www.ijarp.com ISSN 2456-9992 Page: 01-10
International Journal Advanced Research Publications
Research Article
Volume: 02
Issue: 04

DRUGS UESD IN PREVENTION AND TREATMENT OF DIABETES

Danish Safder*[1], Noorul Huda[2], Tanya Sharma[3], Dhananjay Mistry[4], Kamalesh Mistry[5], Tusar Ranjan pati[6]

[1]Research Scholar, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.

[2]Associate Professor, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.

[3]Assistant Professor, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.

[4]Lecturer, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.

[5]Assistant Professor, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.

[6]Assistant professor, Dept. Of pharmaceutical Analysis, Nityananda college of pharmacy Balasore Odisha India – 756060.

Article Received: 16 March 2026, Article Revised: 06 April 2026, Published on: 26 April 2026

***Corresponding Author: Danish Safder**
Research Scholar, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.

DOI: https://doi-doi.org/101555/ijarp.7823

ABSTRACT:

Insulin resistance, as a common pathological process of many metabolic diseases, including diabetes and obesity, has attracted much attention due to its relevant influencing factors. To date, studies have mainly focused on the shared mechanisms between mitochondrial stress and insulin resistance, and they are now being pursued as a very attractive therapeutic target due to their extensive involvement in many human clinical settings. In view of the complex pathogenesis of diabetes, natural drugs have become new players in diabetes prevention and treatment because of their wide targets and few side effects. In particular, plant phenolics have received attention because of their close relationship with oxidative stress. In this review, we briefly review the mechanisms by which mitochondrial stress leads to insulin resistance. Moreover, we list some cytokines and genes that have recently been found to play roles in mitochondrial stress and insulin resistance. Furthermore, we describe several natural

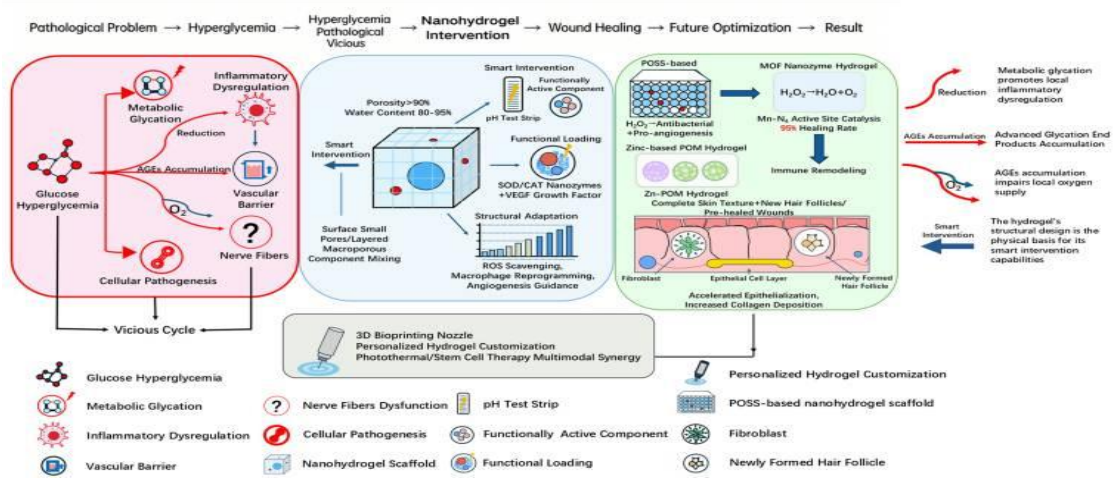
drugs that are currently widely used and give a brief overview of their therapeutic mechanisms. Finally, we suggest possible ideas for future research related to the unique role that natural drugs play in the treatment of insulin resistance through the above targets.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a group of heterogeneous drugs largely known for their anti-inflammatory, antipyretic, and analgesic effects, which are met by means of the inhibition of the cyclooxygenase (COX) enzymes. Even when their use in patients with diabetes mellitus is limited due to relevant adverse events, some pharmacological and metabolic effects of NSAIDs have been further studied to be potentially beneficial in the prevention and/or treatment of diabetic subjects. Effects on endogenous glucose production, peripheral insulin resistance, pancreatic islet, and systemic inflammation and the insulin clearance have been reported. In this article, we overview the scientific literature of the last 5 years regarding the potential effects of NSAID treatment on diabetes prevention/treatment.

KEYWORDS: COX inhibition; NSAIDs; diabetes; inflammation; salsalate. insulin resistance; mitochondrial stress; natural drugs.

INTRODUCTION:

Parkinson's disease (PD) is a neurodegenerative condition associated with progressive neuronal loss in the substantia nigra pars compacta (SNpc), the major origin of dopamine release in the brain . This deficiency in dopamine triggers tremors, rigidity, slowness of movement, and problems with balance and coordination . PD affects roughly 0.3% of the general population, with prevalence rising to about 1% among individuals over 60 years of age. Between 1990 and 2015, the worldwide prevalence of PD almost doubled, and with the increasing growing aging population, it has been estimated that this figure will reach 12 million by 2040.



The current therapeutic options for the management of PD aim to increase dopamine concentration at the synaptic level for symptomatic relief of motor deficits. The first-line drug for the management of PD is the dopamine replacement agent levodopa. As PD progresses, patients often need higher or more frequent dosing of this medication, which is limited by adverse effects such as dyskinesias . Levodopa is often formulated in combination with decarboxylase inhibitors (e.g., carbidopa, benserazide) to enhance its central bioavailability. However, the use of combined therapies also increases adverse side effects . Other drugs, such as monoamine oxidase B (MAO-B) inhibitors (e.g., rasagiline, safinamide, selegiline) or catechol-O-methyltransferase (COMT) inhibitors (e.g., entacapone, tolcapone), may also be used to improve dopamine levels, although sometimes symptoms may persist or worsen even with optimized dopaminergic therapy The protein α-synuclein (αS) is the key biological marker for PD. The accumulation of misfolded or oligomeric αS aggregates in the brain contributes to the observed neurodegeneration. The accumulation of αS can downregulate the expression of other proteins called sirtuins (Sirts) . Interestingly, studies have highlighted a link between PD and impaired insulin signaling pathways which can reduce sirtuin activity, exacerbate mitochondrial dysfunction, and promote αS aggregation. Understanding this metabolic-neuronal axis and the mechanisms underlying αS accumulation and sirtuins dysregulation may provide novel insights into potential therapeutic targets for PD.

Tregs and type 1 diabetes mellitus:

T1DM is a T lymphocyte-mediated autoimmune disease that results in the destruction of insulin-producing β cells within the islets of Langerhans, and accounts for 5%–10% of all diabetes cases . Although patients with T1DM have shorter lifespans than healthy people, the life expectancy of patients with T1DM has increased dramatically compared to that of patients 30 years ago owing to the commercial availability of insulin . The detailed pathogenesis of T1DM is unclear, but it has been shown to involve a number of factors. Genetic factors may contribute to the development of T1DM, as studies have shown that syndromic diabetes is strongly associated with consanguinity. Some genetically studies have found that the incidence of T1DM is about twice as common in males than in females. However, the reason for this sex difference is unknown. Epidemiologic, clinical, cellular, and molecular studies and animal experiments have shown that viral infections and metabolic factors are associated with the development of T1DM . In recent decades, immunity has also become a research hotspot.

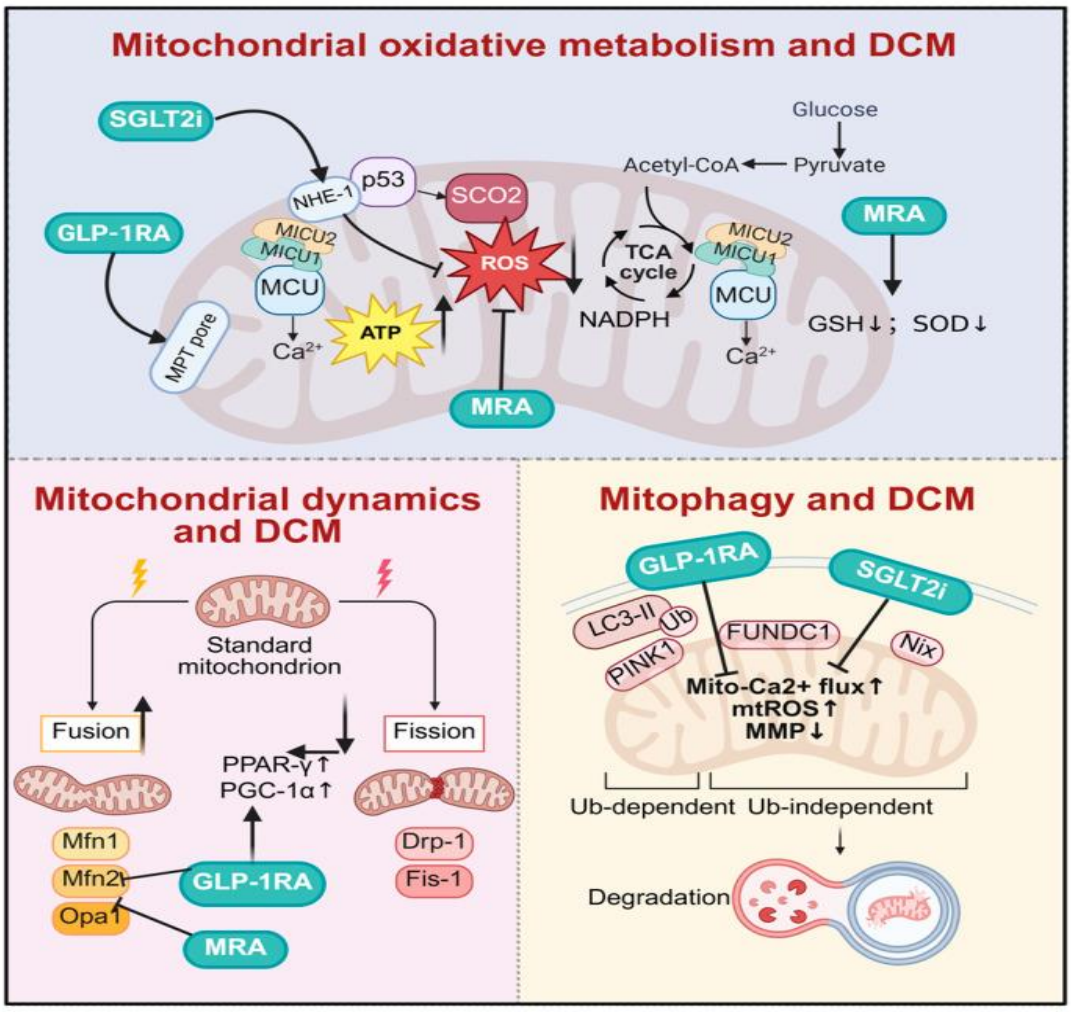
T1DM cannot be cured, and as patients age and the disease progresses, various complications can develop, including diabetic nephropathy, diabetic retinopathy, cardiovascular disease, and peripheral neuropathy . The main treatment is insulin, which is delivered by injection; however, some patients are prone to insulin resistance. As T1DM is characterized by the loss of self-tolerance to insulin-producing β cells in the pancreas, and Tregs are a key factor in maintaining immune self-tolerance. Studies have shown that Tregs can have a significant effect on T1DM. Tregs can delay the progression of T1DM by modulating immunity, lowering blood glucose levels, reducing islet damage and improving islet β cell function . Therefore, by providing a strong agonistic T-cell receptor ligand under sub-immunogenic conditions, it may be possible to promote the conversion of naïve CD4+ T cells into FoxP3+ Tregs, thereby restoring self-tolerance and effectively achieving autoimmune-specific prophylaxis. A preventive role for Tregs in T1DM has also been reported.

DPP-4 inhibitors and the risk of osteoarthritis in type 2 diabetes:

Osteoarthritis (OA) is the most common form of arthritis worldwide and a major cause of pain and disability, especially in older adults. People with type 2 diabetes mellitus (T2DM) are known to have a higher risk of developing OA. This may be due to shared risk factors such as obesity, chronic low-grade inflammation, and metabolic disturbances. Despite the high burden of OA, there are currently no effective disease-modifying treatments that can prevent its progression or delay the need for joint replacement surgery. Dipeptidyl-peptidase 4 inhibitors (DPP-4is) are widely prescribed medications for the treatment of T2DM. They improve blood sugar control by prolonging the action of hormones called incretins, which stimulate insulin release. In addition to their role in diabetes management, laboratory and animal studies suggest that DPP-4is may have protective effects on joint tissues by reducing inflammation and slowing the aging process of cartilage cells. However, no large-scale population studies had previously examined whether DPP-4i use is linked to a lower risk of OA in real-world settings. In this study, we used Taiwan's National Health Insurance Research Database to follow more than 165,000 matched pairs of patients with newly diagnosed T2DM from 2009 to 2018. We compared those treated with DPP-4is to those who did not receive these drugs. Patients were followed until the development of OA, the occurrence of hip or knee replacement surgery, or the end of the study period. We found that patients using DPP-4is had a substantially lower risk of developing OA and were less likely to undergo hip or knee replacement surgery. These results suggest that DPP-4is may not only help manage diabetes but also provide protection against OA.

PHARMACOLOGICAL TREATMENT:

DCM is a complication of diabetes mellitus that develops independently of coronary artery disease and hypertension. It is characterized by alterations in myocardial structure and function, progressing inevitably to heart failure. The underlying pathogenesis of DCM is complex, with no specific therapies currently available. Pharmacological treatment focuses on glycemic control, improvement in cardiac function, prevention of complications, and retardation of disease progression.



DIABETES INSIPIDUS:

DI is a rare disease , characterized by hypotonic polyuria and polydipsia . The differential diagnosis of DI involves the distinction between primary forms (central DI) or nephrogenic DI, and secondary forms, where polyuria results from primary polydipsia . Treatment of DI consists of fluid administration in case of dehydration, and in cases of central DI, desmopressin as hormone replacement for the absent vasopressin .

DISCUSSION:

VP secretion is known to be increased in DM, and previous studies suggest that this hormone influences renal haemodynamics and urinary albumin excretion. Understanding the consequences of this elevation in VP may thus be important in the prevention of the renal complications of diabetes. The present experiment evaluated the possible contribution of this hormone to several disturbances observed in DM. The main results show that, in the absence of VP, the glomerular hyperfiltration and rise in albumin excretion typical of DM were absent or largely blunted. Glycosuria was less severe and hypertrophy of the kidney and liver less intense in Brattleboro than in LE controls. These results strongly suggest that VP is involved in the onset and/or early phase of the renal complications of DM.

The streptozotocin model of DM mimics type I diabetes. This model is known to exhibit an increased VP secretion , a finding observed in LE rats in this study as judged by their urinary VP excretion. Control LE and Brattleboro rats share the same genetic background because the Brattleboro strain originated from a LE colony . Consequently, there is no reason to think that pancreatic β cells of Brattleboro rats could be less sensitive to the action of streptozotocin than those of LE rats. The differences in the intensity of diabetic symptoms or complications observed between the two strains are thus most likely attributable, directly or indirectly, to the lack of VP in Brattleboro rats.

CAUSES OF CENTRAL DIABESTES INSIPIDUS:

The etiology of neuronal destruction causing CDI is varied. A comprehensive recent review emphasized that most cases of acquired CDI develop as a result of 3 pathophysiological mechanisms:

1. Anatomical destruction of vasopressinergic neurons by neoplasms,
2. Traumatic damage, as result of traumatic brain injury (TBI) or neurosurgical intervention,
3. Autoimmune destruction of the AVP-secreting neurons.

In addition, familial forms of CDI caused by mutations in the AVP gene occur, usually presenting in childhood. These are usually monogenic disorders, caused by single mutations in the AVP gene, which lead to intracellular accumulation of mutant AVP precursors.

ABBREVIATIONS:

ADIOS T2D!

Adapting Diabetes Interventions to Improve Outcomes and Stop Type 2 Diabetes in Hispanic or Latino Communities

CAB

Community Advisory Board

CDC

Centers for Disease Control and Prevention

CHW

community health worker

DPP

Diabetes Prevention Program

GAD-7

Generalized Anxiety Disorder-7 Scale

IPAQ

International Physical Activity Questionnaire

LDBQ

Latino Dietary Behaviors Questionnaire

MVPA

moderate-to-vigorous physical activity

ORBIT

Obesity-Related Behavioral Intervention Trials

PHQ-8

Patient Health Questionnaire

SAFS

Short Attitudinal Familism Scale

SASH

Short Acculturation Scale for Hispanics

SSDS

Social Support for Diet scale

SSES

Social Support for Exercise scale

CURRENT NUTRITION THERAPY FOR GESTATIONAL DIABETES MELLITUS:

Nutritional therapy refers to daily meal planning that comprises the provision of energy, macronutrients, and vitamin supplements to guarantee adequate maternal and fetal nutrition while achieving glycemic objectives. A 2017 systematic review from the Cochrane Database including 19 trials, indicated a possible reduction in cesarean section deliveries for women who followed the Dietary Approaches to Stop Hypertension (DASH) versus a control diet at an overall unclear to moderate risk of bias (10 comparisons), but the evidence was considered to be of low quality using GRADE to assess outcomes . Several dietary advice interventions have been studied, such as low-to-moderate glycemic index (GI) diets versus moderate-to-high GI, energy-restricted diets versus non-energy-restricted diets, DASH versus control diets, and low-carbohydrate versus high-carbohydrate diets, rendering challenges in combining the findings to guide clinical practice towards a specific dietary pattern.

The ADA recommends a minimum of 175 g of carbohydrate, 71 g of protein, and 28 g of fiber for all pregnant women . Moreover, it emphasizes the importance of prioritizing monounsaturated and polyunsaturated fats in the diet while avoiding saturated and trans fats. In line with nutrition therapy guidelines for patients with diabetes, both the amount and kind of carbohydrates affect glucose levels . However, liberalizing higher-quality, nutrient-dense carbs was found to result in reduced fasting/postprandial glucose, decreased free fatty acids, improved insulin action, and vascular advantages, as well as the potential reduction of excess infant adiposity.

REFERENCES:

1. McIntyre H.D., Catalano P., Zhang C., Desoye G., Mathiesen E.R., Damm P. Gestational diabetes mellitus. Nat. Rev. Dis. Prim. 2019;5:47. doi: 10.1038/s41572-019-0098-8.
2. Fraser A., Nelson S.M., Macdonald-Wallis C., Cherry L., Butler E., Sattar N., Lawlor D.A. Associations of Pregnancy Complications With Calculated Cardiovascular Disease Risk and Cardiovascular Risk Factors in Middle Age. Circulation. 2012;125:1367–1380. doi: 10.1161/CIRCULATIONAHA.111.044784.
3. Miller HD. From volume to value: better ways to pay for health care. Health Aff. 2009;28(5):1418-1428. 10.1377/hlthaff.28.5.1418
4. Morris ZS, Wooding S, Grant J. The answer is 17 years, what is the question: understanding time lags in translational research. J R Soc Med. 2011;104(12):510-520.

5. Wilson KM, Brady TJ, Lesesne C; NCCDPHP Work Group on Translation. An organizing framework for translation in public health: the Knowledge to Action framework. Prev Chronic Dis. 2011;8(2)
6. Trends in prevalence of type 1 and type 2 diabetes in children and adolescents in the US, 2001-2017. Lawrence JM, Divers J, Isom S, et al. JAMA. 2021;326:717–727. doi: 10.1001/jama.2021.11165
7. Diabetic ketoacidosis in children newly diagnosed with type 1 diabetes mellitus: role of demographic, clinical, and biochemical features along with genetic and immunological markers as risk factors. A 20-year experience in a tertiary Belgian center. Vicinanza A, Messaaoui A, Tenoutasse S, Dorchy H. Pediatr Diabetes. 2019;20:584–593. doi: 10.1111/pedi.12864.
8. ESPE/LWPES consensus statement on diabetic ketoacidosis in children and adolescents. Dunger DB, Sperling MA, Acerini CL, et al. Arch Dis Child. 2004;89:188–194. doi: 10.1136/adc.2003.044875.
9. Acton Kelly J., Burrows Nilka Ríos, Moore Kelly, Querec Linda, Geiss Linda S., Engelgau Michael M. Trends in diabetes prevalence among American Indian and Alaska native children, adolescents, and young adults. Am J Public Health. 2002 Sep;92(9):1485–1490. doi: 10.2105/ajph.92.9.1485.
10. Anderson L. A., Bruner L. A., Satterfield D. Diabetes control programs: new directions. Diabetes Educ. 1995 Sep-Oct;21(5):432–438. doi: 10.1177/014572179502100507.
11. Baker E. L., Melton R. J., Stange P. V., Fields M. L., Koplan J. P., Guerra F. A., Satcher D. Health reform and the health of the public. Forging community health partnerships. JAMA. 1994 Oct 26;272(16):1276–1282
12. Barker D. J. P., Eriksson J. G., Forsén T., Osmond C. Fetal origins of adult disease: strength of effects and biological basis. Int J Epidemiol. 2002 Dec;31(6):1235–1239. doi: 10.1093/ije/31.6.1235
13. Weber BM, Narayan K. Diabetes prevention should be a public-health priority. Lancet. 2008;371:473–474. doi: 10.1016/S0140-6736(08)60233-0
14. Yoon K, Lee J, Kim J, Cho JH, Choi Y, Ko S, Zimmet P, Son H. Epidemic obesity and type 2 diabetes in Asia. Lancet. 2006;368:1681–1688. doi: 10.1016/S0140-6736(06)69703-1.
15. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020;396:1223–1249. doi: 10.1016/S0140-6736(20)30752-2

16. Murphy D, Chapel T, Clark C. Moving diabetes care from science to practice: the evolution of the National Diabetes Prevention and Control Program. Ann Intern Med. 2004;140(11):978–984. doi: 10.7326/0003-4819-140-11-200406010-00040.
17. Mukhtar Q, Jack L, Jr, Martin M, Murphy D, Rivera M. Evaluating progress toward Healthy People 2010 national diabetes objectives. Prev Chronic Dis. 2006 Jan;3(1):A11