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Case Study

AYURVEDIC MANAGEMENT OF METABOLIC DISORDER W.R.T. *PRAMEHA, MEDOROG*

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ABSTRACT

Metabolic disorder is characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action. The disease in which there is increased in quantity and frequency of urination in Ayurved is called *Prameha*. *Prameha* as the word says, "*Prakarsena Prabhutam Pracuram Varam Varam Va Mehati Mutratvagam Karoti Iti prameha*." Dyslipidemia refers to an abnormal level of lipids (fat) in blood, including cholesterol and trigycerides. It is symptomatically similar to the *Medoroga* in Ayurveda. *Medhodushti* is explained as vitiation *in Prakrit karya* of *Medho Dhatu.* It might be like *Medoroga* in Ayurveda. Excess of *Meda Dhatu* is referred to as *Medo Roga* and deranged *Angi* is the root cause of this disease. According to the WHO, 39% of the world adult population has been affected by elevated blood cholesterol, with a relatively higher prevalence among women (40%) than among men (37%). Raised blood cholesterol can have many consequences that include central obesity, insulin resistance, hypertension, dyslipidemia, high triglycerides, and low HDL. A 50yr old male came to Ch. Brahm Prakash Ayurved Charak Sansthan in special OPD of *Kayachikitsa* with Breathlessness on excertion, pain in calf muscle, fatigue and tiredness etc. Complete history taking with examination and investigation conclude to diagnosis of metabolic disorder (Pramrha, *Medoroga*), so patient was treated with internal Ayurvedic herbal formulation, *Pathya, Apathy*a including complete diet chart and *Yogasanas*. The treatment modalities done showed marked improvement in the patient's signs and symptoms and blood investigations and hence, treatment through Ayurveda has effective results in the management.

INTRODUCTION

Etiology of metabolic disorder includes obesity/overweight, sedentary lifestyle, increasing age, and lipodystrophy. The exact cause may be multifactorial and idiopathic. Exaggerate intracellular fatty acid metabolites contribute to insulin resistance by impairing insulin-signaling pathways and accumulating as triglycerides in skeletal and cardiac muscle, while stimulating hepatic glucose and triglyceride production. Surplus adipose tissue leads to increased production of proinflammatory cytokine. The major features include central obesity, hypertriglyceridemia, low HDL cholesterol, hypertension, and hyperglycemia. Associated conditions include type 2 diabetes mellitus, cardiovascular disease, non-alcoholic fatty liver disease, hyperuricemia/gout, polycystic ovary syndrome, and obstructive sleep apnea.

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Prameha as the word says, "*Prakarsena Prabhutam Pracuram Varam Varam Va Mehati Mutratvagam Karoti Iti prameha*." The disease in which there is increased in quantity and frequency of urination is *Prameha*. Sedentary lifestyle excessive sleep, curd, intake of aquatic and marshy land animal, meat, milk preparation, freshly harvesting food articles, freshly prepared alcoholic drinks, preparation of jaggery and all *Kapha* aggravating factors are responsible for the etiology of *Prameha*. The cardinal feature of *Prameha* has been mentioned as "*Prabhuta Avil Mutrata*"

These clinical manifestations are similar to manifestations of a clinical entity named as Diabetes Mellitus, so we can correlate *Madhumeha*. Diabetes

Mellitus is a metabolic disorder with various causes, marked by persistent high blood sugar levels and disruptions in the metabolism of carbohydrates, fats, and proteins. This condition arises from issues with insulin secretion, insulin function, or both. Type 2 diabetes is the predominant form, accounting for 80% to 95% of all diabetes cases globally.

"Dyslipidemia" is a term commonly used in medical literature, is likely discussed in context of cardiovascular disease and type 2 diabetes and risk factors. It is refers to abnormal levels of lipid (fats) in the blood, included elevated cholesterol with high LDL ("bad cholesterol), high trigycerides. Risk factors include genetics, diet, lack of exercise, and certain medical conditions. Lifestyle changes, medication, and regular monitoring are often part of managing dyslipidemia. In Ayurveda dyslipidemia closely related to *Medhodushti* is defined as vitiation *in Prakrit karya* of *Medho Dhatu.* It might be like *Medoroga* in Ayurveda. Excess of *Meda Dhatu* is referred to as *Medo Roga*.

Dyslpidemia and diabetes mellitus is metabolic disorder and deranged *Angi* is the root cause of this disease. *Acharaya Charka* has mentioned *Ahara* as most common factor for *Medovridhi* while *Acharaya Susuruta* has emphasised on the concept of *Ama Dosha*. *Kaphavardhak Aahar, Vihara* leads to formation of undigested *Aam Rasa* which further leads to excessive *Medovriddhi* Also *Madhavkara* stated that, Due to excessive increase fat, channels get obstructed and thus nutrition to other *Dhatu* is not possible only accumulation of fat (*Meda*) *Agnimandya* takes place.

In view of this fact we have taken *Vidangadi Kwath* to correct the deranged/sluggish *Agni* as *Vidangadi Kwath* contains *Vidang*, *Haridra* and *Shunthi* as main ingredients, these three drugs have *Katu rasa*, *Katu vipak* and *Ushana virya* which pacify *Kapha dosha* and promote the *Agni* thus promoting the digestive and metabolic power.

Lipid profile is observed by measuring plasma lipid levels after an overnight fast (≥12 h).

Normal Ranges of lipids

Total Cholesterol - < 200 mg/dl [<5.2mmol/L

Triglyceride - < 150 mg/dl [<2.3mmol/L]

HDL molecules - > 50 mg/dl

LDL molecules - < 100mg/dl

VLDL molecules - < 150mg/dl

Normal range of Blood Sugar Level

Fasting blood sugar-70-99mg/dL

Postprandial Blood Sugar-<140mg/dL

Materials and Methods

Case report: A 50yr old male patient came to Ch. Brahm Prakash Ayurved Charak Sansthan, Khera dabar in special OPD of *Kayachikitsa* with Chief complaint of heart burn since 20 years, Breathlessness on exertion (*Kshudra swasa*), pain in calf muscle (*Angasada*), fatigue (*Alpa prana*) and weakness (*Daurbalya*), tiredness (*Sadan*) since 2 years.

History of present illness: Patient is apparently asymptomatic 2 years back, then patient had gradually onset of breathlessness on excretion, pain in bilateral calf muscle, fatigue and tiredness, etc He feels comfortable after taking Ayurvedic medicines. Hence, He came to our hospital for better management.

History of past illness: K/c/o diabetes mellitus since 2 years, having allopathic treatment for same. N/h/o hypertention, thyroid dysfunction

Treatment history: H/o taking antacid (ocid 20mg od) daily, since 20years, metformine 500mg od since 2 year.

Personal history: On Examination of patient, pallor, icterus, cyanosis, edema, and lymphadenopathy was absent, tongue was coated and he is vegetarian in diet style. Pulse rate is 82/min, B.P- 128/80. His appetite was poor, bowel was clear, micturation day/night 4-5/0-1 times, and sleep is diminished. Occupation is shopkeeper with sedentary life style. He has history of stress of loss of family member 20 year ago.

Investigation: 1. Lipid profile 2. Blood sugar 3. Liver function test 4. Kidney function test

Diagnosis: Metabolic disorder (*Medoroga, Prameha*)

Treatment plan

Oral medication: *Vidangadi kwath* which include *Haridra*, *Shunthi*, *Yasthimadhu*, *Gokshura* and *Vidanga*, 40ml BD before meal for 1month [1]. (Table 1)

Table1: Ingredients of *Vidangadi Kwath* including five herbal drugs

S.No.	Ingredients	Latin name	Proportion
1	*Haridra*	*Curcuma longa* linn.	1 part
2	*Shunthi*	*Zingiber officinale* rocs.	1 part
3	*Yasthimadhu*	*Glycyrrhiza Glabra*	1 part
4	*Gokshura*	*Tribulus terrestris*	1 part
5	*Vidanga*	*Embalia robusta* C.B Clark	1 part

Pathya -Apathya

Apathya Ahara

Godhuma (wheat), *Navanna*, *Sali Ikshu* (sugarcane), *Navnit*, *Ghrita, Dadhi* (curd) *Anupa*, *Audaka Masha*, *Tila.*

Apathya Vihar

Divaswapan (day sleeping), *Avyavaya* (sexual activities), *Avayayam* (less workout), *Swapam Prasang* (extreme sleeping), *Nitya Harsh* (cheerfulness), *Sukh Shaiya* (relaxed quilt), *Achintana* (less stress) and *Manso Nivriti* (sluggish mind).

Pathya Ahara Varga

***Dravya* (Liquids):** *Takra* (butter milk), *Madhu* (honey), *Ushnodaka*, *Til Tail*, *Sarshap Tail* (mustard oil), *Arishtha Asava* (fermented drugs), *Jirnamadya Dugdha*, *Ikshu* (sugarcane), *Navnit*, *Ghrita, Dadhi* (curd),

***Shuka Dhanya* (Cereals):** *Yava* (barley), *Venuyava*, *Kodrava* (millets), *Navanna*, *Shali* (rice paddy).

Shami Dhanya (Pulses): *Mudga* (green gram), *Rajmasha* (cow pea), *Kulattha* (Horse gram), *Chanak*, *Masur*, *Adhaki Masha* (Black gram) *Tila* (sesame seed).

Shaka Varga (Leafy vegetables):- *Vruntak*, *Patrashaka*, *Patola*, *Madhurshaka*, *Kanda*.

Pathya Vihara

Shrama (exertion) *Vyayam* (exercise), *Ratri Jagarn* (awakening in late nights) *Chintha* (rational) *Vyavay* (sexual activity) *Shoka* (grief) *Krodha* (rage).

OBSERVATION AND RESULT

The treatment led to significant improvements in various health parameters, as shown in Table 2. Fasting blood sugar (BSF) decreased from 157 to 128.3mg/dL, postprandial blood sugar (BSPP) dropped from 291 to 199.6mg/dL, total cholesterol was reduced from 280 to 138.98mg/dL, and triglyceride levels fell from 503 to 194.6mg/dL. Additionally, hemoglobin (Hb) showed a slight increase, rising from 11.8 to 12.1 g/dL.

In terms of symptom relief, as detailed in Table 3, the treatment provided notable improvements. Heartburn was alleviated with mild relief, while breathlessness, bilateral calf muscle pain, fatigue, tiredness, and weakness were completely resolved.

Table2: Assessment of objective criteria showing before and after treatment laboratory assessment

S.no.	Criteria	Before treatment 20/09/2023	After treatment 25/10/2023
1.	BSF	157	128.3
2.	BSPP	291	199.6
3.	T. Cholesterol	280	138.98
4.	Triglyceride	503	194.6
5.	Hb	11.8	12.1

Table 3: Assessment of subjective criteria showing before and after treatment symptomatic assessment

S.no.	Symptoms	Before treatment	After treatment
1.	Heart burn	Present	Mild relief
2.	Breathlessness on exertion	Present	Absent
3.	B/L calf muscle pain	Present	Absent
4.	Fatigue	Present	Absent
5.	Tiredness	Present	Absent
6.	Weakness	Present	Absent

DISCUSSION

This formulation available in Dicoction form which having five herbal drug (*Vidanga, Haridra, Shunthi, Gokshura, Yasthimadhu*). Most of contents (*Vidanga, Haridra, Shunthi*) in this *Yoga* are *Katu, Tikta rasa, Ushna virya* and *Katu vipaka* and having *Kaphagana* and *Vataanulomak* property. Due to that it clears the obstructed passage of *Srotas* and improve the *Jatharagni* wich are important to break the pathology of *Medoroga*, *Prameha* and other *Agnimandya* related disease.

Probable mode of action of *Shunthi*

Shunthi has the same *Deepan* property therefore it helps to encourage the rise *Agni* and *Anulomak*, which helps to eradicate constipation. The properties like *Ushna Veerya, Katu Rasa, Tikta Rasa Laghu Guna* Favoure to cleanse the *Srotavrodha*. *Shunthi* has *Vata kaphahara* quality pacify the

symptoms arising out of *Vata Dosha* and *Kapha Dosha*. *Shunthi* is botanically known as *Zingiber officinale Rosc*. It is one of the most common spices, which is in used since centuries for its versatile medicinal actions in Ayurvedic texts. The active compound responsible for its pungency, which makes up 25% of the oleoresin, is primarily composed of gingerols. The diverse biological effects of this plant have been demonstrated through scientific research, which is linked to its phytochemical components such as 10-Gingerdione, 6-Gingerdione, Gingerenone-A, Gingerenone-B, Gingerenone-C, Gingerol, and Zingiberone, among others. The main pharmacological actions of ginger and compounds isolated therefrom include immuno-modulatory, anti-tumorigenic, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, anti-lipidemic and anti-emetic actions. It is considered a safe herbal medicine with only few and insignificant adverse/side effects [2].

Hypercholesterolemia has been linked to increased oxidative stress and elevated lipid peroxidation. As a result, reducing oxidative stress in conditions of hypercholesterolemia is considered a key therapeutic strategy. Polyphenols, plant-derived phytochemicals, are known for their potent antioxidant effects. Polyphenols are capable of scavenging free radicals, chelating transition metalsand inhibiting lipid peroxidation. A report has shown an inverse correlation between polyphenol (flavonoid) intake and total plasma cholesterol concentrations[3].

Ginger-derived terpenes (α-zingiberene, camphene, α-curcumene, β-sesquiphellandrene, α-farnesene, β-bisabolene, α-piene) are known to avoid inflammatory processes and bacterial growth, have an antioxidant effect, help to prevent high blood sugar levels, act as painkillers or protectors of gastric tissue, and exert neuroprotective and anti-carcinogenic properties [4].

A study found that administering 500mg/kg of raw ginger significantly reduced serum glucose, cholesterol, and triglyceride levels in diabetic rats treated with ginger. Additionally, ginger treatment led to a notable decrease in urine protein levels. The ginger also resulted in reduced water intake and urine output in STZ-induced diabetic rats. These findings suggest that raw ginger has hypoglycemic, hypocholesterolemic, and hypolipidemic properties. Furthermore, raw ginger effectively reversed diabetic proteinuria in the rats, indicating its potential value in managing diabetic complications in humans.

In another experiment, the hypoglycemic effects of an aqueous extract of *Zingiber officinale* were evaluated in alloxan-induced diabetic rats, administered at a dose of 500 mg/kg body weight once daily for six weeks. The results showed a significant reduction ($p<0.05$) in serum glucose levels on day 21 and day 42 after treatment. [5]

Probable mode of action of *Haridra*

In Ayurvedic text *Acharya* recommended the use of *Haridra* (turmeric) combined with *Amla* juice and honey for the treatment of all types of *prameha* (diabetes). *Curcuma longa* Linn, commonly known as turmeric, is widely used in Indian households for treating various ailments. The rhizome of *Haridra* is recognized for its therapeutic properties and has been traditionally used by medical practitioners as an anti-diabetic, hypolipidemic, anti-inflammatory, anti-diarrhoeal, hepatoprotective, anti-asthmatic, and anti-cancer agent. *Curcuma longa* (turmeric) contains a variety of bioactive compounds, including curcuminoids, glycosides, terpenoids, and flavonoids. The isopropanol and acetone extracts of *Curcuma longa* have been shown to effectively inhibit the enzyme Human Pancreatic Amylase (HPA), which in turn reduces starch hydrolysis and lowers glucose levels. The primary bioactive polyphenolic compounds in turmeric, collectively known as curcuminoids, include curcumin, demethoxycurcumin, and bisdemethoxycurcumin.

According to the U.S. Food and Drug Administration (FDA), curcuminoids are considered generally safe for consumption. Curcumin, a major constituent and flavonoid of turmeric, has been widely studied for its anti-inflammatory and antioxidant effects. It is known to neutralize harmful reactive species such as superoxide anions, peroxynitrite radicals, and singlet oxygen. Over recent decades, curcumin has garnered significant attention for its therapeutic potential in treating various conditions, including inflammation, diabetes, cancer, and aging. Numerous studies, including in vitro, in vivo, and clinical trials, support its efficacy in these areas. Additionally, curcumin has been shown to reduce triglyceride levels, LDL (low-density lipoprotein), and total cholesterol.[6]

Hypercholesterolemia, which is associated with increased oxidative stress and lipid peroxidation, contributes to vascular damage through the generation of oxidized LDL (OxLDL). In this context, targeting oxidative stress is considered a key therapeutic strategy. Polyphenols, plant-derived phytochemicals with potent antioxidant properties, have been linked to a reduced risk of cardiovascular diseases [7].

Moreover, turmeric and curcumin have shown promising results in managing diabetes in both animal models and human patients. Studies have demonstrated that curcumin administration in diabetic rats led to a significant decrease in blood glucose levels

and an increase in plasma insulin levels, supporting its potential as a therapeutic agent for diabetes management [8].

Probable mode of action of *Gokshura*

Vitiated *Kapha* and *Pitta* in turns affect the *Jatharagni* and *Dhatwagni* and disrupts metabolism and produces an excess of deranged quality *Rasa, Meda, Kleda, Rakta,* etc. All the vitiated *Dhusyas* obstructs the path of *Vata* (*Avarana)*, Which gets aggravated and changes its path. It could increase the digestive power (*Agani*); cleanse each and every channel of the body and helps to normalize the function of *Rasavaha, Medovaha, Mootravaha srotas*. The *Gokshura* was found *Kledahana*, *Kapha-Pitta Nirharana*, due to correction of digestive fire and *Sroto Shodhana* it may help to form the *Dhatus* in proper proportion with appropriate qualities. It has diuretic, aphrodisiac, anti-urolithic, immunomodulatory, anti-diabetic, hypolipidemic, cardiotonic, hepatoprotective, anti-inflammatory, analgesic, antispasmodic, larvicidal and anti-cariogenic activities. They reported that furostanol and spirostanol saponins of tigogenin, neotigogenin, gitogenin, neogitogenin, hecogenin, neohecogenin, diosgenin, chlorogenin, ruscogenin, and sarsasapogenin types are frequently found in this plant[9].

Saponin from TT possesses hypoglycemic properties. TT significantly reduced the level of serum glucose, serum triglyceride, and serum cholesterol, while serum superoxide dismutase (SOD) activity was found to be increased in alloxan-induced diabetic mice[10]. The decoction of *TT* has demonstrated the ability to inhibit gluconeogenesis in mice. Administration of saponins from *TT* resulted in a significant reduction in postprandial blood glucose levels in rats. Additionally, *TT* has been shown to promote dilation of the coronary arteries, thereby improving coronary circulation. In Ayurveda, it is recommended for treating angina pectoris and other cardiac complications associated with diabetes. Therefore, *TT* may offer therapeutic benefits for managing diabetes by lowering blood glucose and lipid levels, as well as through its antioxidant effects [11].

The aqueous extract of *TT* fruits was assessed for its hypolipidemic effects in Wistar albino rats. A dose of 580mg/kg of the extract effectively reduced cholesterol-induced hyperlipidemia, leading to a decrease in cholesterol, triglycerides, low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and atherogenic index (AI), while increasing high-density lipoprotein (HDL) levels in the blood. The observed hypolipidemic effects are likely attributed to the presence of phenolic compounds, which enhance lipoprotein lipase activity in the muscles and reduce it in adipose tissues. This suggests that plasma triglycerides are utilized for energy production in muscles rather than being stored as fat in adipose tissue [12].

Probable mode of action of *Yasthimadhu*

Yashtimadhu (Liquorice), scientifically known as *Glycyrrhiza glabra* Linn., possesses a sweet taste *(Madhura Rasa),* a cooling property *(Sheeta Virya),* and a sweet post-digestive effect *(Madhura Vipaka).* It is known for its ability to balance *Vata* and *Pitta doshas*. Liquorice is a rich source of proteins, amino acids, polysaccharides, simple sugars, minerals, pectins, resins, starches, sterols, and gums. It also contains bioactive compounds such as oestrogens, tannins, phytosterols (including sitosterol and stigmasterol), and a range of vitamins (B1, B2, B3, B5, E, and C), as well as glycosides. Additionally, a variety of biological compounds, particularly triterpenes, saponins (which contribute to its sweet taste), and flavonoids, have been isolated from the plant. Modern scientific studies have confirmed a range of therapeutic properties for *Glycyrrhiza glabra*, including anti-ulcer, anti-inflammatory, antioxidant, hepatoprotective, and skin regeneration activities. The antioxidant effects of liquorice are particularly significant, with compounds like glabridin, hispaglabridin A, and 30-hydroxy-4-O-methylglabridin being identified as key contributors to its potent antioxidant activity. The hepatoprotective effects of glycyrrhizin and 18β-glycyrrhetic acid have also been well-documented, primarily due to their ability to inhibit free radical formation and prevent lipid peroxidation[13]. In a laboratory experiment, the ethanolic extract of glabridin, along with its ethyl-acetate soluble, water-soluble, and hexane-soluble fractions from *Glycyrrhiza glabra*, was found to reduce total serum cholesterol and triglyceride levels while increasing serum HDL (High-Density Lipoprotein) [14].

Probable mode of action of *Vidanga*

Embelia ribes Burm., commonly known as *Vidanga*, has been utilized in traditional medicine for its wide range of therapeutic effects, including analgesic, anthelmintic, anti-oxidant, anti-bacterial, anti-diabetic, anticancer, anti-hyperlipidemic, wound healing, and anti-spermatogenic properties, among others. The plant's extract is rich in essential oils, alkaloids, proteins, flavonoids, carbohydrates, phenolic compounds, and saponins, which are believed to contribute to its antioxidant activity. Key chemical compounds identified in the seeds include embelin, embeliaribyl ester, embeliol, and embelinol. Additionally, from the ethanolic extract of its fruits, compounds such as embelialkyl resorcinols A-I, virenol A, and pentaketides have also been isolated [15].

The lipid-lowering and antioxidant effects of an ethanol extract of *Embelia ribes* (200mg/kg, p.o., for 20 days) were evaluated in rats with streptozotocin (STZ)-induced diabetes (40mg/kg). In the diabetic rats treated with the ethanol extract, significant reductions ($p<0.01$) in blood glucose, serum total cholesterol, and triglycerides were observed, along with increased HDL cholesterol levels, compared to the untreated STZ-induced diabetic rats. The effects of the test drug were found to be comparable to those of gliclazide (25mg/kg, p.o.), a standard antihyperglycemic medication [16].

In another study, embelin (25 and 50mg/kg, p.o., for 21 days) was administered to alloxan-induced diabetic rats. The treatment resulted in a reduction in fasting blood glucose levels and an increase in body weight. Histological examination of the liver, kidney, and pancreas revealed normal tissue architecture, indicating that embelin helped restore the biological function of these organs [17]. Aqueous extracts of *Embelia ribes* (100 and 200mg/kg, p.o. for 40 days) were found to alleviate renal damage in STZ-induced diabetic rats.

This was achieved through improvements in blood glucose levels, lipid metabolism, blood pressure regulation, and inhibition of pancreatic lipid peroxidation. Embelin, a key compound, scavenges superoxide radicals by extracting their electrons and releasing molecular oxygen in a unique manner. Additionally, embelin significantly reduced the levels of inflammatory cytokines[18].

Meta-analysis findings described that administration of *emblica ribes* extract significantly decreased TG levels and increased HDL level in diabetic rats and treatment with it extracts in diabetic rats restored the elevated blood glucose level[19].

CONCLUSION

Patient having dyslipidemia along with obesity may contribute significantly to accelerated coronary atherosclerosis. Because risk factor of coronary heart disease is additive and perhaps multiplicative, even mild degree of dyslipidemia may enhance coronary heart disease risk. Therefore, therapeutic strategies along with lifestyle modification, for management of dyslipidemia are emphasized. *Vidangadi kwath* contribute to control coronary atherosclerosis in form of dyslipidemia management.

According to the Framingham Heart Study, dyslipidemia, which can range from hyper-cholesterolemia to hyperlipoproteinemia, is one of the many modifiable risk factors for coronary artery disease (CAD), stroke, and peripheral vascular disease. In diabetic dyslipidemia, lipid abnormalities may be the result of unbalanced metabolic states of diabetes (i.e., hyperglycemia and insulin resistance). Improved control of hyperglycemia does moderate diabetes associated dyslipidemia; therefore, lipid-modifying treatment is warranted in many diabetic patients. There is also considerable evidence that oxidative damage is increased in diabetes, though the mechanisms are not clear. Continued research in the field of medicine is dedicated to finding effective insulin alternatives, both from synthetic compounds and plant-based sources, for the management of diabetes. In traditional medicine, numerous plants and their extracts have long been used to treat diabetes, offering promising natural solutions alongside conventional treatments.

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