Herbal Medication for the Management of DIABETES

Bachelor of Pharmacy

Dr. Pran Kishore Deb, Dr Balakumar Chandrasekaran
Assistant Professor
Pharmaceutical Medicinal Chemistry
Faculty of Pharmacy, Philadelphia University-Jordan
Email: pdeb@Philadelphia.edu.jo
Learning Outcomes

At the end of this lesson students will be able to

– Define diabetes

– Differentiate between diabetes I and II

– Write the botanical name and family name of plants and herbs useful for the management of diabetes

– Outline the different types of plant extracts and their chemical constituents beneficial for the management of diabetes

– Explain the mechanism of action, uses and side effects of different types of herbal medications for the management of diabetes
**DIABETES**

- Diabetes Mellitus is a group of disorders related to metabolic disturbances that are endocrine in origin. The deficiency is related to an endocrine hormone named insulin.

- The *insulin* hormone is released by the gland of *pancreas* and it **helps in the absorption of sugar molecules from the blood stream**.

- The decreased quantity of insulin leads to decreased absorption of sugar molecules and the blood sugar levels increase.

- The kidney is not able to filter these heavy molecules and they pass out through the urine. The high sugar level in the blood leads to various other disorders in the body like hypertension & nerve related disorders.

- The diabetes could be due to *insufficient insulin release, insufficient insulin production*, or due to *inability of sugar molecules to attach to the insulin hormone*. In either case, the sugar level in the blood increases and it leads to various other metabolic and physical problems.
WHAT ARE THE CAUSES OF DIABETES?

- Diabetes can be classified into:
  - **Type 1 Diabetes**: It is the type of diabetes that comes up due to deficiency to beta cells of the pancreas that produce insulin. This results in the deficiency of insulin cells and hyperglycemia.
  - **Type 2 Diabetes**: It is the type of diabetes that comes up due to resistance of the receptor cells to insulin.

- The probable causes that could lead to diabetes:
  - **Type 1 diabetes** is usually hereditary in nature. Some other factors that can lead to Type 1 diabetes are Gene mutations, infections in the body, and some lifestyle and environmental related causes.
  - **Type 2 diabetes** is due to gene mutation and lifestyle related.
  - **Other causes** for onset of diabetes are hyperthyroidism, Cushing’s syndrome, chronic alcoholism and high carbohydrate diet.
  - **Symptoms**: Weight loss, Weakness and exhaustion on little labor, Vision problems, Hypertension, Skin pigmentation, Wounds and injuries do not relieve quickly, Diabetic neuropathies in later stages.
Herbal Medication for the Management of DIABETES

• The natural herbs or Phytotherapy help a person to improve the diabetes and the nervous disorders related to diabetes in a natural and healthy way. The person suffering from diabetes improves his strength and the body and blood sugar levels become normal.

• The use of phytonutrients to combat diabetes mellitus does offer a novel therapeutic approach to restore normal body functions.

• Phytotherapy that mainly help diabetes are
  • Azadirachta indica (NEEM)
  • Bitter gourd (KARELA)
  • Emblica officinalis (AMALAKI)
  • Ocimum tenuiflorum (TULSI)
  • Gymnema sylvestrae (GURMAAR)
NEEM

(Arabic - Neeb, Azad-darakhul-hind, Shajarat Alnnim)

• Neem is a fast-growing tree that can reach a height of 15–20 metres (49–66 ft). It is evergreen, but in severe drought it may shed most or nearly all of its leaves. The branches are wide and spreading.

• Botanical Name: *Azadirachta indica*

• Family: *Meliaceae*

• Used part: LEAF, Flower, Oil, Seed.

• Habitat: It is native to India and the Indian subcontinent including Nepal, Pakistan, Bangladesh and Sri Lanka. It is typically grown in tropical and semi-tropical regions. Neem trees now also grow in islands located in the southern part of Iran. Its fruits and seeds are the source of neem oil.

• Composition:

• The process of extracting neem oil involves extracting the water-insoluble components with ether, petrol ether, ethyl acetate and dilute alcohol.

• The main constituents are nimbin, nimbinin, nimbidin (bitter component).
NEEM

- **Nimbin** is a triterpenoid and is thought to be responsible for much of the biological activities of neem oil, and is reported to have **anti-inflammatory**, **antipyretic**, **fungicidal**, **antihistamine** and **antiseptic** properties.

- **Azadirachtin** is used commercially as an **insecticide**.
NEEM

Use in diabetes mellitus:
• It has been observed that both leaf extract and seed oil have a stronger hypoglycaemic effect in hyperglycaemic as compared to normal rabbits.

Other uses:
• The tender shoots, leaves and flowers of the neem tree are eaten as a vegetable in India. Dried neem leaves are placed in cupboards to prevent insects eating the clothes, and also in tins where rice is stored. Dried neem leaves burnt in the tropical regions to keep away mosquitoes.
• It is widely used as a dental and gum cleaner (in toothpastes and mouthwashes) to protect from oral infections and bad breath. Gingivitis, bleeding gums and toothache are also relieved by using Neem regularly.
• Another of its famous sue is as a skin disinfectant. It is widely used in soaps, shampoos and body washes and is believed to have relieving action on pimples, acne and skin diseases like psoriasis, and eczema.
• Neem works wonder in medical conditions like bee stings, conjunctivitis, hemorrhoids, and ulcers and even in cases of bronchitis and epilepsy.
• Against pox viruses: In India, people who are affected with pox viruses are generally made to lie in bed made of neem leaves and branches. This prevents the spreading of pox virus to others.
Bitter gourd/ Bitter melon (KARELA)

- It is a tropical and subtropical vine of the family Cucurbitaceae, widely grown in Asia, Africa, and the Caribbean for its edible fruit. Its many varieties differ substantially in the shape and bitterness of the fruit. Bitter melon originated in India and was introduced into China in the 14th century.

- **Botanical Name:** *Momordica charantia*
- **Family:** *Cucurbitaceae*
- Bitter melon is generally consumed cooked in the green or early yellowing stage. Several animal studies and small-scale human studies have demonstrated a hypoglycemic effect of concentrated bitter melon extracts, when consumed in raw or juice form.
- **Charantin** has the potential antidiabetic properties.
- Different parts of the plant are used as a stomachic, laxative, antibilious, emetic, anthelmintic agent, for the treatment of cough, respiratory diseases, skin diseases, wounds, ulcer, gout, and rheumatism.
- It is also used in prevention of cancer and AIDS.
Emblica officinalis (AMALAKI)

- It is found natively in India and commonly known as Indian gooseberry or amla. The fruit ripening in autumn, the berries are harvested by hand after climbing to upper branches bearing the fruits. The taste of Indian emblic is sour, bitter and astringent, and it is quite fibrous.

- **Botanical Name:** *Emblica officinalis*
- **Family:** Euphorbiaceae
- **Part Used:** FRUITS (dried and fresh)

- **Key Active Constituents:** Emblicanin A&B, Puniglucanin, Pedunculagin, 2-keto-gluconolactone (= vitamin-C), Ellagic acid, Hexahydroxydiphenic acid.

- **Emblica officinalis** is aperient, carminative, diuretic, aphrodisiac, laxative, astringent and refrigerant. **It is the richest known source of vitamin 'C'.**

- It is useful in anaemia, jaundice, dyspepsia, haemorrhage disorders, colitis, gout, osteoporosis, diabetes, asthma and bronchitis. It cures insomnia and is healthy for hair. It also acts as an antacid and antitumorganic agent.

- Aqueous fruit extract of amlaki showed significant anti-hyperglycemic effect in streptozotocin-induced diabetic obese rats on par with metformin.

- Emblica officinalis tea may ameliorate diabetic neuropathy due to aldose reductase inhibition.
TULSI or Holy Basil

- It is an erect, many-branched subshrub, 30–60 cm tall with hairy stems and simple phyllotaxic green or purple leaves that are strongly scented. It is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics. The two main morphotypes cultivated in India and Nepal are green-leaved and purple-leaved.
- Botanical Name: *Ocimum tenuiflorum* or *Ocimum sanctum*
- Family: Lamiaceae
- Part Used: Leaves (fresh and dried)
- Some of the main chemical constituents of tulsi are: oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, β-caryophyllene (about 8%), β-elemene (11.0%), Cirsimaritin and germacrene D (about 2%).
TULSI or Holy Basil: Chemical Constituents

- Eugenol
- Urosolic acid
- Carvacrol
- Linalool
- Estragol
- Rosmarinic acid
- Cirsinaritin
- Apigenin
- Caryophylline
- Tulsi has a strong aroma and thus forms components of various herbal products and teas. The Tulsi herb has wonderful **antioxidant, anxiolytic, anti-carcinogenic, neuroprotective, cardioprotective, antihistaminic, mast-cell stabilisation** and **anti-inflammatory properties**.

- It is especially beneficial to the throat and chest. Tulsi is a part of various cough syrups and prevents common cold, flu, cough, rhinitis and sinusitis.

- It can be used either alone or as an **adjuvant in Type 2 Diabetes Mellitus** patients. In a clinical trial study, the **combination of Glibenclamide and O. Sanctum was found more effective in lowering both fasting and post prandial blood glucose levels in the patients of type 2 diabetes mellitus than who consumed only oral hypoglycaemic agents.**

- Isolated *O. sanctum* extracts have some **antibacterial activity** against *E. coli, S. aureus* and *P. aeruginosa*.

- For centuries, the dried leaves have been mixed with stored grains to **repel insects**. In Sri Lanka this plant is used as a **mosquito repellent**.
**Gymnema sylvestre**

- It is an herb native to the tropical forests of southern and central India and Sri Lanka. Common names include gymnema, cowplant, Australian cowplant, gurmari, gurmarbooti, gurmar. The Hindi word Gur-mar (گُر مار in Urdu), literally means sugar destroyer.

- **Botanical Name:** *Gymnema sylvestre*

- **Family:** Apocynaceae

- **Part Used:** Leaves (fresh and dried)

- **Some of the main chemical constituents of Gurmar are:** The plants contain a large number of chemicals, including triterpenoids, which may have pharmacological properties. The constituent saponins have the effect of suppressing the taste of sweetness.

- **Uses:**
  - **Anti-diabetic.** Research suggests that when a gymnema extract is taken orally along with insulin or diabetes medications, it causes significant reduction in blood sugar in people with type 1 or type 2 diabetes.
  - It also helps to reduce body weight in people who are overweight or obese.
  - It helps in stimulating digestion.
  - It also acts as a laxative and diuretic.
Gymnema sylvestre
REFERENCES

Textbooks:


Supplementary books:


Thank you

Happy New Year 2019