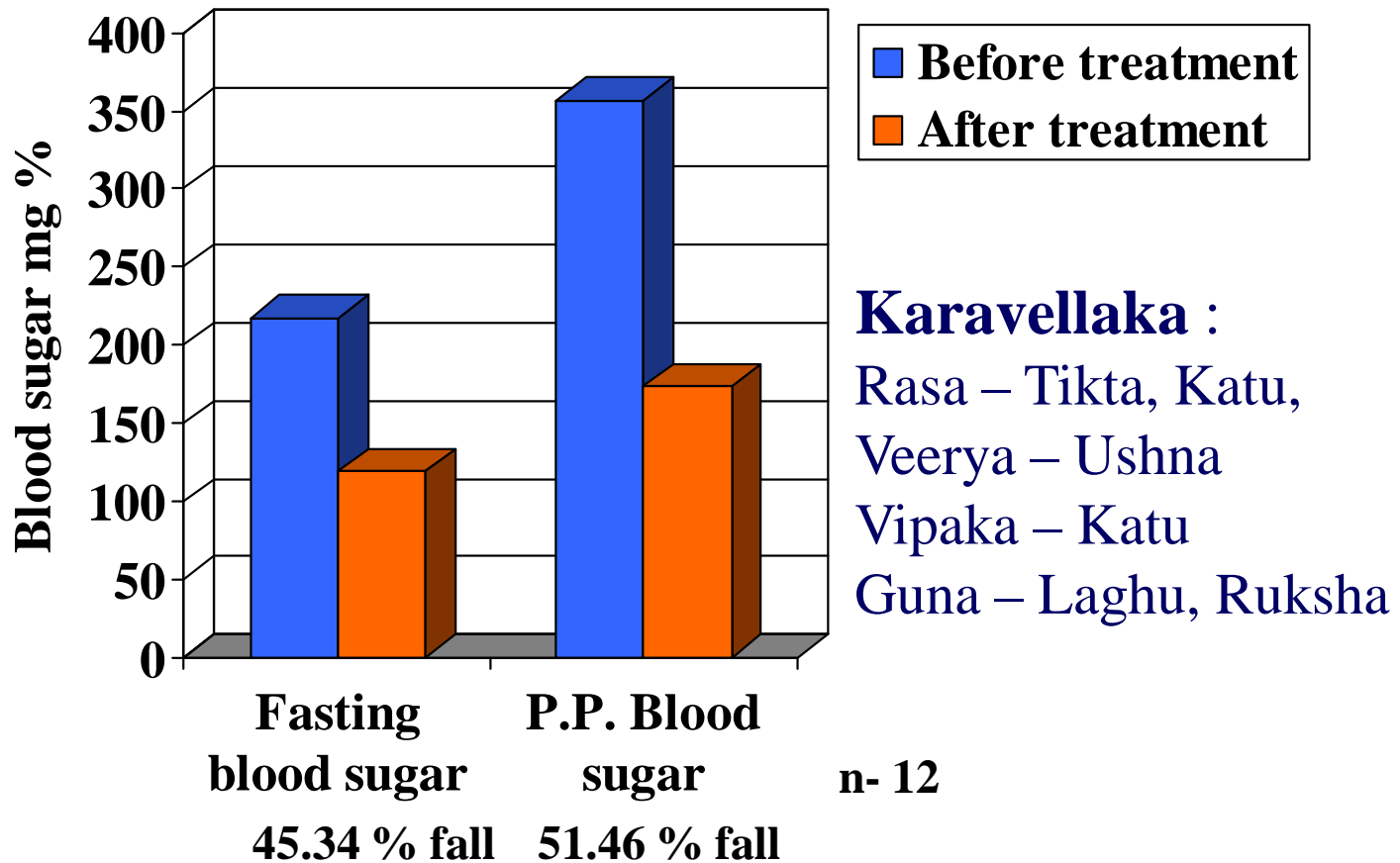
Vipaka

– Madhur

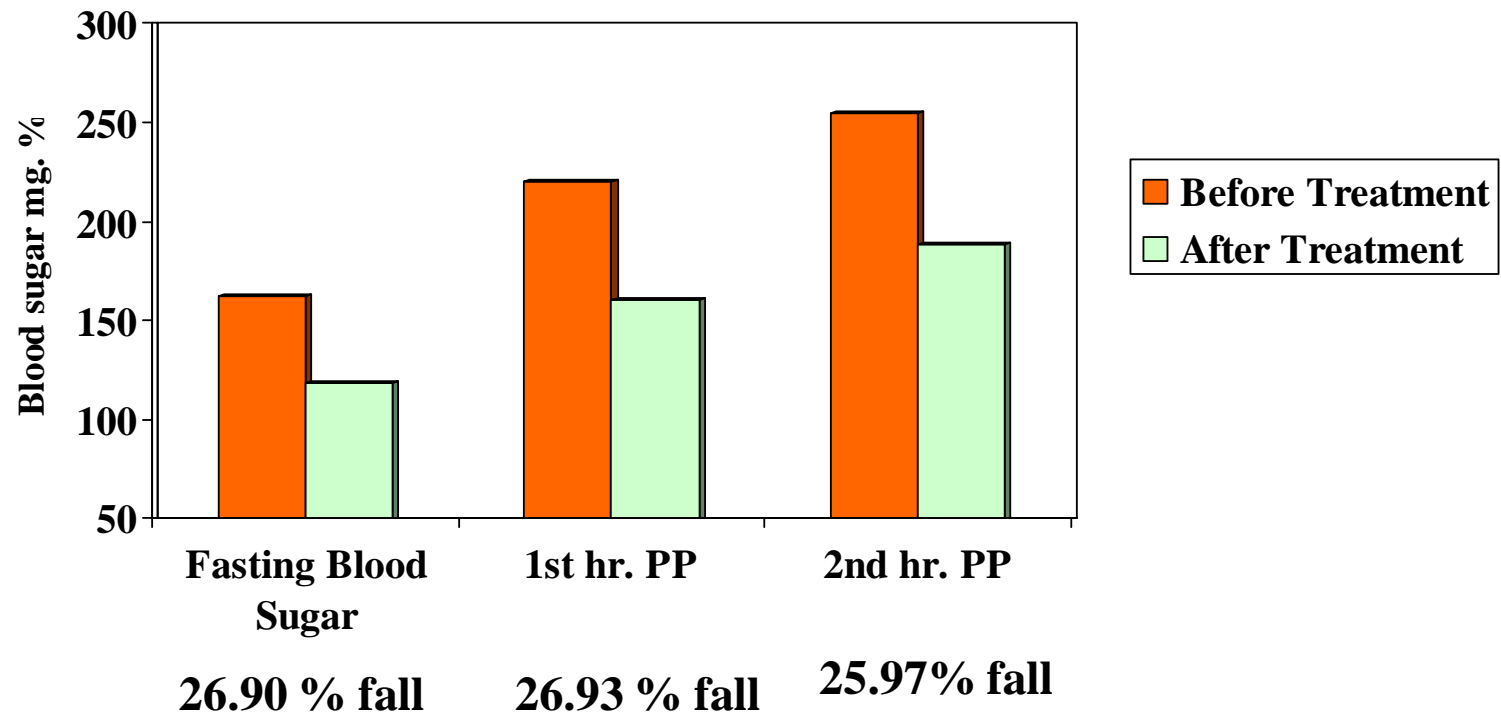
Guna –

Laghu, Ruksha

# Effect of Pterocarpus marsupium along with Tinospora cordifolia and Momordica charantia in maturity onset diabetes



# Effect of *Cassia auriculata* (Avartaki) in maturity onset diabetes

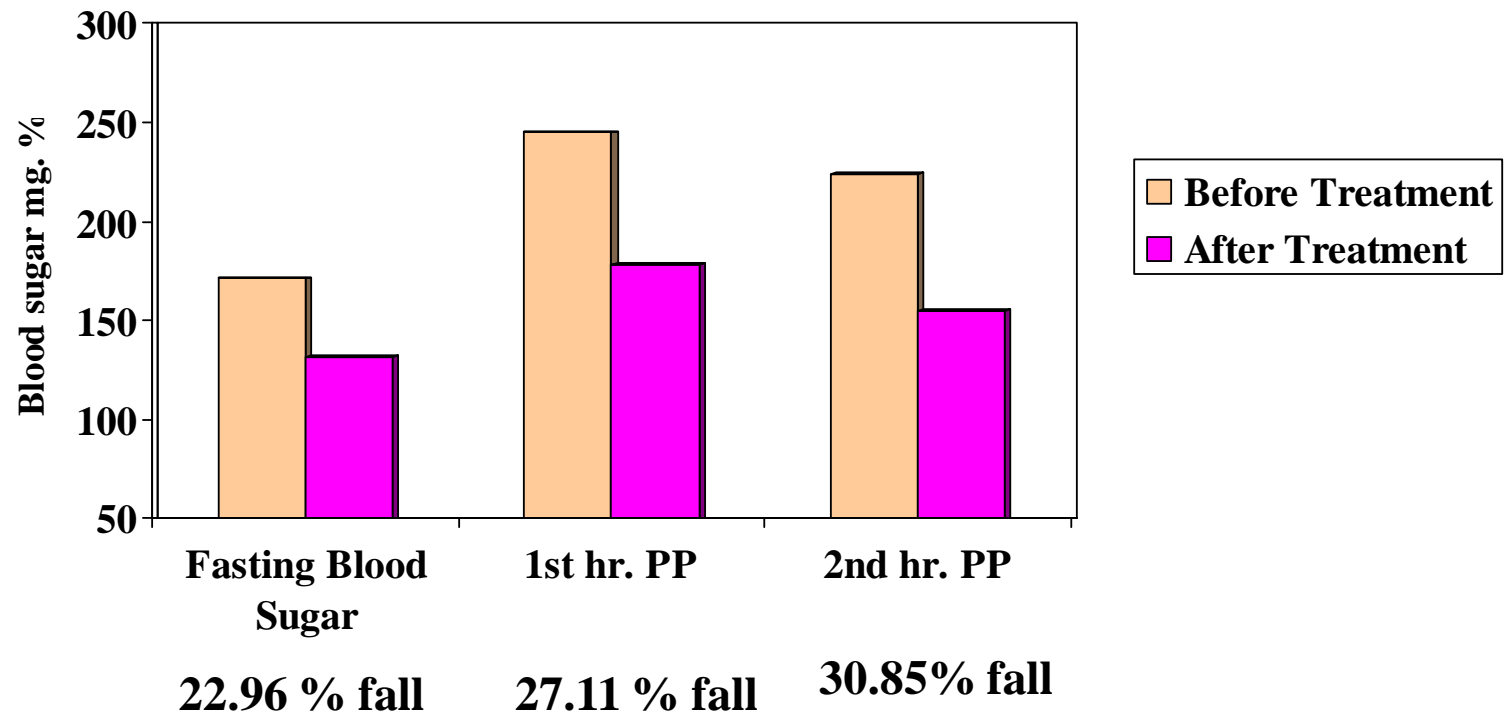


n- 8

# Azadirachta indica (Nimba)



# Effect of *Azadirachta indica* (Nimba) in maturity onset diabetes

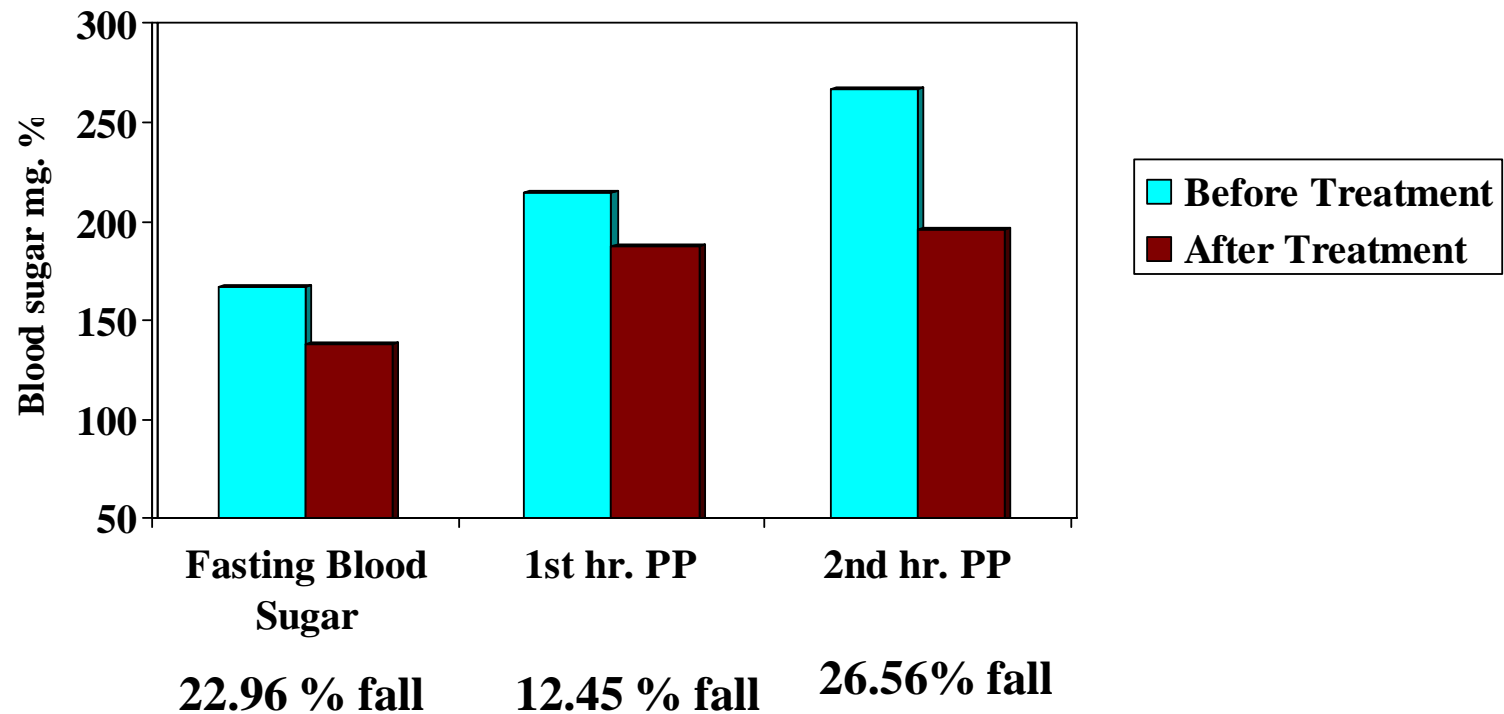


n- 8

# **Ficus glomerata (Udumbara)**



# Effect of *Ficus glomerata* (Udumbara) in maturity onset diabetes

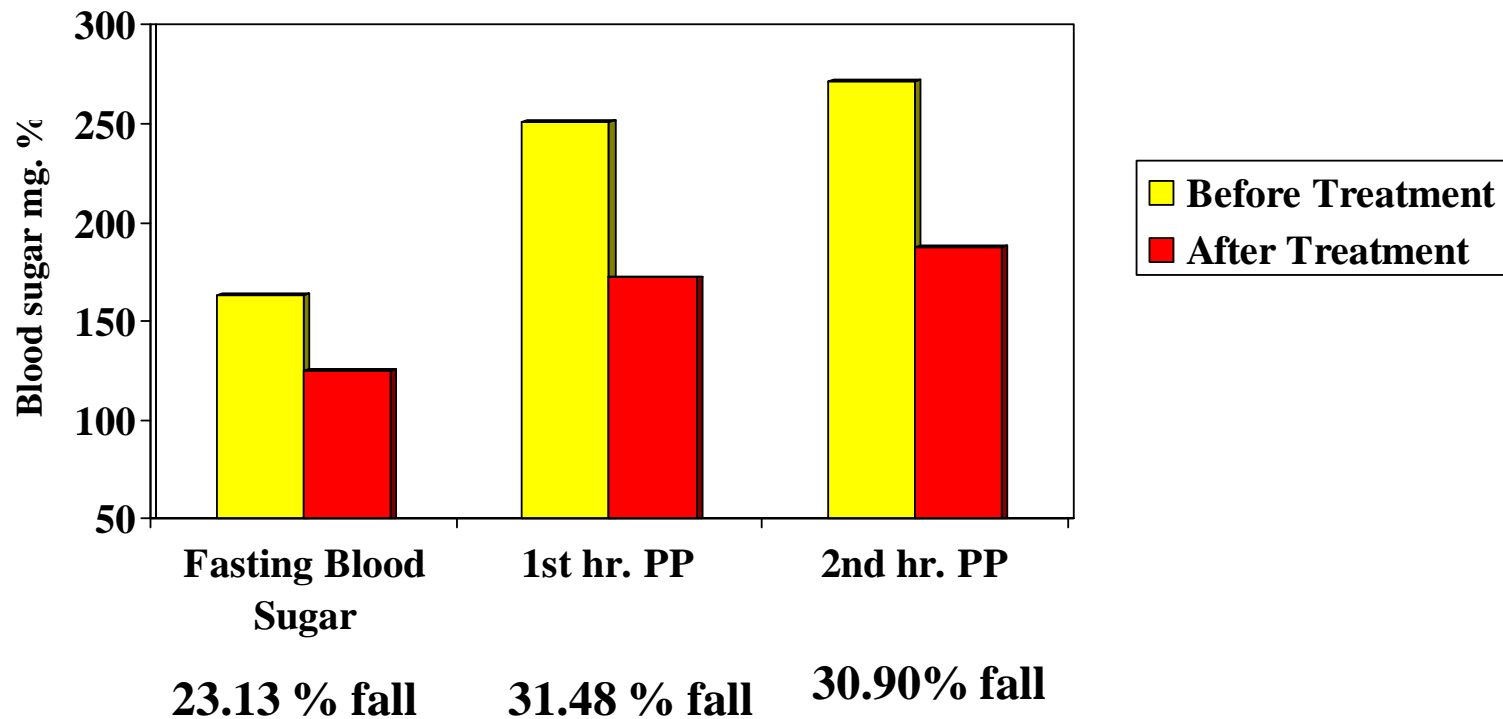


n- 8

# Polyherbal Compound (Mamejaka, Meshashringi & Jambu) in maturity onset Diabetes Mellitus

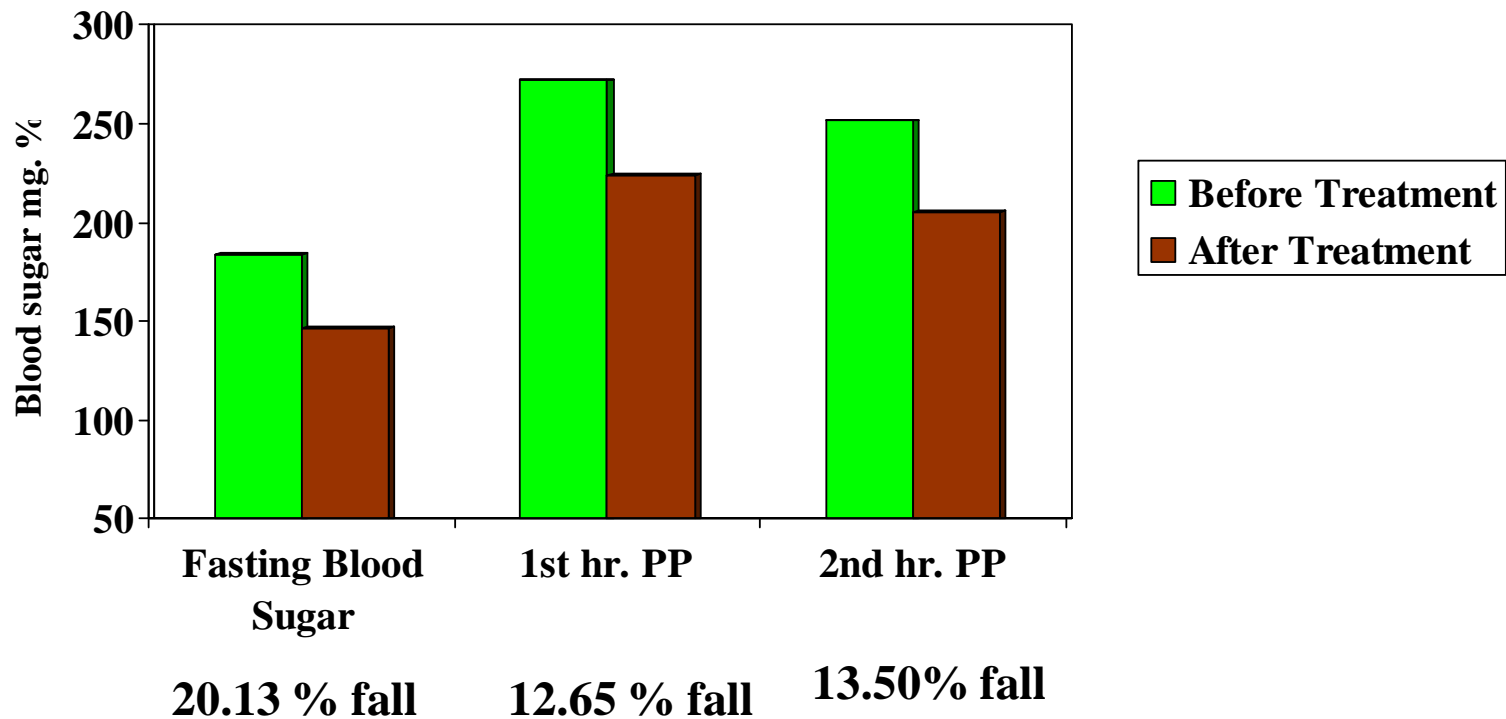
- **Mamejaka (*Enicostemma littorale*)**
  - Guna- Laghu, Ruksha
  - Rasa – Tikta
  - Veerya – Ushna
  - Vipaka – Katu
  - Part used – Panchang
- **Meshashringi/Gudmar/Madhunashini(*Gymnema sylvestre*)**
  - Guna- Ruksha, Laghu
  - Rasa – Tikta
  - Veerya – Ushna
  - Vipaka – Katu
  - Part used – Leaf, Root bark
- **Jambu seeds (*Syzygium cumini*)**
  - Guna- Laghu, Ruksha
  - Rasa – Kashaya, Madhur, Amla
  - Veerya – Sheet
  - Vipaka – Katu
  - Part used – Fruit, Kernal, Bark, Leaf

# Effect of Polyherbal Compound (Mamejaka, Meshashringi & Jambu) in maturity onset Diabetes Mellitus



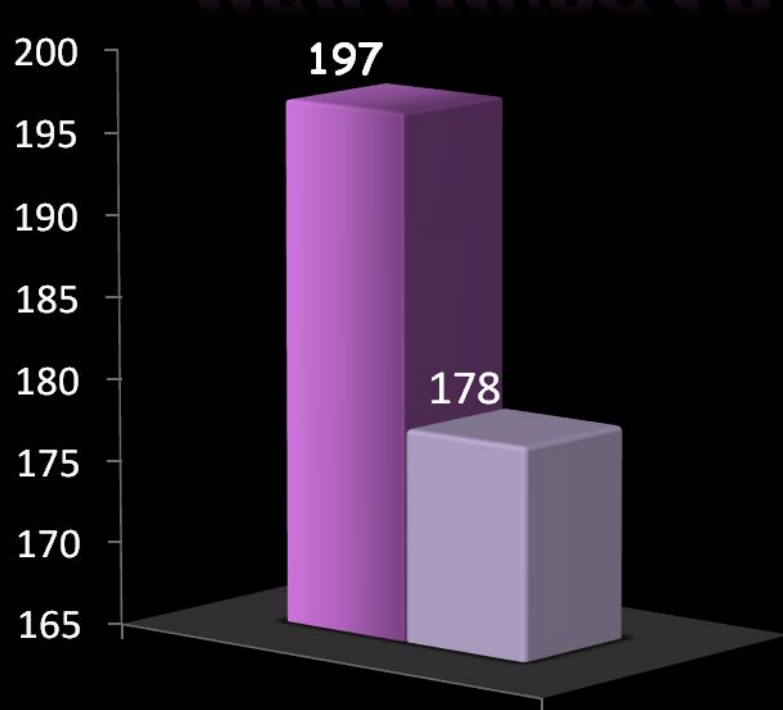
n- 8

# Effect of Compound Herbo-mineral formulation Chandraprabhavati in maturity onset Diabetes Mellitus



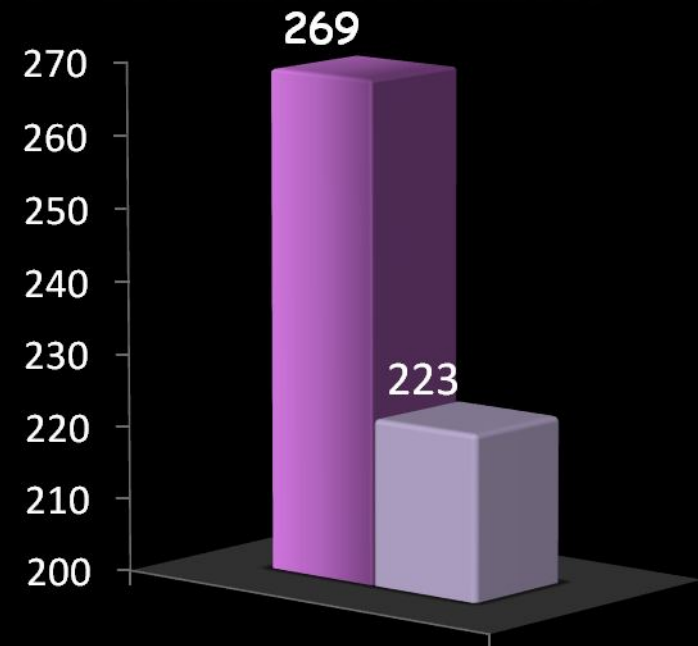
n- 37

# MEHAMUDGARA VATI (B.R. - PRAMEHA ROGADHIKAR)



*FBS\*\* (mg%)*

Student's Paired 't' Test  
\*\* Highly significant



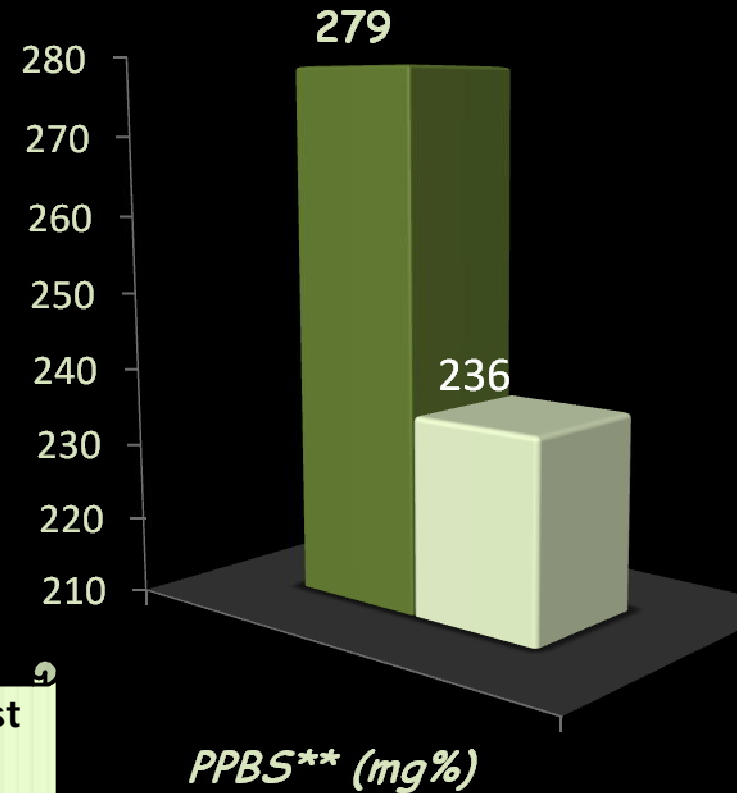
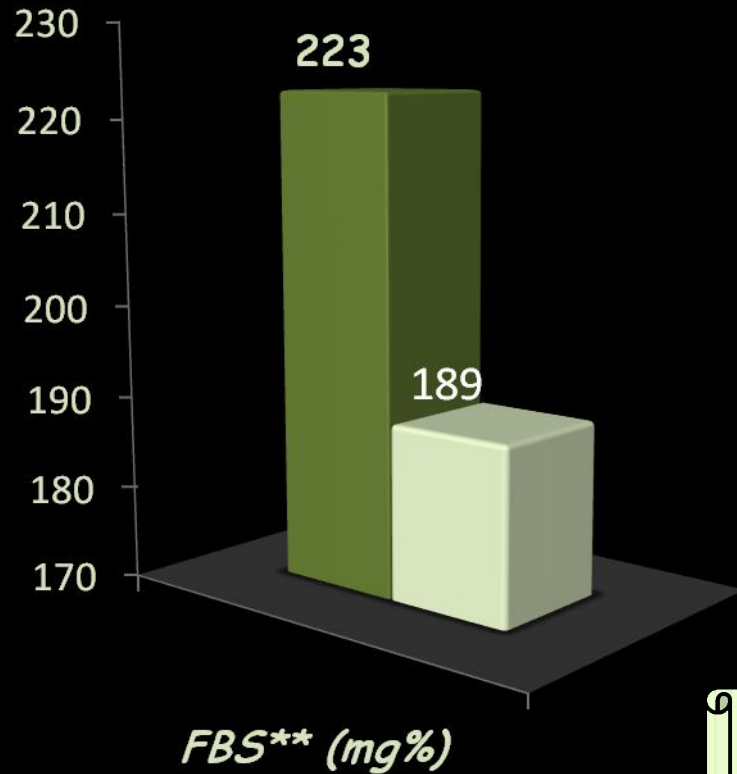
*PPBS\*\* (mg%)*

Dose: 1 gm thrice a day  
(after Breakfast, Lunch & Dinner)

Duration: 3 months

**Ingredients:** Lauha Bhasma - 16 parts, Triphala - 3 parts,  
Trikatu - 3 parts, Guggulu - 4 parts,  
Rasanjana, Kiratatikta, Pippalimula, Gokshura,  
Devadaru, Bidalavana, Trivrutta, Dadim, Bilva (each 1 part)

# MODERN ANTI DIABETIC DRUG + MEHAMUDGARA VATI



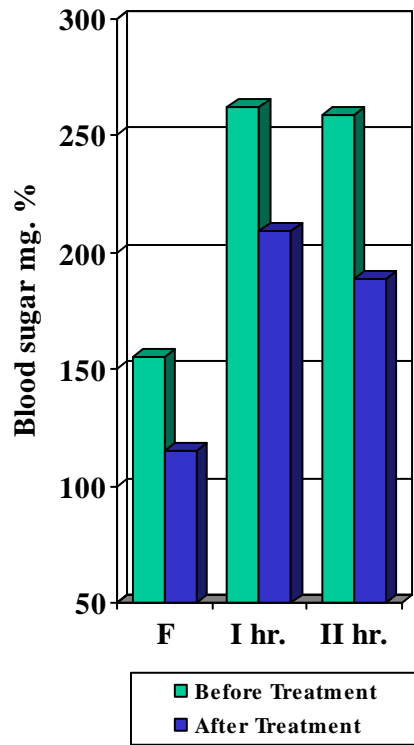
Student's Paired 't' Test  
\*\* Highly significant

Dose: 1 gm thrice a day  
(after Breakfast, Lunch & Dinner)  
Duration: 3 month

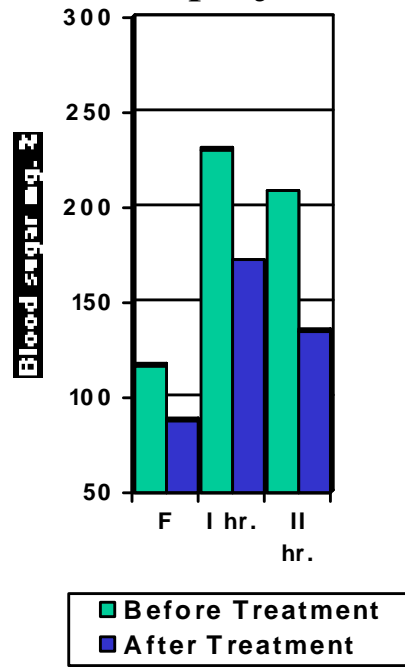
# Role of Constitution in treatment response

## Response of *C. tamala* in Diabetes- In general and constitution wise

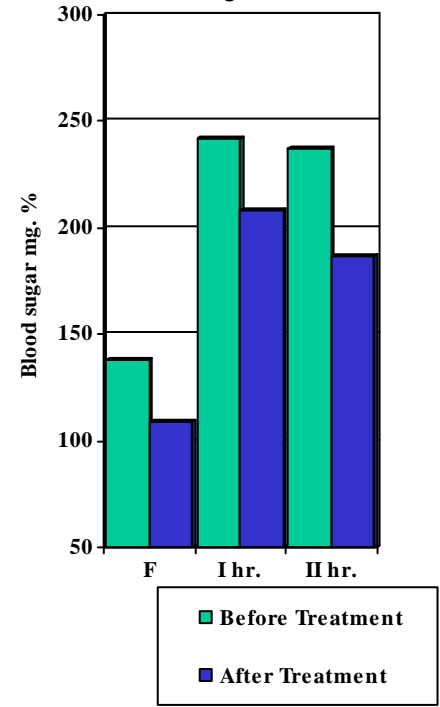
In General



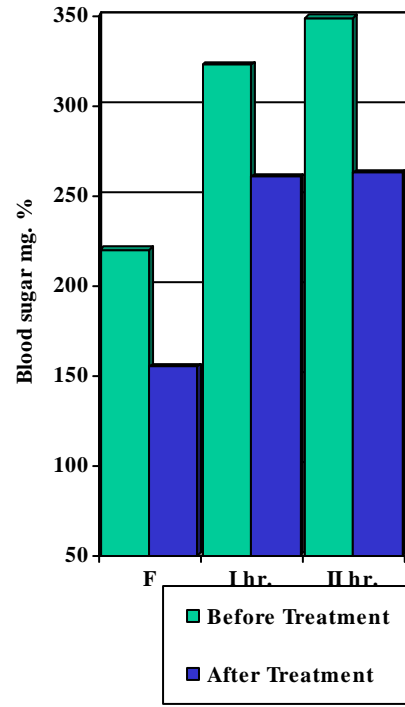
Kaphaja



Pittaja

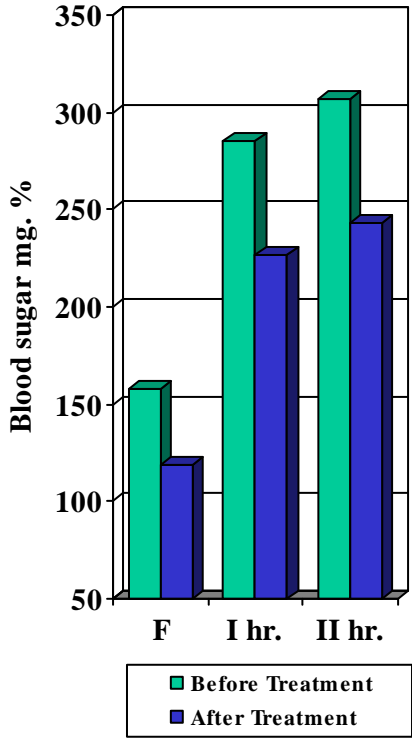


Vataja

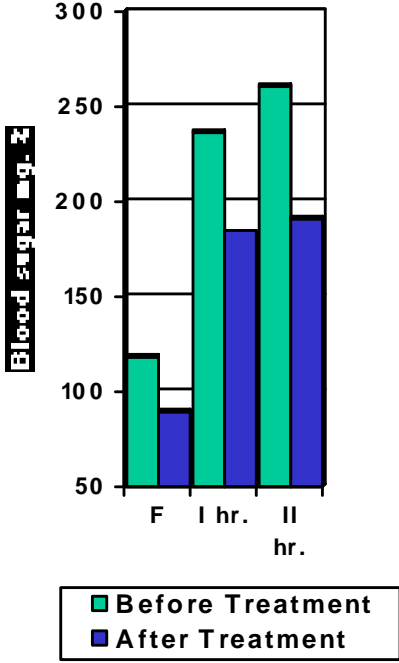


# Response of Inula racemosa in Diabetes - In general and constitution wise

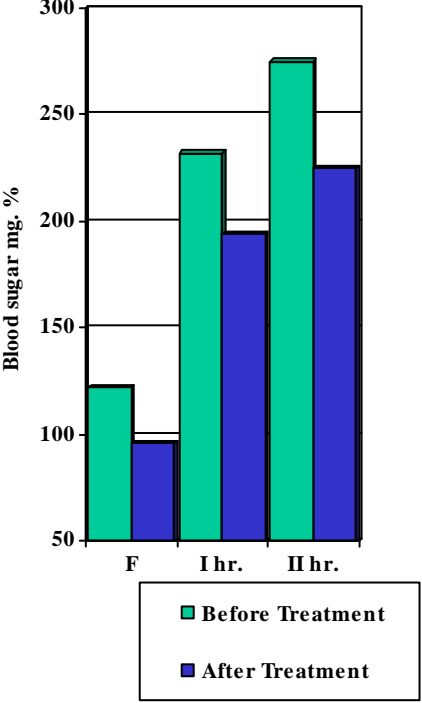
In General



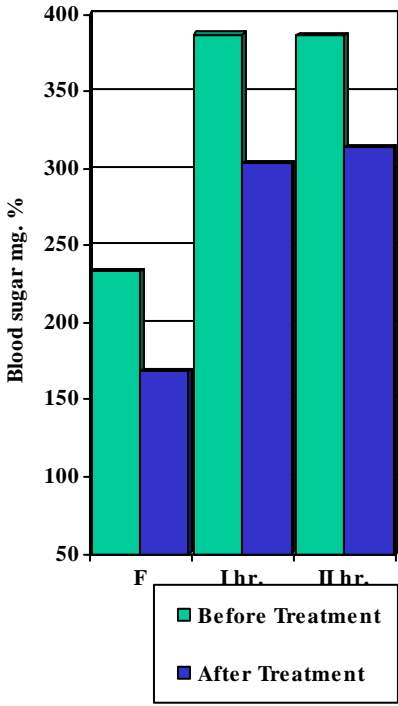
Kaphaja



Pittaja

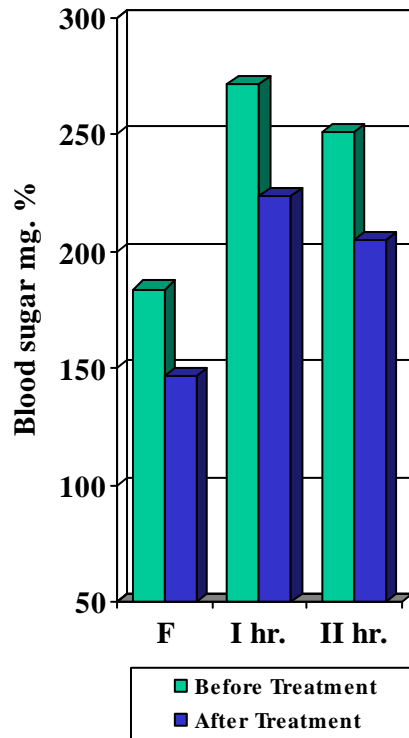


Vataja

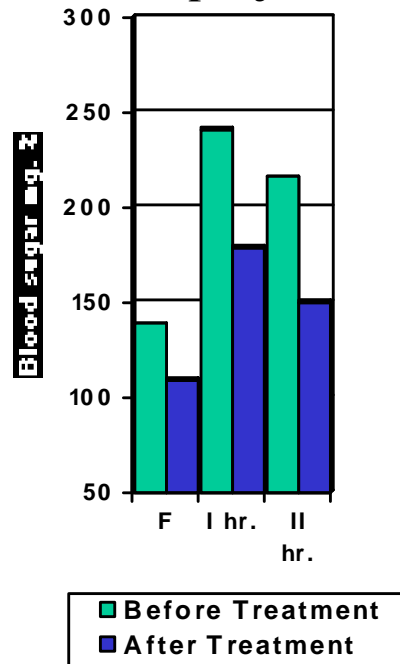


# Response of Chandraprabha vati in Diabetes- In general and constitution wise

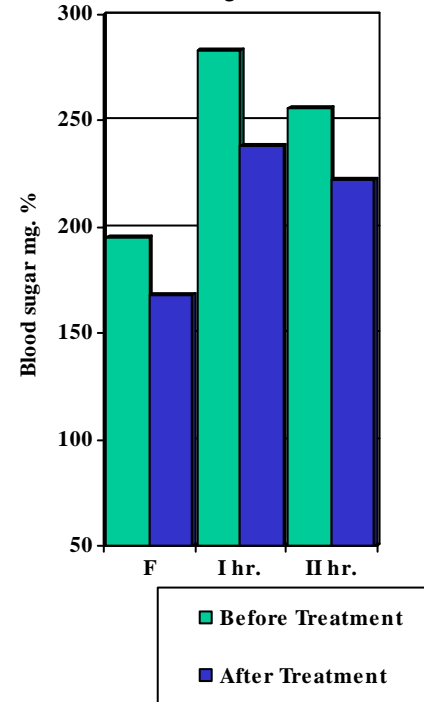
In General



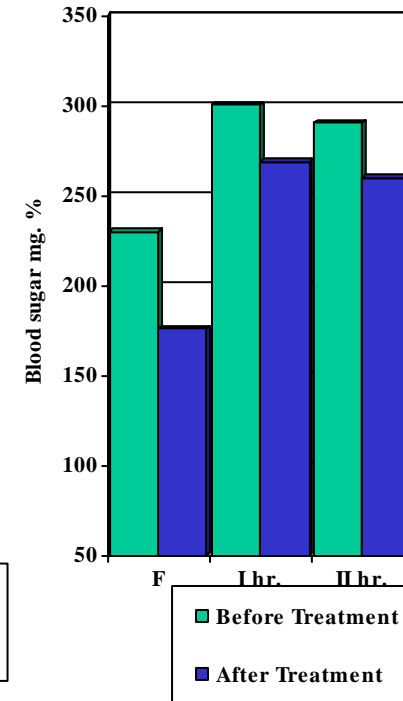
Kaphaja



Pittaja

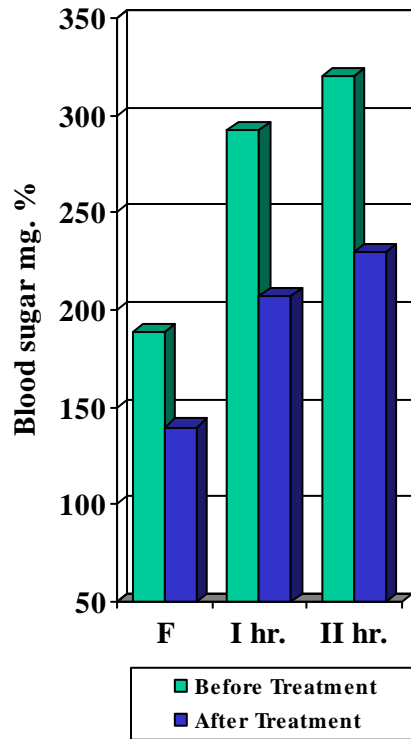


Vataja

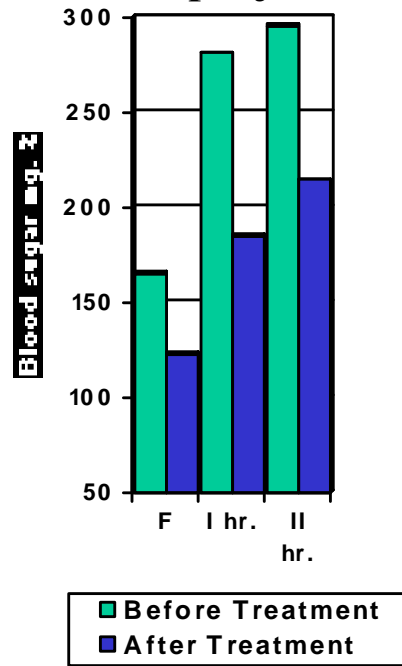


# Response of Diabenese in Diabetes- In general and constitution wise

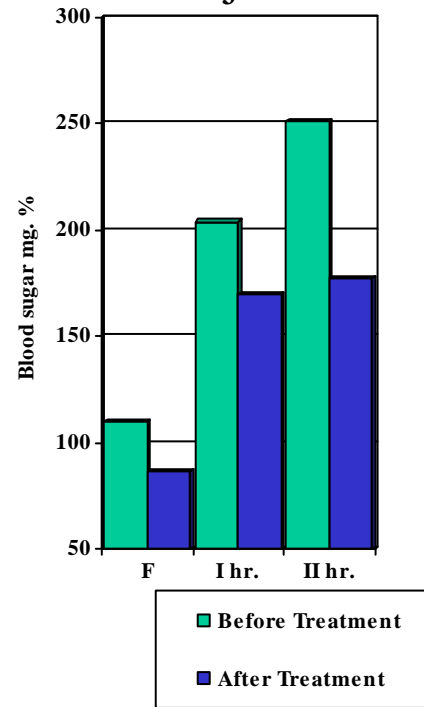
In General



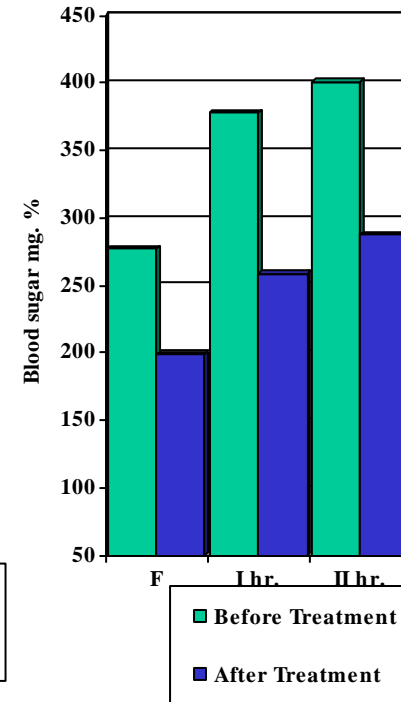
Kaphaja



Pittaja

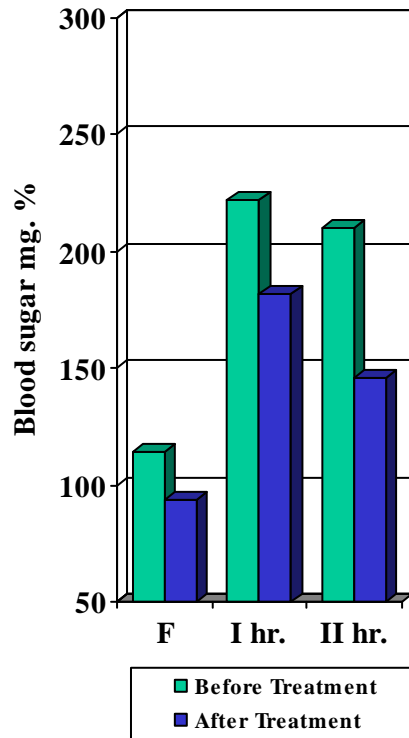


Vataja

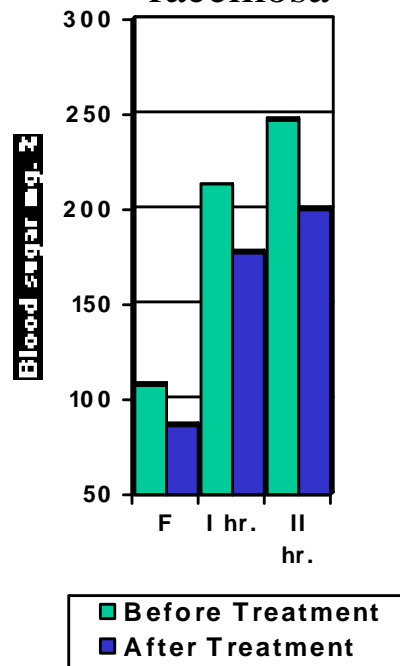


# Response of treatment in Diabetics with different drugs in Early Diabetes (Kaphaja Prameha)

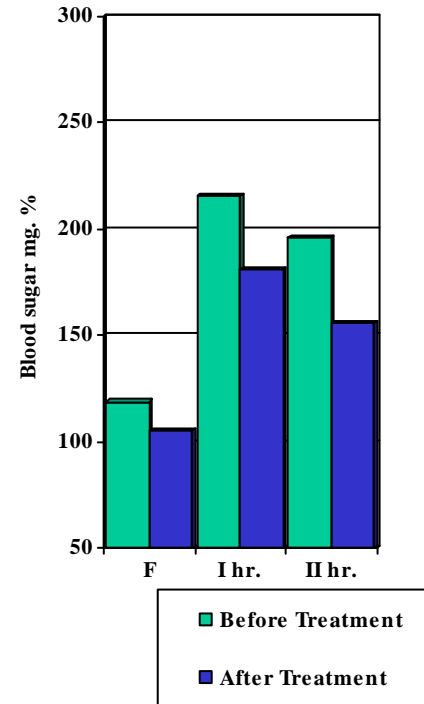
C. tamala



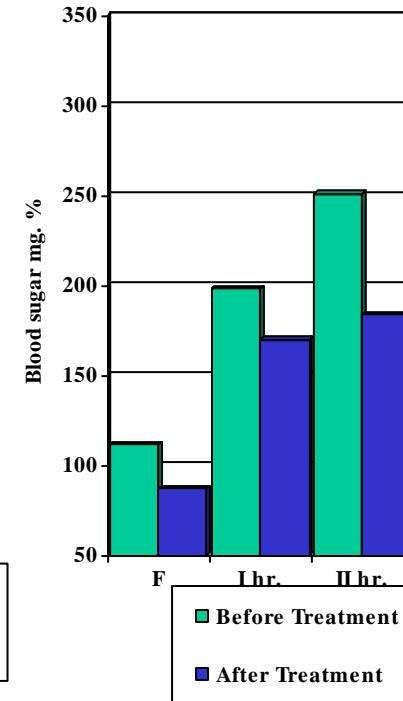
Inula racemosa



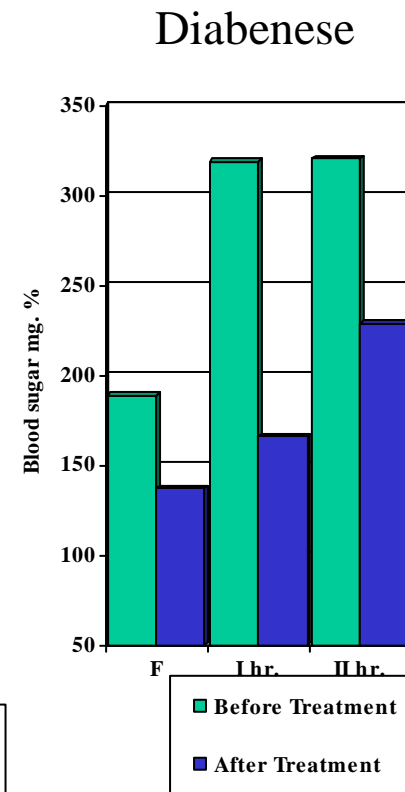
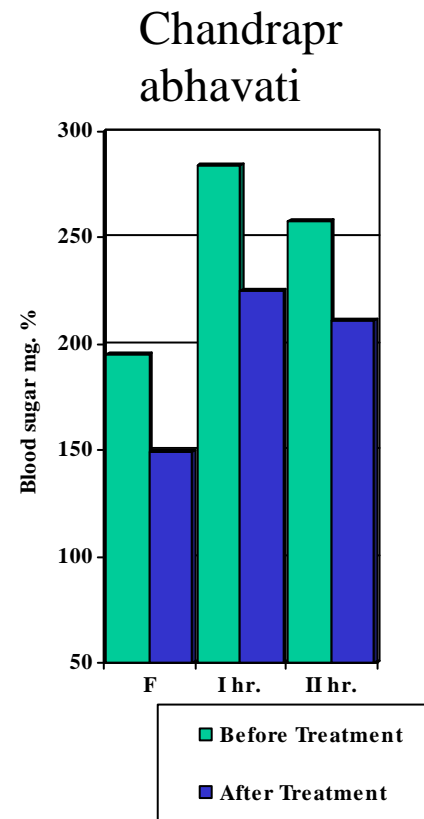
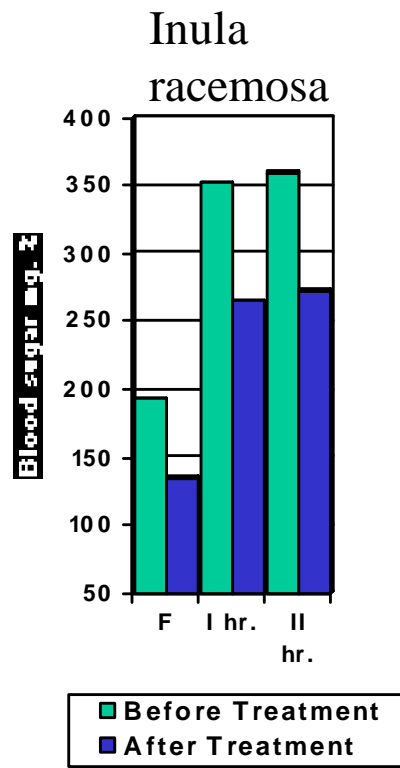
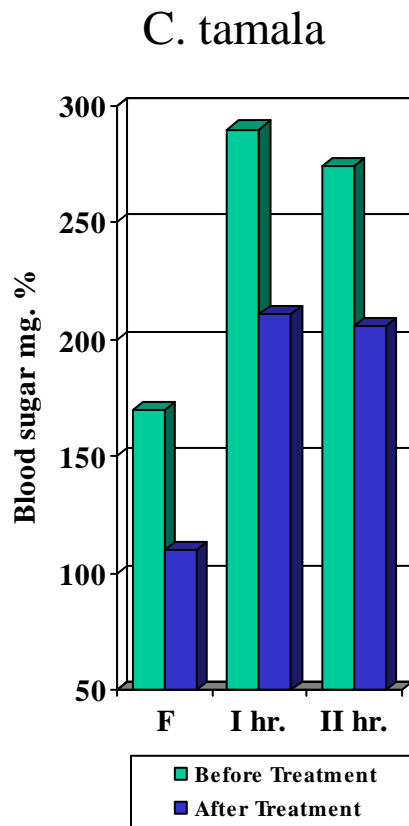
Chandraprabhavati



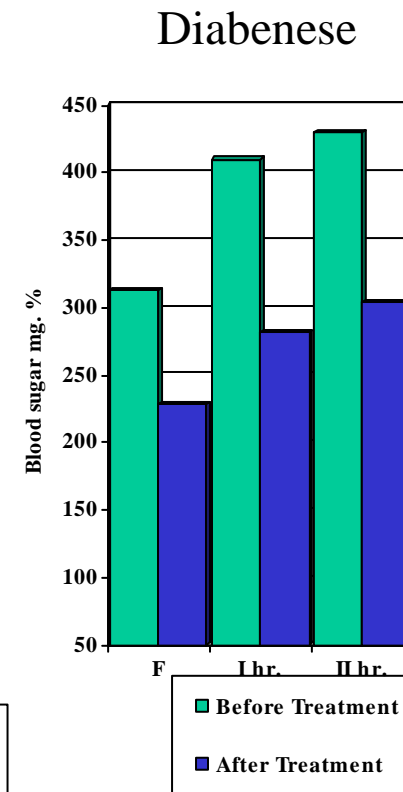
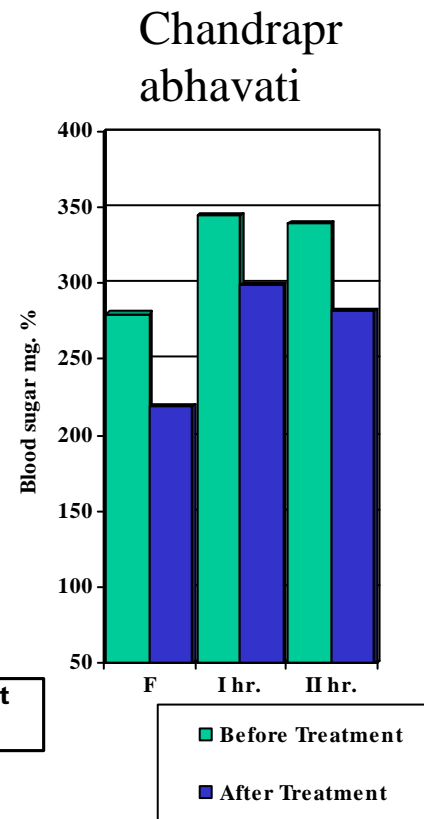
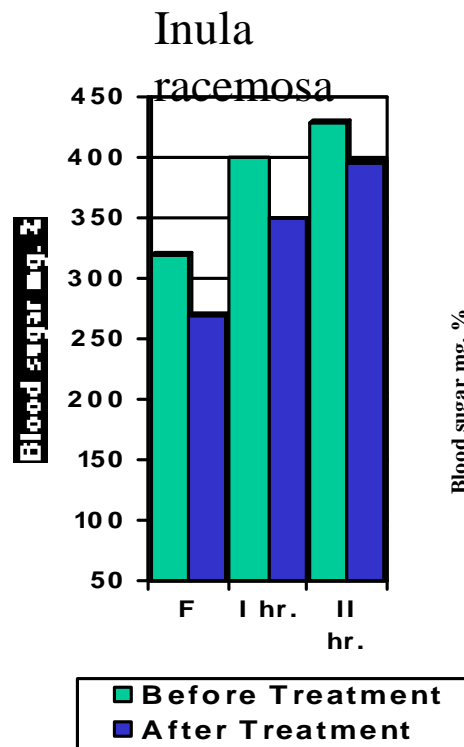
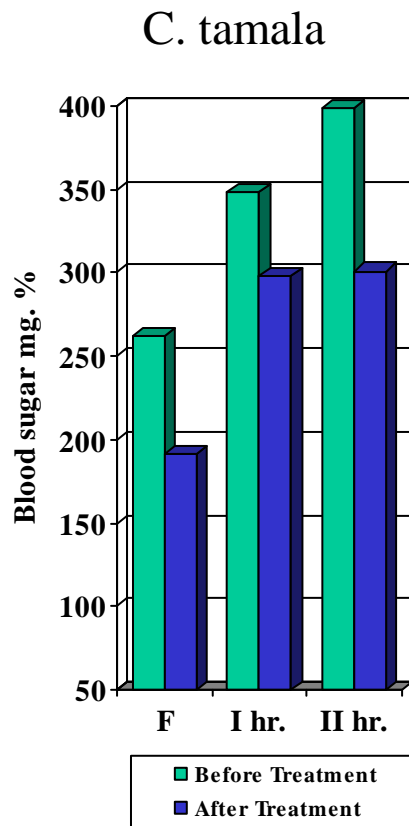
Diabenese



# Response of treatment in Diabetics with different drugs in Acute Diabetes (Pittaja Prameha)



# Response of treatment in Diabetics with different drugs in Chronic Diabetes (Vataja Prameha)



## Evaluation of Mental Health & Blood sugar level in 100 patients of Diabetes Mellitus

<b>Psychic factor</b>	<b>No. of Patients</b>	<b>Mean FBS mg%</b>	<b>Mean PPBS mg%</b>
Worry (Chinta)	70	159.31	222.78
Anxiety (Udvega)	69	192.66	260.28
Anger (Krodha)	69	158.18	225.03
Grief (Shoka)	49	159.41	220.19
Fear (Bhaya)	28	175.98	234.78
Pleasure (Harsha)	1	185	213
No psychic symptom	17	156.47	195.34

# Psychic Symptoms observed in 100 patients

<b>Psychic Symptom</b>	<b>No. of Patients</b>
<b>Anxious</b>	<b>69</b>
<b>Tension</b>	<b>70</b>
<b>Fear</b>	<b>28</b>
<b>Insomnia</b>	<b>67</b>
<b>Intellectual cognitive</b>	<b>58</b>
<b>Depressed Mood</b>	<b>49</b>
<b>Somatic Muscular</b>	<b>56</b>
<b>Somatic Sensory</b>	<b>57</b>
<b>Cardiovascular</b>	<b>58</b>
<b>Respiratory</b>	<b>45</b>

# Psychic Symptoms observed in 100 patients

<b>Psychic Symptom</b>	<b>No. of Patients</b>
<b>Gastrointestinal</b>	<b>51</b>
<b>Genitourinary</b>	<b>28</b>
<b>Autonomic</b>	<b>57</b>
<b>Behavior at interview</b>	<b>53</b>
<b>Anger</b>	<b>69</b>
<b>Suicidal thoughts</b>	<b>10</b>
<b>No symptoms</b>	<b>17</b>

## Effect of Sarasvata Formulation on psychic symptoms in D.M.

Parameters	Mean Score		% of relief	S.E.	p
	BT	AT			
Anxious	3.9	0.9	76.92	0.2	<0.001
Tension	3.9	0.8	79.49	0.29	<0.001
Insomnia	3.5	0.5	85.71	0.2	<0.001
Somatic muscular	2.5	0.4	84.0	0.37	<0.001
Behaviour at interview	3.3	0.3	90.91	0.22	<0.001

**Dose: 500 mg. tid with anit-diabetic therapy, Duration 2 months, n:10**

*(Bhatia S., Chandola H.M.2001)*

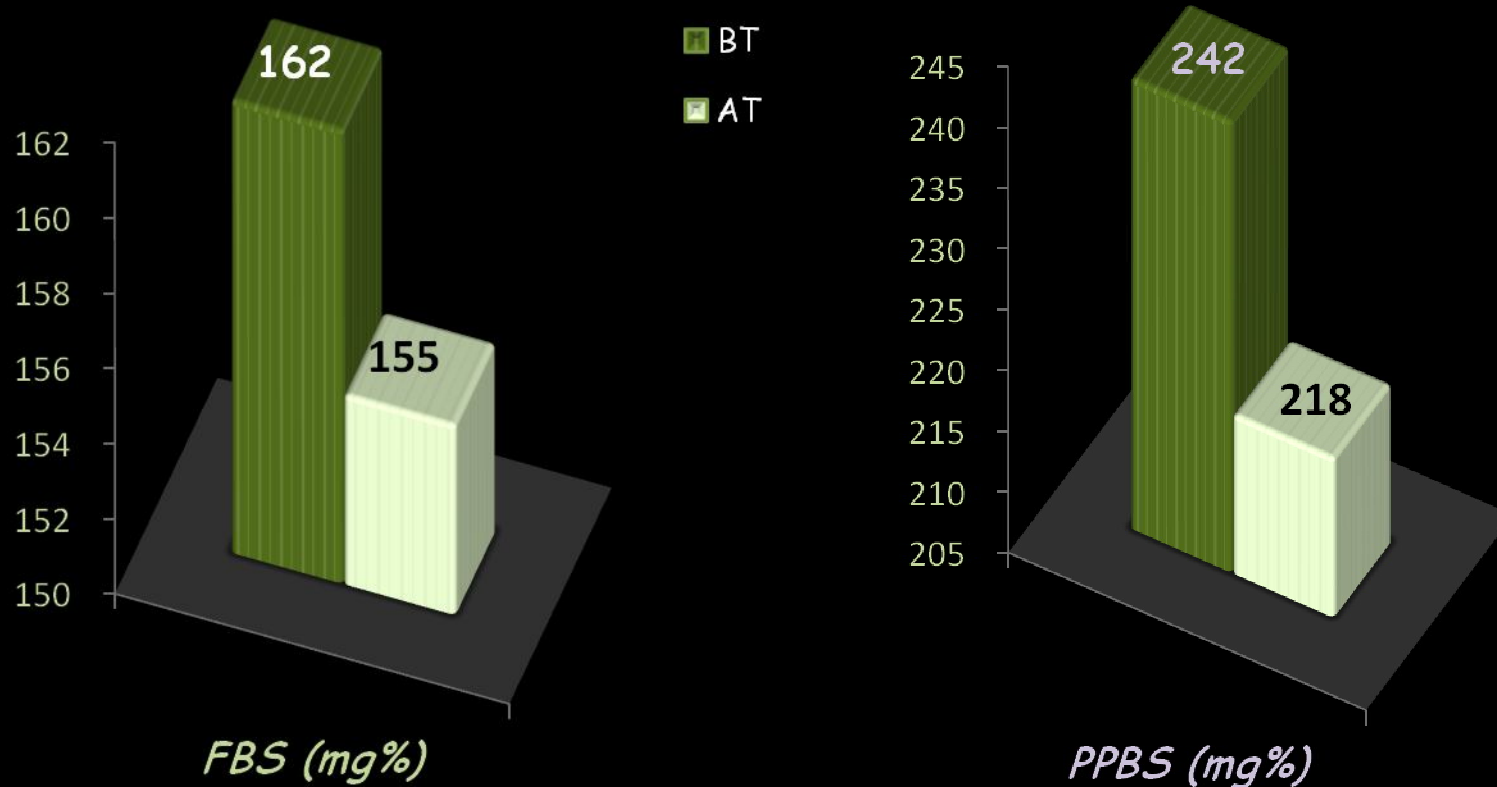
# Effect of Sarasvata formulation in Diabetes Mellitus

Parameter	Mean		% relief	S.E.	P
	B.T.	A.T.			
<b>FBS</b>	<b>152.2</b>	<b>123.8</b>	<b>18.66</b>	<b>8.05</b>	<b>&lt;0.01</b>
<b>PPBS</b>	<b>208.1</b>	<b>159.7</b>	<b>23.26</b>	<b>11.01</b>	<b>&lt;0.01</b>
<b>S. Cholesterol</b>	<b>196.52</b>	<b>191.99</b>	<b>2.31</b>	<b>5.51</b>	<b>&gt;0.05</b>

**Sarasvata Churna: Saussurea lappa, Withenia somnifera, Trachyspermum ammi, Rock salt, Cuminum cyminum, Carum bulbocastum, Zingiber officinale, Piper nigrum, Piper longum, Cissampelos pareira, Convolvulus pluricaulis, Acorus calamus, Baccopa monniera, Dose: 500 mg. tid with anit-diabetic therapy, Duration 2 months, n:10**

*(Bhatia S., Chandola H.M.2001)*

# POLY HERBAL ANTI DIABETIC FORMULATION



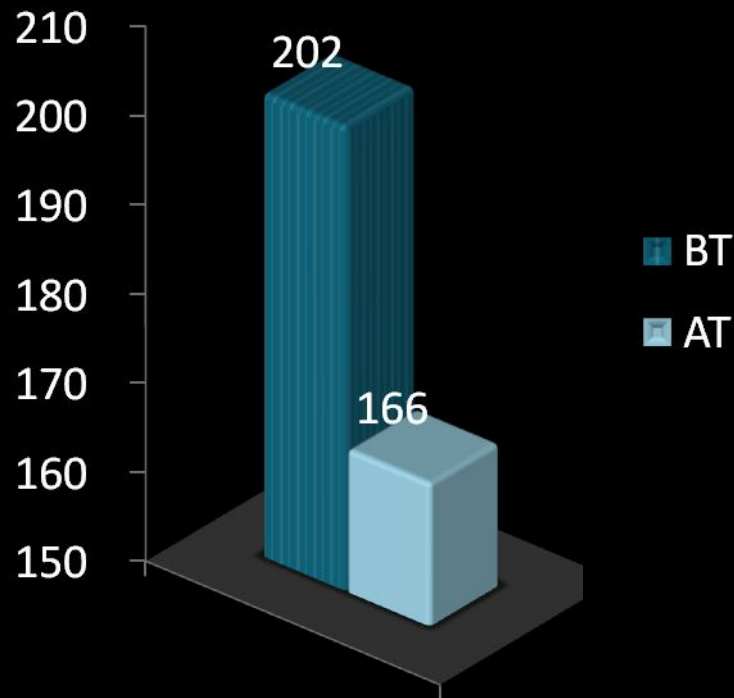
Dose: 1 gm thrice a day before meal

Duration: 3 month

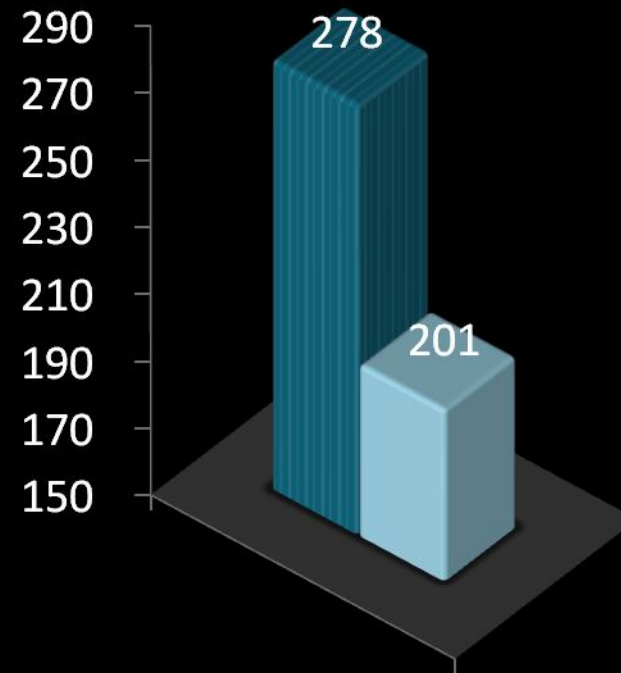
**Poly Herbal Anti diabetic Formulation (PAF):**

Shuddha Shilajeeta, Shuddha Guggulu, Triphala, Saptarangi, Vijayasara

# PAF + MEDHYA RASAYANA



FBS (mg%)



PPBS (mg%)

**Drug: Shankhapushpi Medhya Rasayana**

**Dose: 500 mg thrice a day before meal**

**Duration: 3 month**

# Management of Complications of DM

## Cerebral Atherosclerosis, Alzheimer's, Dementia etc

Shankhapushpi    Convolvulus pluricaulis

Mandukaparni    Centella asiatica

Brahmi            Bacopa monnieri

Vacha             Acorus calamus

Jyotishmati      Celastrus paniculatus

Guduchi          Tinospora cordifolia

# Ischemic Heart Diseases

**Arjuna Bark**

**Terminalia arjuna**

**Guggulu**

**Commiphora wightii**

**Pushkaramula**

**Inula racemosa**

**Kustha**

**Saussurea lappa**

**Gokshura**

**Tribulus terrestris**

# Diabetic Enteropathy

**Bilva**

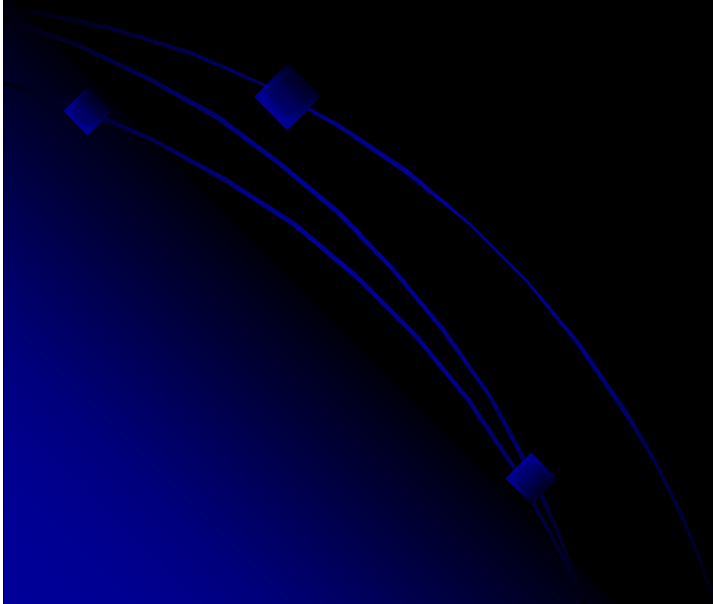
**Aegle marmelos**

**Kutaja**

**Holarrhena antidysenterica**

**Haritaki**

**Terminalia chebula**



# Diabetic Nephropathy

Punarnava

Boerhavia diffusa

Gokshura

Tribulus terrestris

Varuna

Crataeva nurvala

# Erectile Dysfunction

Kapikacchu

Mucuna pruriens

Ashvagandha

Withania somnifera

Shweta Musli

Asparagus ascendensis

Jatiphal

Myristica fragrans

# **Diabetic Neuropathy**

**Dashamula Kwatha**

**Guggulu Based Formulations**

# **Diabetic Retinopathy**

**Saptamrita Lauha**

**Mahatriphala Ghrita**

# Diabetic Carbuncle

**Mahamanjisthadi Kwatha – Internal and Local**

**Leech application**

**Kaishora guggulu etc.**



# Conclusion

- **Prameha is described as a set of complex clinical disorders characterized by frequent abnormal micturition, with the etiology involving genetic predisposition as well as improper diet and life style. The role of stress and obesity in its pathogenesis is also elaborately discussed in Ayurvedic classical texts.**
- **The clinical conditions described in Prameha have much in common with those described in allopathic medicine for Obesity, metabolic syndrome & Diabetes Mellitus. The Ayurvedic management of Prameha emphasizes dietary and lifestyle recommendations and herbal preparations in accordance with psycho-physiological constitution of the patient.**

# Conclusion

- **Ayurvedic drugs should be used in its natural form without disturbing its natural combination/ holistic principle of drug. Single drug may have composite fractions & each fraction has its own medicinal value.**
- **Poly herbal combination potentiate therapeutic efficacy of a particular ingredient of formulation and also counter act adverse effect if present in the combination. Instead of isolating a particular alkaloid it is suggested that the Ayurvedic Drugs should be used as a whole.**

# Conclusion

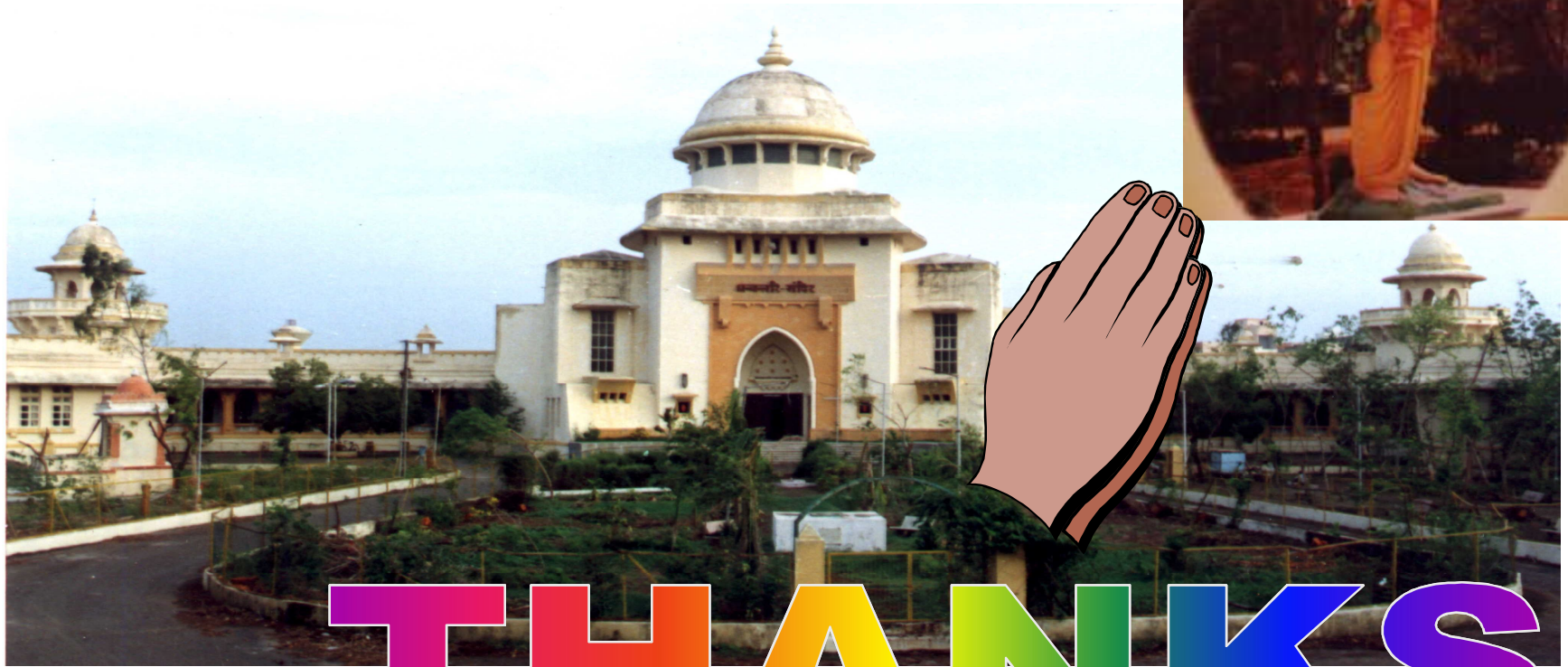
Contd..

**All patients of diabetes are not similar so a stepped care treatment is advised. In early stage of disease and having Kaphaja constitution, it is better to use ayurvedic drugs alone. In acute stage and having Pittaja constitution of patients wherever found necessary, oral insulin promoter may be added. In chronic stage and having Vataja constitution, insulin therapy may also be added as these cases are insulin dependent.**

# Conclusion

Contd..

- **Mental health promoting drugs (Medhya), if added along with anti-diabetic therapy, will further potentiate anti diabetic effect of the principal drug by counteracting stress.**
- **Ayurveda and modern medicine both are complimentary and supplementary to each other. Simultaneous administration of ayurvedic drugs will not only potentiate therapeutic efficacy of the modern drug rather it will also reduce adverse effect of the modern drug, if any; to lead the patient a healthy & happy life.**



THANKS

# *Prameha* in Ayurveda: Correlation with Obesity, Metabolic Syndrome, and Diabetes Mellitus. Part 1—Etiology, Classification, and Pathogenesis

Hari Sharma, MD, DABP, FCAP, FRCPC, DABHM,<sup>1</sup> and H.M. Chandola, MD (Ay), PhD<sup>2</sup>

## Abstract

**Background:** Obesity, metabolic syndrome, and diabetes mellitus are increasing in epidemic proportions globally. *Prameha* is a syndrome described in the ancient Ayurvedic texts that includes clinical conditions involved in obesity, prediabetes, diabetes mellitus, and metabolic syndrome.

**Materials and methods:** Integrating the theory and modalities of *Ayurveda* in the management of these disorders may prove to be beneficial. Even though *Prameha* is a *Tridoshaja Vyadhi* (a disease involving all three of the psychophysiological principles known as *Doshas* [i.e., *Vata*, *Pitta*, and *Kapha*]), it is basically a disease with *Kapha* predominance.

**Results:** There are 20 subtypes of *Prameha* due to the interaction of the three *Doshas* and 10 *Dushtyas* (disturbed functioning of the principles that support the various bodily tissues); several of these subtypes have sweet urine, whereas some of them have different coloration of the urine, highlighting the inflammatory conditions involved in the metabolic syndrome. This disease has close ties to *Sthaulya* (i.e., obesity). With regard to diabetes mellitus, *Sahaja Prameha* and *Jatah Pramehi* correlate with type 1 diabetes; *Apathyanimittaja Prameha* correlates with type 2 diabetes. *Madhumeha* is a subtype of *Vataja Prameha* (*Prameha* with *Vata* predominance) that can occur as the terminal stage of type 2 diabetes (in which insulin is required), or as type 1 diabetes beginning in early childhood. The latter is defined as *Jatah Pramehi Madhumehino* in *Charaka Samhita*, one of the classical Ayurvedic texts.

**Conclusions:** Various dietary, lifestyle, and psychologic factors are involved in the etiology of *Prameha*, particularly in relation to disturbances in fat and carbohydrate metabolism. The ancient Ayurvedic knowledge regarding *Prameha* can be utilized to expand the current understanding of obesity, metabolic syndrome, and diabetes.

## Introduction

OBESITY, METABOLIC SYNDROME, and diabetes mellitus are increasing in epidemic proportions globally. *Ayurveda* describes a set of complex clinical disorders with frequent abnormal micturition, collectively called *Prameha*, which correlate in many ways with obesity, metabolic syndrome, and diabetes mellitus. Integrating the theory and modalities of *Ayurveda* in the management of these disorders may prove to be beneficial (see Sharma and Chandola, Ayurvedic Concept of Obesity, Metabolic Syndrome, and Diabetes Mellitus in this issue, pp. 000–000). The etiology, classification, pathogenesis, and management of *Prameha* are discussed at length and in detail in the Ayurvedic texts.

## Etiological Classification of *Prameha*

*Nidana* is the branch of Ayurveda that addresses the etiology of disease. The etiology of *Prameha* is discussed in *Sushruta Samhita*, which identifies two types of *Prameha*: *Sahaja*, which is hereditary, and *Apathyanimittaja*, which is acquired.<sup>1</sup> *Charaka Samhita* mentions *Jatah Pramehi* due to *Bija Dosh*,<sup>2</sup> meaning *Prameha* that arises due to genetic factors.

### *Sahaja Prameha/Jatah Pramehi (Hereditary)*

In Ayurveda, the words *Sahaja* and *Jatah* indicate genetic predisposition in the pathophysiology of disease. Broadly, in hereditary diseases there may be two contributing factors:

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1. A certain defect in the sperm and ovum (referred to as Bija Dosh), which results in a genetic disorder or genetic predisposition to disease.  
In regard to Prameha, Charaka Samhita mentions that excessive indulgence in Madhura Rasa (foods/drinks with a sweet taste) by the parents is the chief cause of this chromosomal damage to the sperm and ovum. (In Ayurveda, foods/drinks with a sweet taste include sugar, milk, butter, rice, and breads.).
2. An intrauterine environment that negatively affects the development of the fetus due to the mother's diet, lifestyle, or adverse psychologic state during pregnancy. This congenital aspect can trigger the disease process for which there is a genetic predisposition.  
Regarding Prameha, the overindulgence of Madhura Rasa by the mother during pregnancy is likely to trigger Prameha. Lifestyle factors include laziness or a sedentary lifestyle, and psychologic factors include depression.

The diet, lifestyle, and adverse psychologic state of the mother during lactation may also play a decisive role in precipitating Prameha in the infants. In addition, excessive intake of Madhura Rasa during childhood can contribute to the onset of Prameha in children who are genetically predisposed. Thus, hereditary predisposition and unwholesome dietary and lifestyle choices, especially the excessive intake of Madhura Rasa, can play a combined role to cause hereditary Prameha.

The description of Sahaja Prameha in Sushruta Samhita and Jatah Pramehi in Charaka Samhita are quite similar to that of type 1 diabetes (also known as insulin-dependent diabetes mellitus or juvenile-onset diabetes). Jatah Pramehi Madhumehino, as defined in Charaka Samhita, correlates with type 1 diabetes beginning in early childhood.

#### Apathyanimitaja Prameha (Acquired)

The acquired form of Prameha is referred to as Apathyanimitaja Prameha. The description of Apathyanimitaja Prameha in Sushruta Samhita is very similar to that of type 2 diabetes (also known as non-insulin-dependent diabetes mellitus or adult-onset diabetes). The types of food and drink likely to precipitate this disease have been enumerated in all the classical Ayurvedic texts.<sup>1-4</sup> These are briefly listed below, along with lifestyle factors and psychologic factors that lead to the onset of Prameha:

1. **Dietary factors:** Excessive intake of yogurt, meat of aquatic animals, milk, new (not aged) grains, foods/drinks containing sugar and jaggery (an unrefined form of cane sugar), cold foods, sweet foods, sour foods, unctuous (oily) foods, liquid foods, foods that are heavy to digest, and slimy foods.
2. **Lifestyle factors:** Sedentary lifestyle, excessive sitting, excessive sleeping, sleeping during the daytime, lack of exercise, and laziness.
3. **Psychologic factors:** Disturbance in mental health caused by extremes of psyche such as Vishada (depression) and bipolar disorder.

#### Doshic Classification of Prameha

Prameha has been classified according to the predominant Dosh in the disease process. Ayurveda describes three groups of basic clinical distinctiveness, which are Kaphaja, Pittaja,

and Vataja Prameha.<sup>1,2,4</sup> Ayurveda has identified a progression of Prameha through several stages. In the initial stage, Kapha is in excess, which vitiates Meda (fat) and Kleda (body fluid), thereby precipitating Kaphaja Prameha. Further progression results in Kshaya (loss) of Kapha. Pitta then predominates, which vitiates the blood (Rakta), precipitating Pittaja Prameha. Further progression results in loss of Pitta. This leads to vitiation of Vata, which drags vital substances/vital essence out of the body through the urine, precipitating Vataja Prameha.<sup>5</sup> Ayurveda also specifies that any of these three types of Prameha can be precipitated directly, depending upon genetic predisposition and improper diet and lifestyle.

Correlating the Doshic classification of Prameha with the etiological, Kaphaja and Pittaja Prameha are always Apathyanimitaja Prameha (acquired), while Vataja Prameha can be either hereditary or acquired. If Kaphaja and Pittaja Prameha are not managed properly, in due course of time they lead to Madhumeha (a subtype of Vataja Prameha), which is a terminal stage of the disease that is said to be incurable.<sup>1,6</sup> This disease can be equated with the terminal stage of type 2 diabetes, which has progressed into insulin-dependent diabetes. It has been observed that in the Pittaja stage of Prameha, there is a tendency toward moderate hyperglycemia, which may be due to increased adrenal medullary and cortical activities. In Vataja Prameha, there may be severe hyperglycemia with hypoinsulinemia.<sup>7</sup>

Correlating Prameha with obesity, metabolic syndrome, and diabetes mellitus, the early manifestation of the disease process in these conditions, with carbohydrate, lipid, and protein metabolism disturbances accompanied by glycosuria, proteinuria, etc., correlate with Kaphaja Prameha, which can be easily controlled and cured. The inflammatory, hepatic, and gallbladder complications, and lipid and blood abnormalities are much more in line with the description of Pittaja Prameha, which can be managed. The advanced stage of disease, with metabolic disturbances associated with loss of immunity, correlates with type 2 diabetes that has progressed into insulin-dependent diabetes, and correlates with the hereditary form of type 1 diabetes, which both correlate with Vataja Prameha. Both of these are incurable as described in Ayurveda.

Ayurveda describes 20 subtypes of Prameha on the basis of gross urinary characteristics and clinical manifestations. These are divided into 10 subtypes of Kaphaja Prameha, six subtypes of Pittaja Prameha, and four subtypes of Vataja Prameha. Following is a description of the etiological factors (dietary, lifestyle, and psychologic) for the three Doshic categories of Prameha, and a description of the urinary changes for the 20 subtypes.

#### Kaphaja Prameha

1. **Dietary factors<sup>2</sup>:** Hayanaka (a type of millet grain), Yavaka (a variety of barley), Avena sativa Linn. (a variety of oats), Chanaka (*Panicum miliaceum* Linn., a type of millet grain), Uddalaka (*Paspalum scrobiculatum* Linn., kodo millet), Naishadha (a type of millet grain), Itkata (*Saccharum* species), Mukundaka (a type of rice), Mahavrihi (a type of rice), Pramodaka (a type of rice), Sugandhaka (a type of rice), Harenu (*Pisum sativum* Linn., green peas), Masha (*Vigna mungo* Linn., urad dal [a legume]), the meat of domesticated, marshy, and aquatic animals, Til Palal (a byproduct of Sesamum [sesame]), Payasa (a type of milk preparation), sugarcane preparations, milk, fresh wine, and immature curd (homemade yogurt that has not matured yet).

2. Lifestyle factors<sup>6</sup>: Lack of physical activity, excessive sleep, too much lying down, too much sitting, sedentary habits.
3. Psychologic factors: Depression.
4. Subtypes and urinary clinical manifestations:
  - *Udakameha*<sup>2</sup>: Clear urine in larger quantity without odor; patient feels cold sensation while passing urine.
  - *Ikshuvalikameha*<sup>2</sup>: Very sweet urine, cool, slightly viscid, turbid due to slimy substances, and resembling the juice of sugar cane.
  - *Sandrameha*<sup>2</sup>: If urine is kept overnight, precipitate is present in the container.
  - *Sandraprasadmeha*<sup>2</sup>: Literally, *Sandraprasadmeha* means a portion of the urine is turbid and a portion is clean like *Sura* (undistilled alcohol). Described as *Surameha* in *Sushruta Samhita*<sup>1</sup> and *Ashtanga Hridaya*.<sup>4</sup>
  - *Shuklameha*<sup>2</sup>: Urine is white and appears as if it is mixed with flour (paste). While passing urine the patient feels erection of body hairs. It is described as *Pishtameha* in *Sushruta Samhita*.<sup>1</sup>
  - *Shukrameha*<sup>2</sup>: Patient passes urine similar to quality of semen or semen itself may be mixed with urine.
  - *Sheetameha*<sup>2</sup>: Urine is very sweet and abundant, with low temperature.
  - *Siktameha*<sup>2</sup>: Patient passes small particles like sand in the urine.
  - *Shanairmeha*<sup>2</sup>: Flow of urine becomes slow and patient feels difficulty in passing urine.
  - *Lalameha*<sup>2</sup>: Urine is turbid and slimy; it is sticky and threads may be demonstrated like gum.

#### Pittaja Prameha

1. Dietary factors: Intake of *Ushma* (foods that are hot in potency), sour foods, excessively salty foods, alkaline foods, pungent foods, eating before the previous meal is completely digested, eating mutually contradictory foods<sup>2</sup> (these are foods that should not be eaten together, e.g. milk and bananas, milk and salty foods, yogurt and sour fruits, etc.).
2. Lifestyle factors: Exposure to very intense heat of the sun or fire, overexertion.<sup>2</sup>
3. Psychologic factors: Anger.<sup>2</sup>
4. Subtypes and urinary clinical manifestations:
  - *Kalameha*<sup>2</sup>: Urine is blackish.
  - *Nilameha*<sup>2</sup>: Urine is bluish.
  - *Lohitameha*<sup>2</sup>: Urine contains blood and is salty in taste with putrid odor. It is described as *Shonitameha* in *Sushruta Samhita*<sup>1</sup> and as *Raktameha* in *Ashtanga Hridaya*.<sup>4</sup>
  - *Manjishtameha*<sup>2</sup>: Urine is pink like decoction of *Manjishita* (*Rubia cordifolia* Linn.) with putrid odor.
  - *Haridrameha*<sup>2</sup>: Urine is yellow like the color of turmeric, pungent, and associated with a severe burning sensation.
  - *Ksharmeha*<sup>2</sup>: Urine is like an alkali (ash) solution, in smell, color, and touch.

#### Vataja Prameha

1. Dietary factors: Excessive intake of pungent foods, astringent foods, bitter foods, rough foods, cold foods, and very easily digested foods.<sup>2</sup>

2. Lifestyle factors: Excessive physical exercise, excessive sexual intercourse, excessive use of *Panchukarma* (Ayurvedic purification procedures), suppression of natural urges, fasting, injury, excessive exposure to the sun, staying awake at night.<sup>2</sup>
3. Psychologic factors: Mental trauma, anxiety, and grief.<sup>2</sup>
4. Subtypes and urinary clinical manifestations:

- *Vasameha*<sup>2</sup>: Urine contains *Vasa* (fat).
- *Majjameha*<sup>2</sup>: Urine contains *Majja* (bone marrow). It is described as *Sarpimeha* in *Sushruta Samhita*.<sup>1</sup>
- *Hustimeha*<sup>2</sup>: *Lasika* (lymph) is passed in the urine. The flow and frequency of urine is almost continuous (incontinence).
- *Madhumeha*<sup>2</sup>: Urine is astringent and sweet in taste, yellowish-white in color, and nonunctuous. *Ojas*<sup>2</sup> (the subtlest material substance in the body; the essence of the body; *Ojas* maintains the body's immunity and vitality) is passed in the urine. This subtype is described as *Kshaudrameha*<sup>1</sup> (urine with color and taste like honey) in *Sushruta Samhita*.

#### Prakriti (Psychophysiologic constitution) and Prameha

*Prakriti* is the psychophysiologic constitution of an individual and is determined at the time of birth by the individual's *Dosha* proportions. Each individual has a certain ratio of *Vata*, *Pitta*, and *Kapha* that is unique to him/her; as long as this ratio is maintained, the individual will be healthy. If an imbalance occurs in the *Doshas* due to improper diet and lifestyle or other factors, the beginning of the disease process can occur. The *Prakriti* of an individual plays an important role in the progression and prognosis of the disease and response to treatment. The predominant *Dosha*(s) in the individual's *Prakriti* affects the *Doshic* manifestation of the disease process. In a study on *Prakriti* and diabetes mellitus, it was observed that the progression of disease is slow in diabetic patients with *Kaphaja Prakriti* (*Prakriti* in which *Kapha* is the dominant *Dosha*); these patients had mild hyperglycemia with no insulin deficiency. In contrast, progression is quick in diabetics having *Vataja Prakriti* (*Prakriti* in which *Vata* is the dominant *Dosha*); these patients had severe hyperglycemia with hypoinsulinemia. These values are moderate in the case of patients with *Pittaja Prakriti* (*Prakriti* in which *Pitta* is the dominant *Dosha*).<sup>5</sup>

#### Prameha Classified According to Physique

*Charaka Samhita* has classified the patients of *Prameha* into two main categories on the basis of their body constitution with regard to physique: *Sthula Pramehi* refers to obese diabetic patients and *Krisha Pramehi* refers to asthenic diabetic patients.<sup>3</sup> *Sthula Pramehi* corresponds to patients with type 2 diabetes and *Krisha Pramehi* corresponds to patients with type 1 diabetes.

#### Prognosis

On the basis of prognosis, patients of *Prameha* have been classified into three groups: *Sadhya* (curable), *Yapya* (controllable), and *Asadhya* (difficult to manage).<sup>2</sup> See Table 1 for the features of these three groups.

TABLE 1. FEATURES OF *PRAMEHA* CLASSIFIED ON THE BASIS OF PROGNOSIS

	Sadhya (curable)	Yapya (controllable)	Asadhya (difficult to manage)
Dosha predominance	Kaphaja	Pittaja	Vataja
Body constitution according to physique	Obese		Asthenic
Etiology	Acquired	Acquired	Hereditary (type 1 diabetes) Acquired (advanced, insulin-dependent stage of type 2 diabetes)
Stage of disease process	Early/without complications	Acute, young adults	Chronic/advanced/ with complications
Clinical manifestations	Mild hyperglycemia due to disturbed carbohydrate and fatty acid metabolism Hyperinsulinemia	Moderate hyperglycemia due to hyperadrenalism	Severe hyperglycemia due to hypoinsulinemia

#### Research correlating diabetes mellitus with Doshic types of Prameha

A preliminary study was conducted to correlate the underlying pathology of different stages of diabetes mellitus with the different Doshic types of *Prameha*.<sup>9</sup> A small sample of patients with a complaint of diabetes mellitus or previously known to be diabetic was selected. The diagnosis was established and confirmed using a glucose tolerance test. Plasma insulin, catecholamine, and cortisol levels were measured in the patients. The blood sugar level has been correlated with plasma insulin and plasma cortisol levels. Since diabetes mellitus is a progressive disease, blood glucose, plasma insulin, and plasma cortisol have been correlated with duration of illness and age of the patient. The patients with features of *Kaphaja Prameha* were identified as having mild hyperglycemia (i.e., fasting blood sugar [FBS] up to 140 mg/dL), and hyperinsulinemia. Patients having features of *Pittaja Prameha* had moderate hyperglycemia (FBS of 140–250 mg/dL), with high catecholamine and cortisol levels. These patients were found to be more easily stressed. Patients with features of *Vataja Prameha* were identified as having severe hyperglycemia (FBS > 250 mg/dL) and hypoinsulinemia. The results of this study indicate a correlation of *Kaphaja Prameha* and *Pittaja Prameha* with type 2 diabetes mellitus, and *Vataja Prameha* with type 1 diabetes mellitus.

#### Samprapti (Pathogenesis) of Prameha

##### Purvarupa (prodromal symptoms) of Prameha

In *Ayurveda*, *Purvarupa* refers to prodromal symptoms<sup>1,2,4</sup> that are seen when full manifestation of the disease has not yet taken place. For *Prameha*, these symptoms include excessive sweat, body odor, laziness, inclination towards rest, presence of excessive *Malas* (waste products) in the eyes, ears, teeth, throat, palate, and tongue (buccal cavity), excessive growth of hair and nails, matting of the hair, excessive thirst, a sweet taste in the mouth, a burning sensation in the hands and feet, attraction of insects and ants toward the body and urine, and so on. Diabetes has a close relationship

to conditions within the oral cavity. It leads to adverse changes in the gums and periodontal tissues: effects that may be evident even before clinical diabetes is recognized and diagnosed. Conversely, periodontal diseases, including gingivitis and severe periodontitis, can make it more difficult to control diabetes. Periodontal disease is associated with higher levels of insulin resistance, often a precursor of type 2 diabetes, as well as with higher levels of glycated hemoglobin.<sup>10</sup> These findings may relate to the prodromal symptom of excessive excretion of *Malas* in the buccal cavity. A sweet taste in the mouth is a prodromal symptom that may be explained by the presence of glucose in the saliva. If blood glucose levels are high, glucose is also present in the saliva, which can increase cavities and increase the risk of oral candidiasis.<sup>10</sup>

A burning sensation in the hands and feet is an important feature of neuropathy that results from diabetes mellitus. Excessive sweat as a consequence of obesity may result in bacterial growth that leads to body odor. Excessive thirst may be directly related to disturbed glucose metabolism. Thus, the symptoms described in the *Purvarupa* of *Prameha* include prediabetic symptoms and early manifestation (vascular changes, obesity, etc.) of diabetes or subclinical diabetes.

##### Sthaulya (obesity) and Prameha

The striking relationship between *Prameha* and *Sthaulya* (obesity) has been discussed in Ayurvedic literature, where *Prameha* is said to be one of the complications of obesity.<sup>1</sup> As a result of physical inactivity and excessive intake of sweet substances, there is formation of *Anna*, which is a buildup of toxins from improperly digested food and metabolic products. The buildup of *Anna* leads to additional formation of *Meda* (fat). This refers to an increase in adipose tissue in the body, resulting in the individual becoming overweight. It reflects the current understanding of the peculiar metabolic state in obese individuals, wherein carbohydrate is largely converted to fatty acids. The multifactorial involvement of *Meda* (fat), *Kapha*, *Vata*, and *Agni* (digestive metabolic activ-

ity) is a common pathophysiologic phenomenon of both *Prameha* and obesity. Hyperinsulinemia and insulin resistance are pervasive features of obesity, increasing with weight gain and diminishing with weight loss. Insulin resistance is linked more closely to intra-abdominal fat than to fat in other locations.<sup>11,12</sup> A pathway through which obesity causes insulin resistance has been discovered in mice, in the form of an adipose tissue-derived hormone named *resistin*—an important link between obesity and diabetes.<sup>13</sup>

*Charaka Samhita* has firmly established the relationship between obesity and *Prameha*.<sup>2</sup> The role of *Meda* (fat/adipose tissue) is of great importance in the pathogenesis of *Prameha*. Its role is not only as *Dushya* (disturbed functioning of the *Dhatu*s), but something more than that. According to *Charaka Samhita*, *Bahudrava Shleshma* (Kapha that contains too much liquid) joins and affects *Meda*, causing it to become *Abaddha* (unobstructed or fluid) in nature. This form of *Meda* has been described as acting on *Mansa* (muscle tissue), thereby increasing the volume of body fluid. This has been described as *Sharira-Kleda* (body of fluid) in *Ayurveda*. Thus, excess water in the blood causes increased diuresis. This is how the *Sharira-Kleda* is converted into urine, as discussed in *Charaka Samhita*. This route of pathogenesis for *Prameha* is closely related to obesity.

#### Vataja Prameha as type 1 diabetes mellitus

The pathogenesis of *Vataja Prameha* is similar to that of type 1 diabetes mellitus. *Vata* that is agitated due to various precipitating causes acts on the body in such a way that there is passage of *Vasa* (fat), *Majja* (bone marrow), *Lasika* (lymph), and *Ojas* (essence of the body/immune substances/vitality) through the urine. This condition indicates impaired renal functioning as a result of diabetes, leading to a dire prognosis. Due to *Dhatukshaya* (loss of tissues), the patient becomes very weak and emaciated.<sup>3</sup>

*Charaka Samhita* details a very specific pathogenesis for *Madhumeha*, which is a subtype of *Vataja Prameha*.<sup>2</sup> When an individual excessively consumes the foods that cause *Prameha*, *Kapha* and *Pitta* become vitiated, then adipose tissue and muscle tissue become disturbed and cause impaired functioning of *Vata*. Subsequently, *Vata* gets vitiated and extends to the urinary bladder along with *Ojas*, resulting in *Ojas* being expelled in the urine. In *Ayurveda*, *Ojas* is considered vital to the maintenance of health; its loss in *Prameha* leads to many complications, including *Prameha Pidika* (boils and carbuncles). This advanced condition is comparable to non-insulin-dependent type 2 diabetes progressing into insulin-dependent diabetes. It is the stage of diabetes in which there are complications, including nephropathy, which result in vital substances of the body being excreted through the urine.

#### Prameha as a metabolic disorder and its relationship to mental stress

Obesity, metabolic syndrome, and diabetes mellitus are common in having metabolic disorders. In the pathogenesis of *Prameha*, the role of intermediary metabolic products is very important, because it is a disease generated as a consequence of improper metabolism of food substances. In *Ayurveda*, *Ama* refers to the toxic intermediary products of digestion and metabolism that result from improperly digested food. The relationship between *Prameha* and *Ama* is well documented.<sup>1</sup> If the *Agni* (digestive metabolic activity) is not proper, accu-

mulation of *Ama* occurs, which ultimately leads to *Prameha*. The relationship of *Ama* with psychologic factors, as stated in *Charaka Samhita*, is evidence of the relationship of *Prameha* with mental stress. *Charaka Samhita* states that if an individual is suffering from psychologic stress such as excessive desire, anger, greed, affection, jealousy, grief, pride, anxiety, or fear, the *Agni* is disturbed (*Vishama Agni*), and whatever is eaten is not properly metabolized. This process ultimately leads to the production of *Ama*.<sup>2</sup> This strongly suggests a close relationship between stress and *Ama*, factors contributing to obesity, metabolic syndrome, and diabetes mellitus.

#### Upadrava (Complications) of Prameha<sup>2</sup>

*Upadrava* refers to the complications of *Prameha* and covers all the conditions, other than urinary, which patients with diabetes can develop. These include dyspepsia, diarrhea, fever, burning sensation, weakness, anorexia, indigestion, and diabetic carbuncles and abscesses (referred to in *Ayurveda* as *Pulaka*, *Alji*, and *Vidradhi*). *Ashtanga Samgraha* of *Vagbhata* describes complications for each *Doshic* type of *Prameha* separately.<sup>5</sup> Those for *Kaphaja Prameha* include *co-ryza*, *laziness*, *anorexia*, *indigestion*, *excessive salivation*, *vomiting*, *hypersomnia*, and *cough*. The complications for *Pittaja Prameha* include *hyperacidity*, *excessive thirst*, *fever*, *burning sensation*, *fainting*, *diarrhea*, *anemia*, *cracking of the scrotal skin*, and *pain in the penis and bladder region*. Complications for *Vataja Prameha* include *heaviness in the chest*, *excessive hunger*, *insomnia*, *tremors*, *pain*, *constipation*, *cough*, and *dyspnea*. The complications related to diabetes mellitus, as described in allopathic medicine, are mentioned in *Ayurveda* either directly or indirectly in relation to *Prameha*. Diabetic neuropathy is directly mentioned as a burning sensation in the body, tremors, and *Hastimeha* (incontinence of urine), while *anorexia*, *vomiting*, *diarrhea*, etc., denote diabetic enteropathy. Heaviness in the chest indicates cardiac disorders, and *fainting*, *tremors*, etc., may relate to cerebral disorders. The features of nephropathy are not directly referred to in *Upadrava* (complications) of *Prameha*; however, these are described in detail in the 20 subtypes of *Prameha* discussed previously, such as *Vasameha*, *Majjameha*, *Raktameha*, *Manjishtameha*, and so on. The presence of excessive waste products in the eyes, ears, tongue, etc., discussed previously as *Purvarupa* (prodromal symptoms), indicates that these organs would become increasingly disturbed with the advancement of disease and ultimately retinopathy<sup>14</sup> and other disorders could develop as a result.

It is interesting to note that many of the features of complications are described in *Charaka Samhita* as disorders and diseases caused by overintake of *Santarpana* (a highly nutritious, high-calorie diet intended to increase weight). These disorders and diseases include *Prameha*, *Pidaka* (carbuncles), *Kushithu* (skin diseases), *Mutrakrichhra* (urinary disorders), *Klaibya* (erectile dysfunction), *Sthaulya* (obesity), *Indriya Srotasam Lepa* (structural and functional impairment of the sensory organs), and *Shophu* (generalized edema).<sup>3</sup> Hence, all these clinical conditions seem to be interrelated and originate from the same pathogenesis.

#### Conclusions

In *Ayurveda*, *Prameha* is described as a set of complex clinical disorders characterized by frequent abnormal

micturition, with the etiology involving genetic predisposition as well as improper diet and lifestyle. The role of stress and obesity in its pathogenesis is also elaborately discussed in the Ayurvedic texts. The different types of *Prameha* have clinical manifestations that have much in common with those described in allopathic medicine for obesity, metabolic syndrome, and diabetes mellitus.

Part 2 of this article will focus on the management of *Prameha* in Ayurveda, which emphasizes dietary and lifestyle recommendations and herbal preparations, in accordance with the psychophysiological constitution of the patient. *Ayurveda* also addresses the management of psychologic factors that contribute to the development of *Prameha*. An abundance of research has been conducted on the herbs used in the management of *Prameha*, demonstrating their antidiabetic, hypolipidemic, and antioxidant effects.<sup>15-18</sup>

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## *Prameha* in Ayurveda: Correlation with Obesity, Metabolic Syndrome, and Diabetes Mellitus. Part 2—Management of *Prameha*

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### Abstract

**Background:** Obesity, metabolic syndrome, and diabetes mellitus are increasing to epidemic proportions globally. *Prameha* is a syndrome described in the ancient *Ayurvedic* texts that includes clinical conditions involved in obesity, prediabetes, diabetes mellitus, and metabolic syndrome.

**Materials and methods:** Various dietary, lifestyle, and psychologic factors are involved in the etiology of *Prameha*, particularly in relation to disturbances in fat and carbohydrate metabolism.

**Results:** The Ayurvedic management of *Prameha* emphasizes dietary and lifestyle recommendations and herbal preparations, in accordance with the psychophysiologic constitution of the patient. *Ayurveda* also addresses the management of psychologic factors that contribute to the development of *Prameha*. Ayurvedic treatment known as *Apatarpana* (balanced diet with restricted calories) and *Santarpana* (highly nutritious, high-calorie diet intended to increase weight) are recommended for patients with type 2 and type 1 diabetes, respectively. Various Ayurvedic herbs and herbomineral formulations are utilized, based on the stage and type of disease as well as the psychophysiologic constitution of the patient. A large body of research has been conducted on these Ayurvedic herbs.

**Conclusions:** Integrating the theory and modalities of *Ayurveda* in the management of these disorders may prove to be beneficial.

### Introduction

OBESITY, METABOLIC SYNDROME, and diabetes mellitus are increasing to epidemic proportions globally. *Ayurveda* describes a set of complex clinical disorders with frequent abnormal micturition, collectively called *Prameha*, which correlate in many ways with obesity, metabolic syndrome, and diabetes mellitus. Integrating the theory and modalities of *Ayurveda* in the management of these disorders may prove to be beneficial and has been discussed previously.<sup>1</sup> Elaboration of the etiology, classification, and pathogenesis of *Prameha* has also been discussed previously.<sup>2</sup> The current discussion centers on the management of *Prameha*.

### Management of *Prameha*

Avoiding etiological factors and halting the progression of pathophysiologic events are the main objectives for the management of any disease. The management of *Prameha* depends on multiple aspects such as the psychophysiologic constitution of the patient and the specific etiopathology.<sup>3</sup> If the patient is physically strong and suffers with *Apathyam-*

*mittaja* (acquired) *Prameha*, *Samshodhana* (biopurification) is considered the ideal option. For physically weak patients, *Samshtunana* (pacification of the *Doshas*) is recommended. *Samshtunana* is also utilized after biopurification in those patients who undergo *Samshodhana*. The measures used for *Sthaulya* (obesity) can be utilized for the management of *Prameha*,<sup>4</sup> such as *Apatarpana* (balanced diet with restricted calories). Measures that minimize the morbid *Kapha* and *Meda* (fat) will improve the health of the patient. The foods recommended for *Prameha* in the classical Ayurvedic texts should be included in the patient's diet. Balanced nutrition, appropriate physical exercise, and administration of herbal supplements will help to manage *Prameha*.

The dietary regimen and lifestyle management recommendations mainly address the *Doshic* dominance of the disease, as they should be more catabolic in nature for the patients with *Kaphaja Prameha* (*Prameha* in which *Kapha* is the predominant *Dosha*), and more anabolic in nature for those with *Vataja Prameha* (*Prameha* in which *Vata* is the predominant *Dosha*). Both *Charaka Samhita* and *Sushruta Samhita* have recommended anabolic treatments, known as

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*Santarpana* and *Brimhana*, for patients with *Vataja Prameha*.<sup>4,5</sup> *Santarpana* refers to a highly nutritious, high-calorie diet intended to increase weight, and *Brimhana* likewise refers to increasing the body bulk or weight.

#### Dietary management

*Ayurveda* considers diet to be one of the primary pillars of health. Food is an imperative internal factor that accounts for health as well as disease. As Hippocrates said 2000 years ago, "Let food be your medicine and medicine be your food."<sup>6</sup> The proper diet imparts physical strength and helps diminish the morbidity of the *Doshas*, thereby maintaining equilibrium of the bodily tissues. Eating a proper diet is a key step in preventing and controlling *Apathyanimittaja* (acquired) *Prameha*. The role of *Ashta Aahara Vidhivishesha*<sup>3</sup> and *Aayatana Aahara Vidhividhana*<sup>3</sup> (dietetic regulations) has primary importance among the multiple preventive aspects of *Prameha*.

"What you eat." The prime aspect of the dietetic regulations can be referred to as "what you eat." Patients with *Prameha* must eat a diet that pacifies the disease. The best foods to eat are those that are not sweet, not too oily, have the ability to mitigate *Kapha* and *Meda*, and are nourishing. Foods and drinks that are sweet in taste, such as dairy products, *Ikshu* (sugar cane), sugar products, foods with *Guru* (heavy) quality and *Sheeta* (cold) quality (such as ice cream), *Madya* (alcoholic beverages and wines), and so on should be avoided since they further provoke *Kapha* and *Meda*.

In the diet, first and foremost importance should be given to *Yava* (barley).<sup>3</sup> A preparation called *Apupa* (a type of cake) made with barley can be eaten. Research shows the consumption of barley kernels and products made from barley flour enriched with  $\beta$ -glucan improves glucose tolerance, reduces insulin responses, and lowers inflammatory markers.<sup>7-10</sup> Preparation of food from barley grain soaked overnight in a decoction of *Triphala* [an herbal mixture comprised of *Phyllanthus emblica* Linn., *Terminalia bellirica* (Gaertn.) Roxb., and *Terminalia chebula* (Gaertn.) Retz.] helps mitigate *Prameha*. Research on *Triphala* and the herbs that comprise it has shown beneficial antidiabetic effects. In a study on rats with alloxan-induced diabetes, *Triphala* reduced the blood glucose level significantly. It also scavenged hydroxyl and superoxide radicals *in vitro* and inhibited lipid peroxide formation.<sup>11</sup> Keeping lipid levels and their oxidation in check is an important aspect in the management of obesity, metabolic syndrome, and diabetes. Research on *Amalaki* (*Amla*; *Phyllanthus emblica*; also known as *Emblia officinalis* Gaertn.) shows that it has antidiabetic, hypolipidemic, and antioxidant properties.<sup>12</sup> *Amla* reduced lipid peroxidation and strongly inhibited production of advanced glycosylated endproducts in rats with streptozotocin-induced diabetes.<sup>13</sup> In aging rats, *Amla* prevented dyslipidemia and oxidative stress.<sup>14</sup> *Terminalia belerica* reduced alloxan-induced hyperglycemia by 50% in rats and significantly decreased oxidative stress.<sup>15</sup> In a study on experimental myocardial injury induced by isoproterenol, pretreatment with *T. chebula* extract decreased lipid peroxide formation and ameliorated the effect of isoproterenol on myocardial marker enzymes, indicating a reduction in myocardial necrosis.<sup>16</sup>

In addition to barley, preparing food from the seeds of *Venu* (bamboo) and *Godhooma* (wheat) soaked overnight in a decoction of *Triphala* may also be beneficial for *Prameha*. Studies conducted on extracts of bamboo (*Bambusa dendrocalamus*) have demonstrated hypoglycemic effects in alloxan-induced diabetes in rabbits<sup>17</sup> and rats.<sup>18</sup> With regard to wheat, foods with a low glycemic index and foods rich in whole grain are associated with a reduced risk of metabolic syndrome, type 2 diabetes, and cardiovascular disease.<sup>19-21</sup> A possible mechanism relates to the colonic metabolism of indigestible carbohydrates, with a link between gut microbial metabolism and key factors associated with insulin resistance.<sup>7,8</sup>

An abundance of research has been conducted on the health-promoting properties of spices, including antidiabetic, antioxidant, and lipid-lowering properties.<sup>22-25</sup> Turmeric (*Curcuma longa* Linn.) and curcumin, the pigment that gives turmeric its orange-yellow color, have been extensively researched in relation to diabetes. More than 35 years ago, it was shown that curcumin can modulate blood glucose levels in patients with diabetes.<sup>26</sup> Current research has shown that turmeric extracts suppress blood glucose levels in mice with type 2 diabetes,<sup>27</sup> prevent lipid peroxidation and aortic fatty streak formation in rabbits,<sup>28</sup> and increase high-density lipoprotein (HDL) cholesterol.<sup>29</sup> Curcumin significantly decreases blood cholesterol and triglycerides in rats with streptozotocin-induced diabetes.<sup>30</sup> Tetrahydrocurcumin, an active metabolite of curcumin, significantly reduces blood glucose, increases plasma insulin, and reduces lipid peroxidation, cholesterol, and triglycerides in rats with diabetes.<sup>31</sup> Curcumin is an effective immunomodulator,<sup>32</sup> and it reduces the impact of advanced glycosylated endproducts in diabetes.<sup>26</sup> In *Ayurveda*, *Haridra* (turmeric) and *Amalaki* are considered one of the best simple herbal combinations to manage *Prameha*.<sup>3</sup> They can be taken in powder form or as part of the diet since *Haridra* is a spice commonly used in the preparation of various dishes and *Amalaki* is a seasonal fruit.

Additional spices with antidiabetic effects include cinnamon, *Jeeraka* (*Cuminum cyminum* Linn., cumin), *Dhanyaka* (*Coriandrum sativum* Linn., coriander), *Shunthi* (*Zingiber officinale* Rosc., ginger), *Methika* (*Trigonella foenum-graecum* Linn., fenugreek), and *Rasona* (*Allium sativum* Linn., garlic). Cinnamon reduces serum glucose, triglycerides, and low-density lipoprotein (LDL) in patients with type 2 diabetes.<sup>33</sup> Cumin reduces levels of blood glucose, glycosylated hemoglobin, plasma cholesterol, and triglycerides in rats with alloxan-induced diabetes. It was more effective in treating diabetes than the drug glibenclamide.<sup>34</sup> Coriander significantly decreased lipid peroxide levels and increased the activity of antioxidant enzymes in rats fed a high-fat diet.<sup>35</sup> It also significantly decreased levels of total cholesterol and triglycerides, and increased levels of HDL cholesterol.<sup>36</sup> Similar pharmacologic actions are seen with ginger. It reduces lipid levels, atherosclerotic lesions, and lipid peroxide levels.<sup>37</sup> Fenugreek significantly reduces fasting blood glucose, triglycerides, and very-low-density lipoprotein (VLDL) in patients with type 2 diabetes.<sup>38</sup> In a double-blind placebo-controlled study, it improved glycemic control, decreased insulin resistance, decreased serum triglycerides, and increased HDL in patients with type 2 diabetes.<sup>39</sup> In a study on patients with type 1 diabetes, fenugreek significantly reduced fasting blood glucose, total cholesterol, LDL, VLDL,

and triglycerides.<sup>40</sup> In rats with diabetes, it displayed immunomodulatory and neuroprotective actions,<sup>41</sup> reduced oxidative stress,<sup>42</sup> and showed a significant effect on key carbohydrate metabolic enzymes.<sup>43</sup> Garlic lowered fasting blood glucose and serum triglyceride levels in a double-blind placebo-controlled study on patients with type 2 diabetes.<sup>44</sup> In rats with streptozotocin-induced diabetes, it significantly decreased serum glucose, total cholesterol, and triglycerides. The antidiabetic effect was greater than that of glibenclamide.<sup>45</sup> Garlic significantly decreased total cholesterol and LDL, and significantly raised HDL, in a randomized, double-blind, placebo-controlled study on male patients with mild hypercholesterolemia.<sup>46</sup> Similar results were seen in a study on patients with coronary artery disease, in which garlic significantly reduced total serum cholesterol and triglycerides, and significantly increased HDL.<sup>47</sup>

Vegetables that mitigate *Prameha* include *Karavellaka* (*Momordica charantia* Linn.; bitter gourd; bitter melon) and *Patola* (*Trichosanthes anguina* Linn.). *M. charantia* administered orally produced a significant hypoglycemic effect in rabbits with alloxan-induced diabetes.<sup>48</sup> In rats with alloxan-induced diabetes subjected to a chronic sucrose load, *M. charantia* maintained normal glucose levels, reduced triglyceride and LDL levels, and increased HDL levels. It also improved the antioxidant status, as evidenced by low levels of thiobarbituric acid-reactive substances and normal levels of reduced glutathione. Upon termination of the treatment, the rats were under oxidative stress and reverted back to diabetic conditions.<sup>49</sup> Feeding dried bitter gourd powder to rats with streptozotocin-induced diabetes decreased fasting blood glucose by nearly 30%.<sup>50</sup> An aqueous extract powder reduced fasting blood glucose in rats with diabetes by 48%, an effect comparable to that of glibenclamide.<sup>51</sup> A methanol extract of bitter gourd normalized blood glucose, reduced triglycerides and LDL, and increased HDL in rats with diabetes. Discontinuation of the extract resulted in reversion to a diabetic state.<sup>52</sup> *Ayurveda* advocates using *Tikta Shaka*<sup>53</sup> (green leafy vegetables) as a main component of the diet for patients with *Prameha*. Judicious administration of legumes and grains such as *Kodrava* (kodo millet), *Mudga* (green gram, moong dal), *Kulatha* (*Macrotyloma uniflorum* Linn., horse gram), *Adhaki Beeja* (pigeon peas, toor dal), and so on may be helpful. Oils such as *Sarshapa Taila*<sup>54</sup> (mustard oil) and *Ingudi* [*Balanites aegyptiaca* (Linn.) Del.] can be used to prevent any further increase in lipid levels.

*Ayurveda* does not prohibit meat in the diet of *Prameha* patients; however, frying of the meat is not recommended.<sup>53</sup> *Harina* (venison) and *Shashaka* (rabbit) are the recommended meats for *Prameha* patients. The meat of domesticated animals is not recommended, and this correlates with current research findings. Consumption of red meat and processed meats are associated with an increased risk of diabetes in women.<sup>55-57</sup> Frequent consumption of processed meat has been associated with an increased risk of diabetes in men.<sup>58</sup> A systematic review and meta-analysis of studies on red and processed meats concluded that the consumption of processed meats is associated with a higher incidence of coronary heart disease and diabetes mellitus.<sup>59</sup>

*Ushnam Asneeyat* refers to eating a diet that is warm. This is recommended since it will ease *Kapha*, normalize *Vata*, and stimulate *Pitta* to intensify the power of digestion. However, food that is extremely hot should not be eaten. Leftovers or old food that is reheated should also not be eaten.

*Ayurveda* recommends the use of *Anupana* (an adjuvant) along with the diet and any herbs that are being utilized. In addition to the action of disease correction, the adjuvant acts as a carrier to transport the therapeutic phytochemicals into the system, and may even act as a catalyst in the interaction of the various phytochemicals. *Sarodaka* and *Kushodaka* are drinks that can be employed in this regard.<sup>3</sup> *Sarodaka* is water prepared from *Khadira* [*Acacia catechu* (Linn. f.) Willd.] that has been boiled, then cooled down. *Kushodaka* is water prepared from *Kusha* [*Desmostachya bipinnata* (Linn.) Stapf] that has been boiled, then cooled. These drinks can be taken with meals, with herbs, or whenever the patient feels thirst. They are particularly helpful for obese individuals who are suffering from *Prameha*, since they weaken both *Kapha* and *Meda*. Another recommended drink is called *Raga*. It is usually prepared from small sour fruits such as *Amalaki*, *Kapitha*<sup>53</sup> [*Feronia limonia* (Linn.) Swingl.], *Jambu* (*Syzygium cumini* (Linn.) Skeels), and so on, along with a modest amount of salt.

"How much you eat." Another consideration in the dietetic regulations is "how much you eat." The recommendation in this regard is *Matrvat Asneeyat*, which means the food should be eaten in due measure.<sup>3</sup> The quantity of food that is appropriate is not the same for everyone. It varies according to the individual's psychophysiological constitution and *Agni* (digestive and metabolic process). The ideal amount of food is determined by the individual's level of satiety. *Guru Aahara* (foods with a heavy quality) should be eaten to half of one's satiety level, whereas *Laghu Aahara* (foods with a light quality) can be eaten until the individual reaches full satiety.<sup>3</sup> With regard to optimal digestion of a meal, one can visualize the stomach as being divided into three parts: One third should be filled with solid food, one third with liquid, and one third should remain empty to allow for the proper movement of the *Doshas* in the digestive process.<sup>3</sup> The proper amount of food for the individual will not produce undue pressure on the stomach; will not result in discomfort during activities such as walking, standing, sleeping, talking, and so on; and will satisfy the individual's hunger and thirst. Eating an excessive amount of food may provoke all the *Doshas*, and eating an insufficient amount will impair the equilibrium of the *Dhatu* (the fundamental principles that support the various bodily tissues).

"When you eat." For optimal digestion, it is important to consider "when you eat." *Jeerne Asneeyat* refers to the recommendation that one should eat only after the previous meal has been fully digested. Untimely ingestion and overeating leads to accumulation of the *Doshas* and overwhelms *Agni* (the digestive power), which contributes to the development of *Apathyanimitaja* (acquired) *Prameha*. Digestion of the previous meal can be ascertained by a feeling of hunger and appropriate evacuation of the bowels and bladder. Following this dietetic recommendation is helpful for keeping the *Doshas* in balance, maintaining an individual's digestive power, and managing *Prameha*.

#### Lifestyle management

"*Ayurveda* considers dietary and lifestyle management to be the first line of treatment for *Prameha*. The *Ayurvedic* texts

contain a detailed description of lifestyle management for *Prameha*. *Sushruta Samhita* emphasizes the importance of regular exercise, including brisk walking, jogging, sports, wrestling, fencing, horseback riding, and so on. Patients are advised to avoid laziness and a sedentary lifestyle. It is essential to perform exercise such as walking or jogging to burn extra calories in the body. *Sushruta Samhita* states that if a person follows an active lifestyle, he/she can overcome *Apathyanimittaja* (acquired) *Prameha* within 1 year.<sup>5</sup> Exercise brings lightness to the body, reduces fat, and improves the ability to work. *Ayurveda* recommends stopping the workout when slight sweating develops on the forehead. The Ayurvedic texts provide a cautionary note about the preservation and maintenance of health for asthenic diabetics (type 1 diabetics) since they are *Vata*-predominant. These patients are not advised to undertake vigorous exercise, as it will further provoke *Vata* and result in a poor prognosis.

Meditation, *Pranayama* (breathing exercises), and *Asanas* (yoga exercises) are beneficial in developing and maintaining a healthy lifestyle.<sup>60</sup> Research has shown that a comprehensive lifestyle education program that includes these practices reduces risk factors for diabetes mellitus. Subjects with diabetes who participated in the 8-day lifestyle modification program had significantly lower fasting plasma glucose, serum total cholesterol, LDL, VLDL, and total triglycerides, and significantly higher HDL, on the last day of the course compared to the first day of the course.<sup>61</sup> Several studies conducted on patients with type 2 diabetes demonstrated the beneficial effect of a 40-day program of specific *Asanas* (Yoga exercises). There was a significant decrease in fasting blood glucose levels. A significant decrease in waist-hip ratio and changes in insulin levels were also noted, suggesting a positive effect of Yoga *Asanas* on glucose utilization and fat redistribution.<sup>62</sup> Pulse rate and systolic and diastolic blood pressure decreased significantly.<sup>63</sup> There were improvements in pulmonary functions.<sup>64</sup> Nerve function parameters improved in the group of patients practicing Yoga *Asanas*, while nerve function in the control group deteriorated over the period of study.<sup>65</sup> A study on 60 patients with type 2 diabetes showed that *Pranayama* (breathing exercises) and Yoga *Asanas* improved cognitive brain functions in patients with diabetes.<sup>66</sup>

Patients are also advised to study the scriptures according to their own religion or tradition (e.g., *Veda*, texts of ancient India that expound upon the laws of nature), which highlight the development of a positive mental attitude and decrease anxiety and stress. Inadequate physical and mental exercise<sup>53</sup> are major causes of *Prameha* and *Sthaulya* (obesity). Strictly following these Ayurvedic management principles will be beneficial in the treatment of these disorders.

#### Management of disturbed psychologic factors

According to *Ayurveda*, psychologic factors play an important role in the development of *Prameha*, similar to their importance in obesity, metabolic syndrome, and diabetes mellitus. Thus, psychologic management is vitally important in the treatment of these disorders. Meditation and *Pranayama* (breathing exercises) help counteract stress and balance the emotions, resulting in a more positive outlook on life.<sup>60</sup> Various mental health-promoting herbs (*Medhya*) have shown promising results as adjuvants to the principal ther-

apy in patients with diabetes. In a survey study of 100 patients with type 2 diabetes, disturbances in mental health (e.g., anger, grief, worry, fear, anxiety, and so on) were noted. Even though the patients were on antidiabetic medication, their blood glucose was not well controlled. With concomitant administration of the mental health-promoting herbal mixture known as *Saraswata Churna*, a decrease in fasting and postprandial blood glucose was observed. *Saraswata Churna* contains *Ashwagandha* [*Withania somnifera* (Linn.) Dunal], *Shankhapushpi* [*Convolvulus pluricaulis* Choisy], *Brahmi* [*Bacopa monnieri* (Linn.) Pennell], *Vacha* [*Acorus calamus* Linn.], and so on [Bhatia et al., 2001; see Box 1]. The *Medhya* herbs have antistress, antioxidant, and immunomodulation properties.<sup>67-75</sup> Thus, they counteract stress-induced neuroendocrine changes (high catecholamines) and lead to better availability of insulin to metabolize blood glucose.<sup>76,77</sup>

#### Herbal and herbomineral supplements

Plants are valuable for health in various ways. They are the foundation of both food and medicine. Cultures around the world have utilized different techniques for treating disease based on what is available in their biocultural environment. Most developing countries depend directly on plants for their health care needs. Even in nations where allopathic medicine and the pharmaceutical industry are prominent, plants are being recognized as a valuable resource for the promotion of health and treatment of disease. The World Health Organization has recommended appraisal of the therapeutic utility of plants for conditions in which there is a lack of safe drugs in conventional medicine. Ayurvedic herbal supplements are being utilized globally, since they are effective in managing many chronic disorders, are cost-effective, and lack the toxic side-effects associated with many chemically synthesized drugs. For the treatment of *Prameha*, there are more than 100 medicinal plants *Ayurveda* utilizes, singly or more often in combination. Selection of the herbal treatment is based on the stage and type of disease, as well as disturbances in the psychophysiologic constitution of the patient. Research has shown that many of these herbs have an antidiabetic effect as well as a beneficial effect on the lipid profile.<sup>78-81</sup>

*Meshashringi* [*Gymnema sylvestre* (Retz.) R.Br.; *Gurmar*] targets several of the etiologic factors associated with diabetes, including chronic inflammation, obesity, and pancreatic  $\beta$ -cell function.<sup>82</sup> In a study on rats with streptozotocin-induced diabetes, *G. sylvestre* treatment resulted in a 30% increase in total pancreatic weight, and a significant increase in the number of islets and number of  $\beta$ -cells per islet. The regenerated pancreatic tissue resulted in complete control of fasting blood glucose levels within 20-60 days. Normal rats in this study did not experience an increase in insulin release when treated with *G. sylvestre* extract, indicating that this herb has a normalizing effect on blood glucose and may therefore be safer than conventional oral hypoglycemic agents such as sulphonylureas.<sup>83</sup> Several clinical studies have demonstrated that *G. sylvestre* is effective in decreasing blood glucose levels in patients with type 1 and type 2 diabetes.<sup>82,84,85</sup> Two (2) clinical trials investigated the effects of combining *G. sylvestre* treatment with conventional therapy, compared to conventional therapy alone. In 22 patients with

## BOX 1. RESEARCH IN THESES, CD-ROM, AND WEBSITE

- Bhatia S, Chandola HM, Singh G. A clinical study on the role of Manasa Bhava in the etiopathogenesis of Madhumeha and its management by Saraswata Choorna. MD(Ayu) thesis. Institute for Post Graduate Teaching & Research in Ayurveda, Gujarat Ayurved University, Jamnagar, India, 2001.
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- Hota P. A clinical study on Vatarakta and its management with Kaishor Guggulu. MD(Ayu) thesis. Gopabandhu Ayurved Mahavidyalaya, Utkal University, Puri, India, 1997.

type 2 diabetes, treatment with *G. sylvestre* extract significantly reduced blood glucose, glycosylated hemoglobin, and glycosylated plasma proteins, whereas with conventional treatment alone (i.e., glibenclamide or tolbutamide), these values increased or remained the same. The patients receiving the herbal extract were able to decrease the dosage of their conventional drug, and 5 patients were able to discontinue the drug entirely and maintain their blood glucose levels using only *G. sylvestre*.<sup>84</sup> In 27 patients with type 1 diabetes, *G. sylvestre* treatment reduced fasting blood glucose, glycosylated hemoglobin, and glycosylated plasma protein levels. Insulin requirements decreased and serum lipids returned to near normal levels. Patients on insulin therapy alone had no significant reduction in serum lipids, glycosylated hemoglobin, or glycosylated plasma proteins.<sup>85</sup>

Aqueous and alcoholic extracts of *Guduchi* [*Tinospora cordifolia* (Willd.) Hook. f. & Thomson] reduced glucose levels in rats with alloxan-induced diabetes. The antihyperglycemic effect may be due to pancreatic islet free-radical-scavenging activity. This herb also lowers the levels of tissue and serum cholesterol, phospholipids, and free fatty acids (Plants of Ayurveda, 2005; see Box 1).<sup>86-89</sup> *Kiratiktika* [*Swertia chirata* (Roxb.) Buch.-Ham.; also known as *Swertia chirayita* (Roxb.) H. Karst.] is a potent antidiabetic herb. In a pilot study, *Swertia chirata* produced a significant decrease in fasting and

postprandial blood glucose levels in patients with diabetes.<sup>81</sup> It contains swerchirin, a xanthone found in the *Swertia* species of plants. Xanthones are a unique class of biologically active compounds with antioxidant properties. Research has shown swerchirin produces a significant decrease in blood glucose levels in rat models.<sup>90-94</sup> A 60% decrease in blood glucose induced by swerchirin was accompanied by a marked depletion in  $\beta$ -granules and insulin in the pancreatic islets. Glucose uptake and glycogen synthesis by the diaphragm muscle was significantly enhanced *in vitro* by the serum of swerchirin-treated rats. It was therefore concluded that swerchirin lowers blood glucose levels by stimulating insulin release from the islets of Langerhans.<sup>94</sup>

*Shilajatu* (*Shilajit*, *Asphaltum punjabianum*) is a resinous, mineral-rich substance with vegetative origins that is found in the Himalayan mountains.<sup>95</sup> It is recommended for many diseases, such as *Pramela*, *Sihaulya* (obesity), *Hridroga* (heart disease), and so on. It is an established treatment for diabetes that not only mitigates morbid *Kapha* and *Meda*, but also has rejuvenating properties.<sup>96</sup> In a clinical study on patients with diabetes, *Shilajit* significantly reduced lipid peroxidation and significantly increased levels of catalase, an antioxidant enzyme.<sup>97</sup> In rats with diabetes, *Shilajit* produced a significant reduction in blood glucose levels as well as beneficial effects on the lipid profile. Using *Shilajit* in combination with

glibenclamide or metformin significantly enhanced their ability to lower glucose and improve the lipid profile, compared to administering the drugs alone.<sup>98</sup> *Shilajit* attenuated streptozotocin-induced hyperglycemia in rats and reduced the decrease in superoxide dismutase activity in pancreatic islet cells. It was postulated that *Shilajit* acts as a free-radical scavenger.<sup>99</sup>

*Charaka Samhita* recommends *Madhwasava*, a polyherbal fermented preparation, for patients with *Prameha*. Hypoglycemic effects in animal models have been noted for some of the ingredients of *Madhwasava*, including *Tejapatra* [*Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.], *Pushkarmula* (*Inula racemosa* Hook. f.), and *Chirayata* (*Kirratatika*, *Swertia chirata*).<sup>18,93,100,101</sup> As discussed previously, in a pilot study on patients with diabetes, *S. chirata* produced a significant decrease in fasting and postprandial blood glucose levels.<sup>81</sup> A pilot study on *Tejapatra* showed insulin-releasing activity as well as a decrease in fasting and postprandial blood glucose levels in patients with diabetes.<sup>102,103</sup>

*Mamejjaka* (*Enicostema littorale* Blume) is used as a single herb and also as part of an antidiabetic mixture.<sup>104</sup> In a clinical study on patients with type 2 diabetes, *E. littorale* reduced blood glucose and prevented the progression of diabetic complications. There was significant improvement in the lipid profile, blood pressure, and kidney function.<sup>105</sup> It significantly reduced blood glucose and lipid peroxides in rats with alloxan-induced diabetes, and increased superoxide dismutase, catalase, and glutathione peroxidase.<sup>106</sup> In studies on rats with streptozotocin-induced type 1 diabetes, *E. littorale* significantly reduced glucose, cholesterol, and triglyceride levels,<sup>107</sup> and ameliorated diabetic nephropathy. Serum creatinine and urea were significantly decreased, and glomerular function improved.<sup>108</sup> In rats fed a hypercholesterolemic diet, *E. littorale* decreased serum cholesterol, triglycerides, LDL, VLDL, liver and kidney cholesterol levels, and lipid peroxidation levels. There was an increase in HDL, and an increase in reduced glutathione levels.<sup>109</sup>

A pilot study on an herbal mixture containing *Tejapatra* (*Cinnamomum tamala*), *Pushkarmula* (*Inula racemosa*), *Mamejjaka* (*E. littorale*), *Meshashringi* (*Gymnema sylvestris*), and *Jambu* (*Syzygium cumini*) seeds with *Karavellaka* (bitter melon; *Momordica charantia*) juice, administered at a dose of 5 g twice a day before meals, decreased fasting and postprandial blood glucose levels in patients with diabetes (Singh et al., 1992; see Box 1). *Avartaki* (*Cassia auriculata* Linn.) and *Methika* (*Trigonella foenum-graecum*) as single herbs and decoction of *Nimba* (*Azadirachta indica* A. Juss.; *Neem*) have also demonstrated blood glucose-lowering action (Marwah et al., 1990; see Box 1). In a clinical study on patients with type 2 diabetes, *Neem* showed significant hypoglycemic activity.<sup>110</sup> In rabbits with alloxan-induced diabetes, the hypoglycemic effect of *Neem* was comparable to that of glibenclamide.<sup>111</sup>

The herbs *Gokshura* (*Tribulus terrestris* Linn.),<sup>112</sup> *Asana* (*Pterocarpus marsupium* Roxb.),<sup>81</sup> *Kulatha* [*Vigna unguiculata* (Linn.) Walp.], and *Saptaparna* [*Alstonia scholaris* (Linn.) R.Br.] are also beneficial in treating *Prameha*. These herbs can be used in different combinations, depending on the Doshic involvement and severity of the illness. An herbal mixture comprised of one part each of *Karavellaka* (bitter melon; *M. charantia*), *Jambu* (*S. cumini*), *Gurmar* (*Meshashringi*, *G. sylvestris*), and *Amra* (*Mangifera indica* Linn.), taken along with *Shilajit*, was investigated in a clinical study on 805 pa-

tients with diabetes. The results showed a statistically significant reduction in fasting and postprandial blood glucose, along with clinical improvement (website of India's Central Council for Research in Ayurveda and Siddha; see Box 1). *Vijayasaradi Kwatha*, *Nishakatakadi Kwatha*,<sup>113</sup> *Katakagadiradi Kwatha*, *Saptaranyadi Vati*, and *Chandraprabha Vati*<sup>114</sup> are a few other polyherbal combinations that have an antidiabetic effect. Given the abundance of Ayurvedic herbs that are used to treat *Prameha*, further research and clinical trials in this field may determine which are most effective in managing diabetes mellitus.

### Management of complications

Patients with diabetes are at high risk for a number of complications. Ayurvedic herbs that target specific organ functions are helpful in managing these disorders. A large body of research has been conducted on these herbs. For cardiovascular complications, *Arjuna* (*Terminalia arjuna* Linn.),<sup>115,116</sup> *Guggulu* [*Commiphora wightii* (Am.) Bhandari],<sup>117</sup> *Pushkarmula* (*Inula racemosa*),<sup>117-119</sup> and *Kushtha* [*Saussurea lappa* (Decne.) C.B. Clarke]<sup>120,121</sup> can be utilized. *Bilva* [*Aegle marmelos* (Linn.) Corr. Serr.],<sup>122,123</sup> *Kutaja* [*Holarhena antidysenterica* (Roxb. ex Fleming) Wall. ex A. DC.],<sup>124,125</sup> and *Haritaki* (*Terminalia chebula*)<sup>126,127</sup> are helpful in managing diabetic enteropathy. For diabetic nephropathy, *Punarnava* (*Boerhavia diffusa* Linn.),<sup>128,129</sup> *Gokshura* (*Tribulus terrestris*),<sup>130-133</sup> and *Varuna* (*Crataeva nurvala* Buch-Ham.)<sup>134,135</sup> are useful. *Kapikacchu* [*Mucuna pruriens* (Linn.) DC.],<sup>136-138</sup> *Ashwagandha* (*Withania somnifera*),<sup>139</sup> *Shweta Musli* (*Asparagus adscendens* Roxb.) (Deka et al., 2004; see Box 1), *Ashwattha* (*Ficus religiosa* Linn.) (Virani et al., 2009; see Box 1), and *Jatiphala* (*Myristica fragrans* Houtt.) (Deka et al., 2004; see Box 1) can be utilized for erectile dysfunction. For diabetic neuropathy, *Dashamula Kwatha* (Dwivedi, 1986; see Box 1) and *Guggulu*-based formulations are helpful. For diabetic retinopathy, *Saptamrita Lauha* (Upadhyaya and Singh, 1993; see Box 1)<sup>140</sup> and *Mahatriphala Ghrita* (Gupta Durgesh, 2009; see Box 1) are recommended. Local and internal administration of *Mahamanjishthadi Kwatha* (Anil Kumar, 1985; see Box 1) and *Kaishor Guggulu* (Shringi, 1996; Hota, 1997; see Box 1) can be utilized for various skin manifestations. For cerebral diseases such as dementia and Alzheimer disease, *Shankhapushpi* (*Convolvulus pluricaulis*),<sup>71,141,142</sup> *Mandukaparni* [*Centella asiatica* (Linn.) Urb.],<sup>143-145</sup> *Brahmi* (*B. monnieri*),<sup>73,146,147</sup> *Vacha* (*Acorus calamus*),<sup>148,149</sup> *Jyotishmati* (*Celastrus paniculatus* Willd.),<sup>150,151</sup> and *Guduchi* (*Tinospora cordifolia*)<sup>152,153</sup> are recommended.

### Conclusions

In *Ayurveda*, *Prameha* is described as a set of complex clinical disorders characterized by frequent abnormal micturition, with the etiology involving genetic predisposition as well as improper diet and lifestyle. The role of stress and obesity in its pathogenesis is also elaborately discussed in the Ayurvedic texts. The clinical conditions described in *Prameha* have much in common with those described in allopathic medicine for obesity, metabolic syndrome, and diabetes mellitus. The Ayurvedic management of *Prameha* emphasizes dietary and lifestyle recommendations and herbal preparations, in accordance with the psychophysiological constitution of the patient. *Ayurveda* also addresses the management of psychological factors that contribute to the development of *Prameha*.

Ayurveda has a vast array of herbs and herbal mixtures that are used in the treatment of *Prameha*. A large number of these herbs have demonstrated efficacy in research investigations. The herbs have various properties, including hypoglycemic, antihyperglycemic, hypolipidemic, antihyperlipidemic, insulin-promoting, and antioxidant properties. Some of these herbs are capable of counteracting stress-induced catecholamines, which are established insulin antagonists. Hence, the selection of the herb or combination of herbs for the patient depends upon the stage of the disease, disturbances in the psychophysiological constitution of the patient, and mode of action of the herbs. Further research is needed in the clinical setting to elucidate the Ayurvedic modalities that are effective in the management of obesity, metabolic syndrome, and diabetes mellitus, in light of their similarities with *Prameha*.

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