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A COMPREHENSIVE REVIEW OF DIABETES MANAGEMENT: IMPLICATIONS FOR MEDICAL STAFF - REVIEW ARTICLE

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ABSTRACT

Background: Diabetes is a pressing global health crisis, with approximately 387 million people affected worldwide, reflecting an 8.3% prevalence rate. The majority of these individuals live in low- and middle-income countries and are in the 40–59 age group. In China and India, the prevalence is notably high, and certain genetic and lifestyle factors exacerbate the risk of diabetes and related conditions. **Aim:** This review aims to provide an updated analysis of diabetes management, focusing on emerging therapies, the role of medical staff, and the implications of new technologies and treatments in improving patient outcomes. **Methods:** A comprehensive literature review was conducted to evaluate current therapies for diabetes management, including pharmacological, non-pharmacological, and technological interventions. The review also examines secondary forms of diabetes and the role of novel therapeutic approaches like stem cell technology, gene therapy, and nanotechnology. **Results:** The review highlights the effectiveness and limitations of various diabetes therapies, including traditional medications like metformin and sulfonylureas, and newer treatments such as incretin mimetics and combination therapies. It also discusses advancements in nanotechnology, stem cell research, and gene therapy, noting their potential to transform diabetes treatment. **Conclusion:** Effective diabetes management requires a multifaceted approach that includes optimizing existing therapies and integrating new technologies. While advancements in nanotechnology, stem cell therapy, and gene therapy offer promising avenues for treatment, challenges such as safety, cost, and technological limitations persist. Medical staff must stay abreast of these developments to provide comprehensive care and improve patient outcomes.

KEYWORDS: Diabetes management, glucose-lowering therapies, nanotechnology, stem cell therapy, gene therapy, medical staff implications.

INTRODUCTION

Diabetes is a critical global health issue, with its alarming escalation presenting a severe challenge to humanity. Recent estimates indicate that approximately 387 million individuals are affected by this condition worldwide, reflecting a prevalence rate of 8.3%, with 46.3% of these cases remaining undiagnosed.[1] Notably, the majority of these individuals reside in low- and middle-income countries and fall within the 40–59 age bracket. A population survey conducted by the Indian Council of Medical Research[2] highlights China as having the highest incidence, with an estimated 98.4 million cases, followed by India with 65.1 million diabetes patients.[3] Certain characteristics prevalent among Asian Indians contribute to their heightened susceptibility to diabetes and coronary artery disease[4,5], such as elevated insulin resistance[6] and increased abdominal adiposity.[7]

The choice and application of glucose-lowering therapies depend on various factors, including the extent of hyperglycemia, hepatic and renal function, hypoglycemia risk, body mass index, self-monitoring capability, and medication cost. For type 1 diabetes, therapeutic strategies encompass insulin secretion stimulation using GLP analogues like Exenatide and Liraglutide[8,9], insulin injections to address β cell deficiencies, dipeptidyl peptidase-4 (DPP-4) inhibitors such as Sitagliptin, and methods to enhance islet survival.[10,11] Additionally, islet cell regeneration is targeted through islet neogenesis-associated protein (INGAP) peptide therapy.[12] In the management of type 2 diabetes, traditional therapeutic options include sulfonylureas and repaglinide, which augment insulin secretion; troglitazone, which enhances insulin action in adipose and muscle tissues; metformin, which facilitates insulin mechanisms in liver cells; and miglitol and acarbose, which delay carbohydrate absorption from dietary intake.[13] However, these

treatments are often accompanied by significant side effects. Alternative strategies include combination therapies, such as insulin with sulfonylureas, which reduce daily insulin requirements[14], and the FDA-approved insulin and metformin combination, which helps minimize weight gain associated with insulin therapy.[15] Additionally, combining troglitazone with insulin effectively reduces insulin needs and improves glycemic control.[16]

Secondary forms of diabetes may arise due to genetic defects or mutations. These include various types of Maturity Onset Diabetes of the Young (MODY), such as MODY1 caused by mutations in the hepatocyte nuclear factor-4-alpha (HNF4α) gene located on chromosome 20q12-q13.1; MODY2 due to mutations in the glucokinase (GCK) gene on chromosome 7p15-p13; MODY3 resulting from mutations in the hepatocyte nuclear factor-1-alpha (HNF1A) gene on chromosome 12q24.2; MODY4 linked to mutations in the insulin promoter factor-1 (IPF1) gene on chromosome 13q12.1; MODY5 associated with mutations in the hepatic transcription factor-2 (TCF2) gene on chromosome 17cen-q21.3; MODY6 involving mutations in the neurogenic differentiation 1 (NEUROD1) gene on chromosome 2q32; MODY7 due to mutations in the Kruppel-like factor 11 (KLF11) gene on chromosome 2p25; MODY8, or diabetes-pancreatic exocrine dysfunction syndrome, related to mutations in the carboxylester lipase (CEL) gene on chromosome 9q34; and MODY9, which involves mutations in the paired box gene 4 (PAX4) on chromosome 7q32. Additionally, mitochondrial diabetes, specifically MELAS syndrome, is associated with mutations in the mitochondrial genome and includes mitochondrial myopathy, stroke-like episodes, encephalopathy, and lactic acidosis. Genetic syndromes such as Klinefelter's syndrome, Turner's syndrome, Down syndrome, Prader-Willi syndrome, Laurence-Moon-Biedl syndrome, Friedreich's ataxia, Huntington's chorea, myotonic dystrophy, and porphyria are also linked to diabetes. Drug- or chemical-induced diabetes can result from the use of medications and substances such as thiazides, DPH, α-interferon, L-asparaginase, vacor, nicotine, pentamidine, steroids, levothyroxine, and diazoxide.[17]

Addressing diabetes and its complications requires a strategic approach aimed at achieving effective glycemic control. This involves assessing the current glycemic status and analyzing associated disorders to provide appropriate healthcare resources.[18] Newer medications, such as sulfonylureas and insulin, may lead to hypoglycemia and weight gain[19], while biguanides like metformin can cause gastrointestinal issues including diarrhea and nausea, and rarely, lactic acidosis. Thiazolidinediones are also associated with weight gain, which is particularly concerning for type 2 diabetic patients who are often already obese.[20] Recent drugs like incretin mimetics may cause nausea, vomiting, and diarrhea.[21] Despite the availability of these treatments, achieving comprehensive glycemic control remains a significant challenge. Current trends in diabetes management underscore the need for further research into natural products and their analogues for drug development. This paper provides an update on the global prevalence and scenario of diabetes and explores emerging trends in clinical diabetology, including the advantages and limitations of current therapies. The development of next-generation therapeutics, such as statins, nanotechnology, and stem cell technology, highlights the potential of natural products and their analogues in advancing diabetes treatment and management.

Classification of Diabetes

Insulin Dependent Diabetes Mellitus (IDDM), also referred to as juvenile-onset diabetes or type 1 diabetes, represents 5–10% of diabetes cases and results from an autoimmune-mediated destruction of pancreatic beta cells. This form of diabetes can manifest at any age but is predominantly diagnosed in children and young adults. Management requires continuous insulin administration to maintain blood glucose levels. The progression of beta cell destruction varies: it tends to be rapid in infants and children, while it occurs more slowly in adults. Symptoms commonly include ketoacidosis in younger individuals, whereas older patients might experience modest fasting hyperglycemia that can escalate to severe hyperglycemia or ketoacidosis under stress or infection.[22] Additionally, individuals with IDDM are at increased risk for other autoimmune conditions such as Graves' disease, vitiligo, celiac disease, autoimmune hepatitis, myasthenia gravis, Hashimoto's thyroiditis, Addison's disease, and pernicious anemia.[22] This type of diabetes exhibits a hereditary component and is more prevalent among people of African and Asian descent.[23]

Primary diabetes includes insulin-dependent diabetes mellitus, characterized by the destruction of beta cells and consequent insulin deficiency, and non-insulin-dependent diabetes mellitus, marked by insulin resistance and reduced insulin secretion. Secondary diabetes can result from hormonal imbalances, such as acromegaly and pheochromocytoma; pancreatic dysfunction, including pancreatitis, pancreatectomy, Cushing's syndrome, and glucagonoma; or drug and chemical-induced reactions from agents like thiazides, psychoactive drugs, and anticancer agents. These secondary conditions can lead to hypersensitivity reactions, insulin receptor abnormalities, and various genetic syndromes. Additionally, secondary diabetes can be associated with hyperlipidemia, muscular dystrophy, and malnutrition, leading to hyperglycemia, glycosuria, ketonuria, dehydration, lipemia, and acidosis. Complications may include cataracts and vascular lesions, such as atheromatous and atherosclerotic changes.

Idiopathic Diabetes affects a small subset of individuals with type 1 diabetes, predominantly among those of

Asian and African descent, where no identifiable etiology can be determined. These patients experience recurring ketoacidosis and exhibit a persistent state of insulinopenia. The frequency of ketoacidosis episodes and the level of insulin deficiency between these episodes can vary significantly. Idiopathic diabetes is believed to have a genetic predisposition, and the necessity for insulin replacement therapy is contingent upon the patient's specific condition.[22]

Noninsulin Dependent Diabetes Mellitus (NIDDM), also known as adult-onset diabetes, constitutes 90–95% of all diabetes cases. This form of diabetes is strongly associated with major metabolic conditions such as obesity, insulin resistance, and dyslipidemia, which have contributed to its epidemic proportions.[24] Treatment typically involves oral hypoglycemic agents and dietary modifications. Both insulin resistance and diminished insulin secretion are central to the disease's onset. NIDDM is the most prevalent type of diabetes and is the fourth leading cause of death in developed nations, with a twofold increase in mortality and a two- to fourfold higher risk of coronary heart disease and stroke.[25]

Gestational Diabetes Mellitus (GDM) is characterized by any degree of glucose intolerance leading to hyperglycemia of varying severity, diagnosed during pregnancy.[26] GDM, or impaired glucose intolerance first identified during pregnancy[27], affects approximately 14% of pregnant women, translating to 135,000 cases annually in the United States. It serves as a risk factor for developing type 2 diabetes later in life.[28] The risk associated with GDM varies based on ethnicity, diagnostic criteria, and screening methods.[29] GDM can result in complications such as respiratory distress syndrome, neonatal hypoglycemia, and fetal macrosomia, with increased incidence of birth trauma, shoulder dystocia, and cesarean deliveries. Current guidelines emphasize achieving adequate glycemic control to mitigate these maternal and fetal risks. While most women with GDM can manage their blood glucose levels through diet and exercise, some may require oral medications or insulin.

Catamenial Hyperglycemia refers to diabetic ketoacidosis (DKA) that occurs before the menstrual cycle in females, often triggered by factors such as infection, inadequate insulin therapy, acute pancreatitis, stroke, or metabolic disturbances.[30] This condition is marked by uncontrolled hyperglycemia, necessitating insulin doses up to four times higher than usual. Despite continuous insulin infusion, symptoms can worsen, leading to vomiting, significant acidosis, ketonuria, and hyperglycemia. Diagnostic tests, including inflammatory markers, blood counts, renal function tests, electrocardiograms, chest radiographs, thyroid function tests, and urine and blood cultures, often return normal results. The causes of catamenial hyperglycemia remain largely undiagnosed.[31] Hormonal fluctuations during the menstrual cycle, combined with variations in diet and exercise, may contribute to this condition.[32] Effective management of catamenial diabetic ketoacidosis involves implementing comprehensive diet and exercise plans[33] and adjusting insulin infusion rates[32] to prevent diabetic emergencies.

Nanotechnology and Diabetes

Nanotechnology has significantly advanced the treatment of diabetes by introducing innovative approaches for glucose measurement and insulin delivery. Researchers have highlighted the potential benefits of glucose sensors and closed-loop insulin delivery systems, demonstrating their effectiveness in managing both type 1 and type 2 diabetes.[34] One notable advancement is the use of nanomedical devices, specifically microcapsules with pores. These microcapsules are designed to facilitate drug delivery by allowing the passage of small molecules such as oxygen, glucose, and insulin while blocking larger immune system molecules like immunoglobulins and virus particles. Implantation of microcapsules containing islets of Langerhans cells, typically derived from pigs, beneath the skin of diabetic patients could offer a temporary restoration of glucose control without the need for potent immunosuppressants, thus reducing the risk of serious infections.[35]

Challenges associated with diabetes and how nanomedicine addresses these issues:

Measurement Problems and Nanometrology Solutions

- **Continuous Blood Glucose Monitoring**: Stable implanted enzyme electrodes.
- **Noninvasive Monitoring**: Biocompatible nanofilms, "smart tattoos" of glucose, and nanosensors.
- **Improved Diagnosis**: Targeted molecular imaging, near-infrared quantum dots (NIR QDs), and gold nanoparticles.
- **Understanding Mechanisms**: Single-molecule detection.

Therapy Problems and Nanotherapeutic Solutions

- **Improved Insulin Delivery**: Islet cell transplantation, oral insulin, closed-loop insulin delivery, islet nanoencapsulation, and insulin nanoparticles.
- **Artificial Nanopancreas**: Targeted drug delivery using nanoparticles to enhance drug bioavailability by directing the highest dose to specific tissues, organs, or tumors.

Despite these advancements, there are significant technological and safety challenges. Manufacturing three-dimensional nanostructures is complex and lacks standardized techniques compared to simpler two-dimensional nanosurfaces. Additionally, concerns regarding the potential toxicity or hazards of engineered nanomaterials, such as carbon buckyballs and nanotubes, through inhalation, ingestion, or skin absorption, are

growing.[35] Traditional insulin delivery methods, including injections, are often painful and result in poor patient compliance. However, recent developments in micro- and nanotechnology have improved insulin delivery systems, offering alternatives such as pulmonary, nasal, transdermal, and closed-loop systems.[36] These advancements aim to enhance the convenience and effectiveness of insulin administration for diabetes management.

Statin Therapy: A New Perspective

Statins are pharmacological agents that act as inhibitors of 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase, a crucial enzyme involved in the synthesis of low-density lipoprotein (LDL) cholesterol in the liver. By inhibiting this enzyme, statins significantly lower blood cholesterol levels and contribute to the health of blood vessel linings.[37] Given the heightened cardiovascular risk associated with long-term diabetes, statins are widely used as a primary therapeutic strategy for reducing cardiovascular risk in patients with type 2 diabetes.[38,39] These lipid-lowering agents target HMG-CoA reductase specifically and reversibly, disrupting the conversion of HMG-CoA to mevalonic acid, which is a critical step in cholesterol production. Statins are notably more effective in lowering cholesterol levels compared to dietary supplements.[40]

Statin therapy has been shown to markedly reduce LDL cholesterol levels, thereby substantially lowering the risk of developing coronary artery disease.[41] Guidelines from the National Institute for Health and Clinical Excellence (NICE) and the Scottish Intercollegiate Guidelines Network (SIGN) recommend lipid-lowering therapy as a primary preventive measure for patients with type 2 diabetes over the age of 40 (Grade A recommendation). They also suggest considering this therapy for patients with type 1 diabetes aged over 40 (Grade B recommendation).[41] Recent findings presented at a European Association for the Study of Diabetes meeting in Stockholm indicate that statin use remains underutilized among type 2 diabetes patients, with a large American cohort of over 100,000 individuals demonstrating this trend.[42]

While statins are effective in reducing cardiovascular events, even in individuals with modest cholesterol levels and without pre-existing cardiovascular disease, they are not without drawbacks. Statin therapy can cause side effects including renal dysfunction, muscle disorders ranging from myositis to severe rhabdomyolysis, and, rarely, hepatic dysfunction.[41] A trial involving 6,422 patients revealed that younger individuals and those without pre-existing cardiovascular disease often exhibit poor compliance with statin therapy.[38] Consequently, treatment should be prioritized for older patients and those with significant risk factors or symptoms of heart disease.[41] Additionally, although statins generally exhibit good tolerability and fewer adverse effects, they may cause moderate increases in blood glucose levels, potentially leading to diabetes mellitus.[37] Despite these concerns, statins remain a cornerstone of cardiovascular risk management, though they may occasionally induce myopathies and elevate liver enzyme levels in patients with type 2 diabetes.[43]

Stem Cell Technology: A Novel Therapeutic Approach

Stem cell technology offers a promising frontier in diabetes treatment by addressing the underlying issue of β cell deficiency in both type 1 and type 2 diabetes. The loss of β cells in the pancreas results in insufficient insulin production, necessitating innovative strategies either to repair or replace these cells or to enhance insulin sensitivity in the body. Current approaches, such as islet and pancreas transplantation, face limitations due to organ donor shortages.[44]

Type 1 diabetes is primarily caused by autoimmune destruction of pancreatic β cells, whereas type 2 diabetes involves β cell dysfunction coupled with insulin resistance.[45] Mesenchymal stem cell (MSC) therapy has shown promise, particularly in type 1 diabetes, due to MSCs' immunosuppressive properties. MSCs can modulate immune responses both in vitro and in vivo, thanks to their direct contact with other cells and the production of soluble factors.[46–49] Hematopoietic stem cells, which are multipotent and capable of differentiating into various blood cell types, have also demonstrated immunomodulatory effects, improving β cell function in newly diagnosed type 1 diabetic patients.[50] Induced pluripotent stem (iPS) cells, generated by reprogramming adult fibroblasts from type 1 diabetic patients with transcription factors OCT4, SOX2, and KLF4, show potential for differentiating into insulin-producing cells, facilitating disease modeling and cell replacement therapies.[51] Bone marrow-derived MSCs have been shown to differentiate into insulin-producing cells in both in vitro and in vivo settings.[52–54] Human embryonic stem cells (ESCs) are another area of interest due to their pluripotency and ability to produce various cell types. However, their application is hampered by challenges such as the lack of reliable methods for generating specific cell types, potential immunological rejection, and difficulties in purifying specific lineages.[55] Concerns also include the risk of uncontrolled proliferation of transplanted embryonic stem cells.[56] Despite these challenges, stem cell technology holds significant promise for advancing diabetes treatment.

Gene Therapy in Diabetes

Gene therapy has transformed the field of medicine since the 1970s with the cloning and expression of insulin in cultured cells, offering potential cures for diabetes. Effective regulation of blood glucose levels is critical in managing diabetes and preventing its complications. Somatic gene therapy involves two main methods: ex vivo and in vivo gene therapy. Ex vivo gene therapy entails removing tissues from the body, inserting therapeutic genes in vitro, and reimplanting the modified

tissues, while in vivo therapy involves directly delivering gene therapy vectors to patients through various routes, including subcutaneous, intravenous, or local injections.[57]

Ex vivo gene therapy aims to generate cells with β cell properties, such as insulin-producing cells, for transplantation. However, this approach involves the surgical removal and reimplantation of genetically modified tissues.[57] Type 1 diabetes, resulting from autoimmune destruction of insulin-producing β cells, has seen exploration of insulin gene therapy as a potential solution by generating insulin-secreting non-β cells resistant to autoimmune attacks.[59] In vivo gene therapy, preferred for its simplicity, involves direct insertion of gene therapy vectors into patients. Challenges include developing safe and effective vectors. Current strategies include transferring glucose-lowering genes that are non-insulin-based and applying genes that enhance glucose utilization or inhibit glucose production by the liver.[57] For example, glucokinase as a transgene can lower glucose levels in the liver[60] and has been used as an adjuvant therapy.[62] Another strategy involves the gene "protein targeting glycogen" (PTG), which converts glucose to glycogen. Adenoviral-mediated PTG transfer has been shown to stimulate glycogen synthesis and reduce blood glucose levels in rats.[63,64]

Other areas of gene engineering focus on glucose-responsive genes and inducing β cell production in the liver. Manipulating glucose-responsive genes to enhance proinsulin conversion and modifying insulin genes to encode single-chain insulin with reduced activity are ongoing research areas.[65–71] Inducing β cell formation by delivering islet-specific transcription factors is also a promising approach, offering potential solutions for type 1 diabetes autoimmunity.[72,73] Despite the complexities of regulating insulin production and metabolism, these strategies represent significant advancements in diabetes therapy.[74]

Diabetes and Nutrition

Medical Nutrition Therapy (MNT) plays a crucial role in the prevention and management of diabetes, focusing on dietary strategies to treat and manage the condition. Coined by the American Diabetes Association in 1994, MNT comprises two main phases: assessing an individual's nutritional needs and providing treatment through counseling and tailored nutrition therapy.[75] The primary goals of MNT in diabetes management include achieving optimal lipid levels in the blood, maintaining an ideal body weight, and keeping blood glucose levels within the normal range. Effective nutritional therapy is individualized, considering factors such as the patient's age, food preferences, medical conditions, and exercise regime.[76,77] For weight management, calorie requirements are set based on activity levels. Moderately active individuals typically require 30–35 kcal/kg/day, while obese individuals need 20–30 kcal/kg/day. To achieve gradual weight loss, a reduction of 500 calories per day is recommended, aiming for a loss of about 1 lb. per week.[76,77]

Recent guidelines suggest that carbohydrate intake should be adjusted according to protein and fat consumption. While low carbohydrate/high protein diets can lead to initial weight loss and improved glycemic control, they are often difficult to sustain in the long-term. Protein intake should constitute 10–20% of total calories, and total fat intake should be limited to <30% of total calories. A high-fiber diet (20–35 g/day of soluble and insoluble fiber), sodium restriction to 2400–3000 mg/day, moderate alcohol consumption (≤2 drinks/day for men, ≤1 drink/day for women), and the use of multivitamins are also recommended.[76,77]

Herbal medicines have historically been utilized for managing both insulin-dependent and non-insulin-dependent diabetes, offering potential adjuncts to conventional therapies or sources of novel hypoglycemic compounds. The use of naturopathic therapies dates back to ancient times, with references to diabetes in Ayurvedic texts such as the Sushruta Samhita from the fourth and fifth centuries BC.[78] These texts described diabetes as either genetically based or resulting from dietary indiscretion. The popularity of herbal medicines continues due to their cost-effectiveness and relatively few side effects. While many plant-based medicines have been traditionally used to treat diabetes, the mechanisms of action for most herbs remain poorly understood and need standardization.[79] Despite this, some bioactive compounds isolated from plants have demonstrated antidiabetic effects comparable to or even more potent than known oral hypoglycemic agents like daonil, tolbutamide, and chlorpropamide.[80]

Plants with documented antidiabetic properties include Allium sativum (garlic), Gymnema sylvestre, Murraya koenigii (curry leaf), Allium cepa (onion), Withania somnifera (ashwagandha), and Ferula foetida. These plants have shown varying degrees of hypoglycemic and antihyperglycemic activity in experimental models.[81] For instance, Gymnema sylvestre has been extensively studied for its antidiabetic properties and is noted for its potential role in diabetes management.[84,85] The chemical structures of phytomolecules play a crucial role in their antidiabetic activity. Plant species rich in terpenoids, flavonoids, phenolics, coumarins, and other bioactive compounds have shown promise in reducing blood glucose levels.[83] These traditional approaches may offer valuable insights and natural solutions for managing diabetes and its complications.[82]

CONCLUSION

Diabetes management continues to evolve with advancements in pharmacological and non-pharmacological therapies, as well as emerging technologies. Traditional treatments such as sulfonylureas, metformin, and insulin have been fundamental in managing diabetes, but their limitations

in terms of side effects and efficacy have led to the exploration of newer therapies. Incretin mimetics and combination therapies have shown promise in enhancing glycemic control while mitigating adverse effects such as weight gain. Nanotechnology has introduced innovative solutions for diabetes management, including glucose sensors and closed-loop insulin delivery systems. These advancements offer potential improvements in patient compliance and treatment efficacy. However, challenges related to the manufacturing and safety of nanomaterials must be addressed. Stem cell technology holds promise for addressing β cell deficiency in diabetes. Although research in mesenchymal stem cells and induced pluripotent stem cells is ongoing, issues such as immunological rejection and the risk of uncontrolled proliferation remain significant obstacles. Despite these challenges, stem cell therapy presents a potential breakthrough in diabetes treatment. Gene therapy represents another frontier, with efforts focused on developing vectors for insulin production and enhancing glucose utilization. Both ex vivo and in vivo approaches are being explored, with varying degrees of success. The development of glucose-responsive genes and β cell induction techniques may offer future solutions to type 1 diabetes autoimmunity. In conclusion, the integration of these advanced therapies into clinical practice requires ongoing research and adaptation. Medical staff must be well-informed about these innovations to optimize patient care and improve long-term outcomes. Continued advancements in diabetes management will depend on addressing current limitations and harnessing the potential of new technologies.

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مراجعة شاملة لإدارة مرض السكري: الآثار على الطاقم الطبي - مقالة مراجعة

الملخص:

الخلفية :يعتبر مرض السكري أزمة صحية عالمية ملحة، حيث يؤثر على حوالي 387 مليون شخص حول العالم، مما يعكس معدل انتشار يبلغ 8.3%. يعيش معظم هؤلاء الأفراد في البلدان ذات الدخل المنخفض والمتوسط ويتراوحون في الفئة العمرية 40-59 عامًا. في الصين والهند، يكون الانتشار ملحوظًا، وتؤدي بعض العوامل الجينية ونمط الحياة إلى زيادة مخاطر الإصابة بمرض السكري والحالات ذات الصلة.

الهدف :تهدف هذه المراجعة إلى تقديم تحليل محدث لإدارة مرض السكري، مع التركيز على العلاجات الناشئة، ودور الطاقم الطبي، وآثار التقنيات والعلاجات الجديدة في تحسين نتائج المرضى.

الطرق :تم إجراء مراجعة شاملة للأدبيات لتقييم العلاجات الحالية لإدارة مرض السكري، بما في ذلك التدخلات الدوائية وغير الدوائية والتكنولوجية. كما تستعرض المراجعة الأشكال الثانوية للسكري ودور الأساليب العلاجية الجديدة مثل تكنولوجيا الخلايا الجذعية، والعلاج الجيني، وتكنولوجيا النانو.

النتائج :تسلط المراجعة الضوء على فعالية وقيود العلاجات المختلفة للسكري، بما في ذلك الأدوية التقليدية مثل الميتفورمين والسلفونيل يورياز، والعلاجات الأحدث مثل المحاكيات الببتيدية التراخية والعلاجات المركبة. كما تناقش التقدمات في تكنولوجيا النانو، وبحوث الخلايا الجذعية، والعلاج الجيني، مشيرة إلى إمكانياتها في تحويل علاج السكري.

الاستنتاج :يتطلب إدارة مرض السكري الفعالة نهجًا متعدد الجوانب يشمل تحسين العلاجات الحالية ودمج التقنيات الجديدة. بينما توفر التقدمات في تكنولوجيا النانو، وعلاج الخلايا الجذعية، والعلاج الجيني طرقًا واعدة للعلاج، تظل التحديات مثل السلامة، والتكلفة، والقيود التكنولوجية قائمة. يجب على الطاقم الطبي متابعة هذه التطورات لتقديم رعاية شاملة وتحسين نتائج المرضى.

الكلمات المفتاحية :إدارة السكري، العلاجات المخفضة للغلوكوز، تكنولوجيا النانو، علاج الخلايا الجذعية، العلاج الجيني، آثار الطاقم الطبي.