# Abstract

Diabetes mellitus (DM) is a global health issue with a prevalence of 10.5% worldwide, projected to increase to 12.2% by 2045. Type 2 DM, also known as non-insulin subordinate DM, is characterized by hyperglycemia, insulin resistance, and insulin inadequacy. It is linked to hereditary, natural, and lifestyle factors. The disease causes short- and long-term complications and increased mortality. Treatments for DM include GLP-1 analogs and DPP-IV inhibitors, which help standardize fasting and postprandial glucose levels and develop beta-cell function. Fat tissue plays a significant role in the pathogenesis of T2DM. Effective management involves a balanced lifestyle, including a Mediterranean diet, regular physical activity, and weight reduction. Local health workers can help in diabetes self-management and general care, while reducing smoking and limiting saturated and trans fats is crucial for cardiovascular health.

Diabetes management focuses on controlling hyperglycemia to reduce complications and improve personal satisfaction. Clinical practice guidelines recommend maintaining HbA1c levels at 7% or 6% and constant glucose monitoring time over 70% for non-pregnant adults with type 2 diabetes. However, there is limited evidence on the relationship between time in reach and diabetes-related complications. Intensive glycemic control in people with fragility, age, and multi morbidity increases the risk of severe hypoglycemia. The special issue "Diabetes Mellitus: Current Research and Future Perspectives" emphasizes personalized medicine in treating type 2 diabetes and monogenic diabetes of the young.

**Keywords:** Type 2 diabetes mellitus; Diagnosis: Management; Newer drug; Advance treatment; Future Perspective

# Introduction

Diabetes mellitus (DM) is likely one of the most seasoned sicknesses known to man. It was first detailed in Egyptian composition around a long time back. In 1936, the differentiation between type 1 and type 2 DM was plainly made. Type 2 DM was first depicted as a part of metabolic condition in 1988. Type 2 DM (previously known as non-insulin subordinate DM) is the most well-known type of DM portrayed by hyperglycemia, insulin obstruction, and relative insulin inadequacy. Type 2 DM results from association between hereditary, natural and conduct risk factors. Individuals living with type 2 DM are more powerless against different types of both short-and long haul inconveniences, which frequently lead to their unexpected passing. This propensity of expanded dismalness and mortality is found in patients with type 2 DM as a result of the regularity of this kind of DM, its guileful beginning and late acknowledgment.

Diabetes, a constant and moderate cardio metabolic problem, is a significant reason for dreariness, incapacity, and mortality around the world. Extensive individual focused administration of diabetes expects thoughtfulness regarding glycemic control and chance variables for cardiovascular illness (hyperlipidaemia, hypertension, and tobacco use), weight the board, early location and treatment of micro vascular, macro vascular, and metabolic complexities of diabetes and psychological wellness concerns, moderation of weight of treatment, tending to social determinants of wellbeing, and working on personal satisfaction. The previous ten years has seen different advancements in every part of the administration of diabetes. This survey centres explicitly around late advances in the administration of hyperglycemia in diabetes, including drug and non- drug medicines. Individuals with diabetes, guardians, clinicians, wellbeing frameworks, payers, and strategy producers need to see the value in the intricacy and cost associated with ideal consideration of diabetes to genuinely work on the wellbeing and prosperity of individuals living with diabetes.

Type 2 Diabetes Mellitus (T2DM) is portrayed by steadily raised blood glucose, or a rise of blood glucose after a dinner containing sugar. Dissimilar to Type 1 Diabetes which is portrayed by a lack of insulin, most people impacted by T2DM have raised insulin levels (fasting or potentially post glucose ingestion), except if there has been beta cell disappointment. The expression "insulin obstruction" (IR) has been utilized to make sense of why the glucose levels stay raised despite the fact that there is no lack of insulin. Endeavours to decide the etiology of IR have involved itemized assessments of sub-atomic and intracellular pathways, with attribution of cause to unsaturated fat motion, yet the main driver has been tricky to specialists**.**

# Symptom of Diabetes

Diabetes symptoms are caused by rising blood sugar.

# General symptoms

The symptoms of type 1, type 2, and type 1.5 (LADA) are the same, but they occur in a shorter period than types 2 and 1.5. In type 2, the onset tends to be slower. Tingling nerves and slow-healing sores are more common in type 2.

Left untreated, type 1, in particular, can lead to diabetic ketoacidosis. This is when there is a dangerous level of ketones in the body. It’s less common in other types of diabetes, but still possible.

# The general symptoms of diabetes include:

* + - Increased hunger
		- Increased thirst
		- Weight loss
		- Frequent urination
		- Blurry vision
		- Extreme fatigue
		- Sores that don’t heal

# Symptoms in men

* + - In addition to the general symptoms of diabetes, men with diabetes may have:
		- a decreased sex drive
		- erectile dysfunction
		- poor muscle strength

# Symptoms in women

* + - Women with diabetes can have symptoms such as:
		- vaginal dryness
		- urinary tract infections
		- yeast infections
		- dry, itchy skin

# Causes

Insulin is a hormone produced in the pancreas by special cells, called beta cells. The pancreas is below and behind the stomach. Insulin is needed to move glucose into cells. Inside the cells, glucose is stored and later used for energy. When you have type 2 diabetes, your fat, liver, and muscle cells do not respond correctly to insulin. This is called insulin resistance. As a result, glucose does not get into these cells to be stored for energy. When sugar cannot enter cells, a high level of sugar builds up in the blood. This is called hyperglycemia. The body is unable to use the glucose for energy. This leads to the symptoms of type 2 diabetes.

Type 2 diabetes usually develops slowly over time. Most people with the disease are overweight or obese when they are diagnosed. Increased fat makes it harder for your body to use insulin the correct way.

Type 2 diabetes can also develop in people who are not overweight or obese. This is more common in older adults. Family history and genes play a role in type 2 diabetes. Low activity level, poor diet, and excess body weight around the waist increase your chance of getting the disease.

# Epidemiology

The study of disease transmission it is assessed that 366 million individuals had DM in 2011: by 2030 this would have ascended to 552 million. The quantity of individuals with type 2 DM is expanding in each country with 80% of individuals with DM living in low-and centre pay nations. DM caused 4.6 million passings in 2011. It is assessed that 439 million individuals would have type 2 DM continuously 2030. The rate of type 2 DM shifts considerably from one geological district to the next because of natural and way of life risk factors. Writing search has shown that there are not many information accessible on the commonness of type 2 DM in Africa all in all. Studies looking at information patterns inside Africa highlight proof of a sensational expansion in commonness in both provincial and metropolitan setting. What’s more, influencing both orientations similarly.

Most of the DM trouble in Africa gives off an impression of being type 2 DM, with fewer than 10% of DM cases being type 1 DM." A 2011 Community for Infectious prevention and Counteraction (CDC) report gauges that DM influences around 25.8 million individuals in the US (7.8% of the populace) in 2010 with 90% to 95% of them being type 2 DM.12

It is anticipated that the commonness of DM in grown-ups of which type 2 DM is becoming conspicuous will increment in the following twenty years and a large part of the increment will happen in non-industrial nations where most of patients are matured somewhere in the range of 45 and 64 years.

It is projected that the last option will rise to or even surpass the previous in emerging countries, hence finishing in a twofold weight because of the latest thing of progress from transferable to non-transmittable sicknesses.

The on-going pervasiveness of diabetes among grown-ups is 10.5% around the world (536.6 million grown- ups), with stamped variety across districts and nations, and is assessed to reach 12.2% (783.2 million grown- ups) by 2045.Diabetes is more common in major league salary (11.1%) and centre pay (10.8%) nations than in low pay nations (5.5%). The predominance of diabetes is rising all over the place, most quickly in canter pay nations where the commonness is supposed to reach 13.1% by 2045, presumably as a result of changing eating routine and way of life factors, increasing paces of stoutness, lacking assets for early finding and counteraction, and possibly more noteworthy hereditary or epigenetic powerlessness emerging from deficient fetal and youth sustenance. Information for low and centres pay nations is probably going to be undervalued due to boundaries to screening and convenient analysis.

Over 90% of individuals with diabetes have type 2 diabetes, portrayed by insulin obstruction and moderate beta cell disappointment, and usually associated with other cardio metabolic messes, including heftiness, hypertension, cardiovascular sickness, and hepatic steatosis. Diabetes added to 6.7 million passing’s in 2021 alone, featuring the earnestness of forestalling diabetes and upgrading its administration to further develop wellbeing results and personal satisfaction for all individuals in danger of or with the sickness.

# Pathophysiology

Type 2 DM is portrayed by insulin inhumanity because of insulin opposition, declining insulin creation, and possible pancreatic beta-cell disappointment. This prompts a lessening in glucose transport into the liver, muscle cells, and fat cells. There is an expansion in the breakdown of fat with hyperglycemia. The contribution of impeded alpha-cell capability has as of late been perceived in the pathophysiology of type 2 DM. Because of this brokenness, glucagon and hepatic glucose levels that ascent during fasting are not stifled with a dinner.

Given lacking degrees of insulin and expanded insulin obstruction, hyperglycemia results. The incretions are significant stomach middle people of insulin discharge, and on account of GLP-1, of glucagon concealment. In spite of the fact that GIP movement is hindered in those with type 2 DM, GLP-1 insulin tropic impacts are safeguarded, and consequently GLP-1 addresses a possibly valuable remedial choice. In any case, as GIP: GLP-1 is quickly inactivated by DPP-IV in vivo.

Two restorative ways to deal with this issue have been created: GLP-1 analogues with expanded half-lives, and DPP-IV inhibitors, which forestall the breakdown of endogenous GLP 1 as well as GIP. The two classes of specialists have shown guarantee, with potential not exclusively to standardize fasting and postprandial glucose levels yet additionally to further develop beta-cell working and mass. Studies are progressing on the job of mitochondrial brokenness in the advancement of insulin obstruction and etiology of type 2 DM. Likewise vital is fat tissue, as endocrine organ theory (emission of different a dip cytokines, i.e., leptin, TNF-alpha, resistin, and adiponectin ensnared in insulin obstruction and perhaps beta-cell brokenness)."

A larger part of people experiencing type 2 DM are corpulent, with focal instinctive adiposity. Subsequently, the fat tissue assumes a significant part in the pathogenesis of type 2 DM. Albeit the prevalent hypothesis used to make sense of this connection is the entryway/instinctive speculation giving a vital job in raised non- esterified unsaturated fat fixations, two new arising speculations are the ectopic fat stockpiling condition (statement of fatty oils in muscle, liver and pancreatic cells). These two speculations comprise the system for the investigation of the exchange between insulin obstruction and beta-cell brokenness in type 2 DM as well as between our obesogenic climate and DM risk in the following ten years.

Concerning pathophysiology of the sickness, a failing of the criticism circles between insulin activity and insulin emission brings about strangely high glucose levels in blood. On account of β-cell brokenness, insulin discharge is diminished, restricting the body's ability to keep up with physiological glucose levels. Then again, IR adds to expanded glucose creation in the liver and diminished glucose take-up both in the muscle, liver and fat tissue. Regardless of whether the two cycles occur from the get-go in the pathogenesis and add to the improvement of the illness, β-cell brokenness is generally more serious than IR. Be that as it may, when both β-cell brokenness and IR are available, hyperglycemia is enhanced prompting the movement of T2DM.

# Current Treatment

* 1. **Lifestyle treatments: medical nutrition treatment, physical activity, and sleep**

Effective administration of type 2 diabetes should incorporate predictable regard for ways of behaving that support a solid way of life and are primary for accomplishing glycemic control, forestalling difficulties, supporting personal satisfaction, and safeguarding ideal wellbeing. Clinical sustenance treatment for diabetes stresses a reasonable choice of supplement thick food varieties while limiting or dispensing with added sugar, refined grains, and profoundly handled food sources. Proposals for ideal sugar admission and structure differ, with the most grounded proof supporting a general decrease in admission of starches. This standard can be applied to numerous dietary examples, remembering a Mediterranean eating regimen high for monounsaturated and polyunsaturated fats, low carb, veggie lover, or a plant based slims down, and the Dietary Ways to deal with Stop Hypertension diet, with an emphasis on non-bland vegetables, natural products, and vegetables, and some dairy in the people who are lactose lenient. Just the Mediterranean eating regimen has been displayed to lessen cardiovascular illness and mortality. Likewise, proof demonstrates the valuable impacts of association of local area wellbeing laborers to help training in self-administration of diabetes and in general consideration, particularly in rustic or underserved networks, or both. Since hypertension and cardiovascular illness are significant reasons for mortality in people with diabetes, more consideration should be paid to by and large sodium admission and restricting the substance of soaked fat and Trans fat in the eating regimen.”

Preventing smoking and restraint from tobacco items is likewise basic for cardiovascular wellbeing in grown-ups with diabetes, and vigorous proof backings the advantage of halting smoking in spite of the potential for weight gain. In spite of the fact that nicotine substitution items and electronic cigarettes could work with halting smoking, nicotine itself can weaken glucose resilience and antagonistically influence the cardiovascular framework through expanded sympathetic enactment.

Pattern levels of active work ought to be evaluated to set sensible and reasonable conduct situated objectives. Expanding the term of actual work and diminishing stationary time have been accounted for to work on cardiorespiratory wellness and HbA levels. Suggestions can be made to increment relaxation time actual work (strolling, using the stairwell, and family errands), decline inactive time, and present actual work in general. Proactive tasks incorporate both oxygen consuming and opposition preparing, as well as adaptability and equilibrium preparing.

The length and nature of rest are progressively perceived as fundamental parts of the administration of diabetes and people ought to be evaluated for rest related messes. Reference for analysis and treatment of obstructive rest apnoea and other rest issues ought to be thought of whenever demonstrated. Evaluating for psychosocial variables and social determinants of wellbeing that could influence a singular’s diabetes care and personal satisfaction ought to likewise be performed, with commitment of or reference to important clinical colleagues for additional assessment and care, as proper.

Way of life mediations in people with corpulence or who are overweight are best when endeavours are escalated and successive follow-up is accessible, either face to face or essentially. Weight reduction can be accomplished in different ways, and is best when methodologies are joined: caloric limitation, expanded caloric consumption, disposal or replacement of medications that advance weight gain, utilization of weight diminishing medications and, in select individuals, metabolic or bariatric medical procedure. One dietary system that has gotten impressive consideration lately is time confined eating, despite the fact that information in grown-ups with type 2 diabetes are restricted to one randomized controlled preliminary and a bigger preliminary is progressing (n=344; Utilizing Early Time Limited Taking care of and Coordinated Light Treatment to Further develop Glycemic Control in Grown-ups With Type 2 Diabetes, NCT04155619). Weight the board is talked about in more detail underneath.

# Drug treatment of type 2 diabetes mellitus

Beginning administration of type 2 diabetes has custom partner remembered metformin for most grown-ups due to its glucose bringing down impact, unbiased consequences for weight, insignificant gamble of hypoglycaemia, security profile, minimal expense, and simplicity of organization. Presently, in the illumination of proof from preliminaries of cardiovascular and kidney results, choices on treatment of diabetes with medications ought to be made in view of heart comorbidities (laid out atherosclerotic cardiovascular sickness and cardiovascular breakdown), risk factors for atherosclerotic cardiovascular infection and kidney sickness, drawing in grown-ups in shared navigation, and focusing on the utilization of medications displayed to lessen the gamble of cardiovascular or kidney unfavourable results, or both, in grown-ups with explicit comorbidities.

# Role of metformin

Despite the fact that metformin was a generally utilized back-ground drug in most huge preliminaries of cardiovascular and kidney results, a few post hoc examinations have shown benefit with GLP1RAs or SGLT2is paying little mind to foundation utilization of metformin. Current rules from the American Diabetes Affiliation/European Relationship for the Investigation of Diabetes and the American Relationship of Clinical Endocrinology never again suggest metformin as the favoured first line specialist for all people with type 2 diabetes, and on second thought recommend thought of cardiovascular and kidney comorbidities while choosing first line treatment. Cost is a significant thought in choosing the most proper treatment, notwithstanding, likely adding to contrasts in these suggestions from rules utilized in different nations. In the US, safety net providers have not found the rules, and expect that metformin is utilized before different specialists. Direction from the Public Establishment for Wellbeing and Care Greatness (Decent) still suggests metformin as the principal line therapy for individuals with cardiovascular or kidney comorbidities, or both, with presentation of a SGLT2i in individuals who can't endure metformin or need strengthening of treatment. Regardless of powerful result information, GLP1RAS are not suggested Pleasant until disappointment of triple oral medication treatment and just in individuals with a high weight file or in whom insulin treatment can't be utilized." Protection model limitations on recommending GLP1RAS and SGLT2is, including the prerequisite of step treatment beginning with metformin, actually endure yet ought to be re- evaluated to more readily line up with logical proof.

Different circumstances when a medication other than metformin can be considered as first line treatment incorporate serious or indicative hyperglycemia (HbA,,>10%, ketosis, or weight reduction), creatinine freedom or estimated glomerular filtration rate <30mL/min/1.73 m², or when the individual can't endure metformin in spite of delayed up titration of the portion or a preliminary of the drawn out discharge definition, or both. Sulfonylureas and thiazolidinediones are presently less normally suggested due to their unfriendly impact profiles. Sulfonylureas can prompt weight gain and are related with a high gamble of hypoglycaemia, and thiazolidinediones can likewise cause weight gain, as well as liquid maintenance and osteoporosis. Individuals treated with thiazolidinediones should be observed for the advancement of cardiovascular breakdown; thiazolidinediones are not suggested for those with side effects of cardiovascular breakdown and are contraindicated in class 3 or 4 cardiovascular breakdown. Since nonexclusive types of sulfonylureas and thiazolidinediones are accessible, be that as it may, these medication classes are choices when cost is a boundary to getting to different specialists or the person's clinical circumstance requires these medications. Pioglitazone, a thiazolidinedione, has useful impacts in hepatic steatosis and stroke, and can be viewed as in these unique circumstances

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# Role of Sulfonylureas

These by and large very much endured but since they invigorate endogenous insulin emission, they convey a gamble of hypoglycaemia. Older patients, with DM who are treated with sulfonylureas have a 36% expanded chance of hypoglycemia contrasted with more youthful patients." Glyburide is related with higher paces of hypoglycemia contrasted with glipizide. A portion of the gamble factors for hypoglycemia are age- related debilitated renal capability, concurrent utilization of insulin or insulin sensitizers, age more prominent than 60 years, late clinic release, liquor misuse, caloric limitation, various prescriptions or drugs that potentiate sulfonylurea activities. Utilization of long acting sulfonylurea, for example, glyburide ought to be kept away from in old patients with DM and utilization of short-acting glipizide ought to be liked.

Sulfonylureas can cause unregulated insulin delivery and lead to serious hypoglycaemia that can be especially serious within the sight of CKD,because of the collection of dynamic metabolites. Long acting sulfonylureas like glyburide and chlorpropamideare more famous for causing hypoglycaemia.

More limited acting sulfonylureas as glimepiride, glipizidewhat's more; gliclazide specialists are somewhat protected and liked inpatients with CKD. Significant helpful contemplations of sulfonylureas in patients with CKD and diabetes are: (1) Glibenclamide ought to be recommended with alert in patients with an eGFR 60- 90 mL/min, what's more, can't be utilized in patients with an eGFR < 60mL/min; (2) Glimepiride can be used in patients with an eGFR of < 60 mL/min, and measurement change is required assuming the eGFR is < 30 mL/min. Start at 1 mg day to day or on the other hand change to another medication assuming that the eGFR is < 15 mL/min; (3) Gliclazide is under 1% discharged unaltered by the kidneys and doesn't have dynamic metabolites. It is suggested in subjects with an eGFR of 30-60 mL/ min, need to diminish portion in the event that the eGFR is < 30 mL/min, furthermore, it's not suggested assuming the eGFR is < 15 mL/min; furthermore (4) Glipizide doesn't increment hypoglycaemia in patients with CKD. Can be used in all phases of CKD with alert and with portion decrease.

# Role of Alpha-glucosidase Inhibitors

Acarbose, Voglibose and Miglitol have not broadly been utilized to treat type 2 DM people yet are probably going to be protected and compelling. These specialists are best for postprandial hyperglycemia and ought to be stayed away from in patients with huge renal debilitation. Their utilization is generally restricted because of high paces of secondary effects like the runs and fart. Voglibose, which is the most up to date of the medications, has been displayed in a review to essentially further develop glucose resistance, as far as postponed sickness movement and in the quantity of patients who accomplished normoglycemia.

As only less than 2% of an oral dose of acarbose was absorbed as active drug, patients with eGFR < 25 mL/min attained increases about fivefold higher for peak plasma concentration of acarbose and six fold higher for AUC values than subjects with normal renal function. Miglitol is systematically absorbed but is no metabolized, and is rapidly eliminated by renal excretion as unchanged drug. Patients with an eGFR < 25 mL/min taking miglitol 25 mg three times daily showed a twofold increase in miglitol plasma levels when compared with patients with an eGFR > 60 mL/min. Voglibose, an alpha-glucosidase inhibitor only commercialized in Japan, has no renal excretion, and two studies showed that it can be safely utilized in diabetic patients on haemodialysis, in combination with pioglitazone or mitiglinide. In conclusion, alpha- glucosidase inhibitors acarbose and miglitol cannot be used if the eGFR is < 25 mL/min or the serum creatinine level is > 2 mg/dL[279,291,293,302],while voglibose can be used in all stages of CKD including haemodialysis.

# Role of Insulin

Insulin is utilized alone or in blend with oral hypoglycemic specialists. Increase treatment with basal insulin is helpful on the off chance that some beta cell capability remains. Substitution of basal-bolus insulin is fundamental in the event that beta cell depletion happens. Salvage treatment utilizing substitution is essential in instances of glucose harmfulness which ought to imitate the typical arrival of insulin by the beta cells of the pancreas." Insulin comes in injectable structures quick acting, short acting, halfway acting and long acting. The long acting structures are more averse to cause hypoglycemia contrasted with the short acting structures.

Insulin is for the most part viewed as protected inpatients with a decreased kidney capability. In view of their low degrees of corruption, insulin drags out its half-life when there is a debilitation in kidney capability.

Accordingly the gamble of hypoglycemic occasions is 5times higher than in subjects without weakness renal capability. Practically half of coursing insulinis cleared by the kidney through glomerular filtration and ensuing luminal reabsorption of insulin by proximal cylindrical cells through endocytosis, or by means of dispersion of insulin from per tubular vessels and ensuing restricting of insulin to the contra luminal layers of cylindrical cells. In insulin-treated T2DM patients, insulin dosages ought to be decreased by 25% when the eGFRis between 10-50 mL/min, and by half when theeGFR is < 10 mL/min. With respect to human insulin, the pharmacokinetic/pharmacodynamic profiles for insulinanalogs might be impacted by numerous factors including renal capability, albeit the accessible information are somewhat scant. Decrease of starting glargine/glulisine insulin weight-based dosing in hospitalized patients withT2DM and renal disability decreased the recurrence of hypoglycaemia by half without compromising the control of hyperglycemia. Short-acting insulin simple can likewise be used in haemodialysis patients with T2DM.

It shows the remedial calculation for the treatment of patients with T2DM and CKD, proposedby the Spanish Working Gathering, supported by a few logical social orders

# Insulin Analogues

Insulin treatment was restricted in its capacity to copy ordinary physiologic insulin discharge. Customary transitional and long-acting insulin’s (NPH insulin, lente insulin, and ultralente insulin) are restricted by conflicting retention and pinnacles of activity that might bring about hypoglycemia. The pharmacokinetic profiles of the new insulin analogs are unmistakable from those of the normal insulin’s, and their beginning and terms of activity range from fast to delay. At present, two quick acting insulin analogs, insulin lispro and insulin aspart, and one long-acting insulin simple, insulin glargine, are accessible.

# Goals and targets of management of type 2 diabetes mellitus

The essential targets of the administration of diabetes are to diminish the occurrence and weight of complexities and to work on personal satisfaction. By and large, these goals were sought after through control of hyperglycemia. In this glucose driven approach, clinical practice rules suggest focusing on hemoglobin A1c (HbA1c) fixations at <7% (53 mmol/mol) or <6.5% (47.5 mmol/mol) and, all the more as of late, constant glucose checking time in range >70% for most non-pregnant grown-ups with type 2 diabetes, with lower or higher glycemic edges individualized for every individual. These proposals for levels of HbA1c come from information from randomized controlled preliminaries showing decrease in microvascular entanglements with more intensive glycemic control, despite the fact that information for the relationship between time in reach and hazard of difficulties of constant diabetes are restricted yet arising. Execution of glycemic targets in light of persistent glucose checking has additionally been restricted by holes in protection inclusion and

Availability, albeit ceaseless glucose observing is progressively suggested for and utilized by individuals with type 2 diabetes. Randomized controlled preliminaries of more established antihyperglycemic therapies, like sulfonylureas and insulins, be that as it may, have not shown a predictable relationship between escalated glycemic control and decrease in macrovascular complexities or mortality. In any case, longer term follow-up of seriously treated grown-ups gives some proof of a lower chance of macrovascular occasions and cardiovascular demise.

Alternately, escalated glycemic control in people with fragility, old age, and multimorbidity was related with an expanded gamble of serious hypoglycaemia furthermore, passing. Hence, future examination is expected to inspect the impact of concentrated glycemic control when accomplished with more current glucose bringing down drugs, which have a lower hazard of hypoglycaemia and extra cardio reno metabolic advantages. Taken together, these information feature the significance of individualized glycemic the board and the need to move the accentuation away from the flawed substitute of levels of HbA1c towards decreasing hard results of the unfriendly wellbeing impacts of diabetes, while diminishing the weight of treatment. Over the previous 10 years, various randomized controlled preliminaries have shown a decrease in cardiovascular illness, kidney sickness, cardiovascular breakdown, and mortality with the utilization of glucagon-like peptide 1 receptor agonists (GLP1RAs) and sodium glucose transporter 2 inhibitors (SGLT2is), free of a decrease in degrees of HbA1c.These discoveries flagged another complexities driven time of the administration of diabetes, zeroed in straightforwardly on forestalling or decreasing macrovascular, microvascular, and other arising difficulties of diabetes, like cardiovascular breakdown. Many, albeit not all, clinical practice rules suggest treatment with GLP1RAs or SGLT2is, or both, for patients with cardiovascular or kidney illness, or both, or with risk factors for atherosclerotic cardiovascular sickness, autonomous of glycemic control, albeit all keep on focusing on the simultaneous significance of accomplishing HbA1c targets. All the more as of late, the example of the board of diabetes has started to move further, with a recharged center around checking out at the reasons for type 2 diabetes and its metabolic comorbidities and long haul entanglements. This pathogenesis driven move toward places the administration of heftiness at the focal point of the anticipation and treatment of the infection. Indeed, even a generally modest quantity (5-7%) of weight reduction decreased the gamble of episode diabetes and improved glycemic control in individuals with type 2 diabetes. More noteworthy measures of weight reduction have been accounted for to have more prominent beneficial effects on glycemic control (counting abatement of diabetes), metabolic brokenness, and nature of life. Weight misfortune accomplished with metabolic medical procedure diminished the dangers of microvascular and macrovascular difficulties of diabetes and decreased mortality. On the other hand, concentrated way of life medicines in the Look Forward (Activity for Wellbeing in Diabetes) randomized controlled preliminary of 5145 grown-ups with type 2 diabetes and overweight/stoutness didn't decrease the gamble of cardiovascular occasions contrasted with normal consideration. The probability of identifying contrasts between the escalated way of life and

customary treatment gatherings could have been diminished in light of the fact that the cardiovascular occasion rate in the Look Forward populace was a lot of lower than expected (0.7% each year v assessed 3.1% each year). A post hoc examination recommended that the people who lost no less than 10% of their body weight in the principal year had an essentially lower chance of the essential result, which was a composite of the main event of death from cardiovascular causes, non-lethal intense myocardial dead tissue, stroke, and medical clinic confirmation for angina (changed danger proportion 0.79, 95% certainty span 0.64 to 0.98, P=0.034).How weight reduction accomplished with drug therapy, especially specialists, for example, semaglutide and tirzepatide, contrasts and metabolic medical procedure for glycemic control, microvascular and macrovascular difficulties, and mortality, ought to be inspected.

# Advance treatment

* 1. **Nanotechnology and Diabetes Diagnosis**

The term "Nanotechnology" is utilized to portray the control of issue on a nuclear, sub-atomic and supramolecular scale where exceptional quantum mechanical impacts occur. In this manner, the decrease of no less than one aspect at the nanosomic scale (1-100 nm) includes the plan, creation, portrayal and application of different Nano scale materials in various potential regions giving novel mechanical advances . Nanoparticles (NPs) have a progression of brilliant properties contrasted with their mass designs as nanomaterial’s become more subject to its shape and size and connection points are simpler to be gotten to . For instance, metallic nanoparticles (NPs) display trademark tones relying upon their Nano size and shape which can be broadly taken advantage of in bio imaging applications . The utilization of nanomaterial’s and Nano devices in the field of wellbeing and medication, has make the way for the foundation of a new Nano science region, this of Nano medicine. The progressions of nanotechnology in medication can be summed up into three classifications:

# Drug conveyance/Therapeutics:

The improvement of novel nanomaterial-based transporter frameworks means to the controllable and designated discharge and bio-dispersion of a drug compound. Nanotechnology is additionally applied in drug configuration to increment absorbability. For instance, many medications are gently water solvent while others are retained rapidly and afterward eliminated from the body as waste before the dynamic substances arrive at their optical focus subsequently treatment can be ineffectual. Moreover, nanotechnology definitely stand out because of its capacity to produce particles that are drawn to explicit sorts of cells (explicitly to the infected cells for an immediate treatment, for example disease cells). To act as an illustration of designated conveyance, scientists from the College of California have created secluded multifunctional micelles containing a fluorophore or a fluorophore and a medication that specifically connect to the atherosclerotic plaques in ApoE invalid mice. As of late, foundational microorganisms Nano vesicles were developed that are drawn to a physical issue to build how much undifferentiated cells conveyed to the harmed tissue. A few NPs have one of kind properties that empower them to be straightforwardly utilized in treatment; attractive NPs can prompt warming of dangerous cells without influencing the encompassing typical tissue and silver and zinc- oxide NPs show viable antimicrobial movement and might actually become options in contrast to anti-infection agents

# Diagnosis/Imaging:

Through Nano medicine, early recognition, conclusion and counteraction of infections can be improved by involving specific NPs as marks for symptomatic instruments and high-goal imaging or substrates for the advancement of biosensors. The utilization of Nano-sensors will ultimately prompt the development of profoundly touchy biomedical gadgets for the quick and high throughput discovery of infection biomarkers. For instance, the persistent glucose observing from sweat is practical by incredibly delicate metal oxide Nano-sensors. Nanotechnology offers benefits in the space of analysis thinking about that the novel properties of some nanomaterial’s (natural, physical, optical, attractive, compound, primary properties) render them appropriate for symptomatic imaging (growth identification, atherosclerotic plaque imaging and so on) . Alteration of quantum mechanics at the Nano scale makes the NPs more versatile to optical and attractive component than bigger imaging materials. The size of the NP influences the colorproduced and in this way marking materials with differential variety coding can be very valuable during analytic tests. In addition, the use of Nano scale attractive materials creates improved X-ray pictures with additional subtleties.

# Tissue repairing/Biomaterials:

Nanomaterial’s are utilized for the plan of fake cell and inserts for the maintenance or propagation of harmed tissues . Nanotechnology permits the advancement of biocompatible platforms, copying extracellular network (ECM) intricacy and usefulness, which are utilized for tissue recovery. Besides, Nano-highlighted frameworks are intended to typify and control the spatiotemporal arrival of medications (for example development factors). Nanotechnology-based biomaterials (Nano-coatings or Nano-organized surfaces) are likewise used to beat a few issues of embed materials, like bacterial grip or consumption opposition, for instance in muscular health.

Leap forwards in Nanotechnology have unequivocally impacted the logical world fundamentally in the field of medication since the size of NPs is like that of most organic atoms. Nano medicine, as Nano-therapeutics, could be characterized as a use of nanotechnology

Were NPs load the medication working on its restorative properties and diminishing grimness, while the medication can be conveyed to designated tissue with high adequacy. The most utilized NPs for drug conveyance are introduced.

Nanotechnology can give detecting advances to precise also, clinical data, for conclusion of diabetes. Diabetes glucose level tests require independent periodical checks by the patients, to stay away from the gamble of blood glucose abatement to risky levels. Once in a while this routine is troublesome and difficult to be held, especially for the old individuals and the youngsters. Nanotechnology can offer the chance for the turn of events of implantable and wearable detecting advances, giving persistent and exact clinical data . The most well-known approaches to taking advantage of nanotechnology in the determination of diabetes is by applying microphysiometer or by utilizing implantable sensor. The microphysiometer is worked from multiwall carbon nanotubes, which are electrically conductive. The centralization of insulin in the chamber is straightforwardly connected with the current at the cathode and accordingly, the nanotubes are totally functioning able at pH levels which are normal for living cells. The traditional discovery techniques ordinarily measure insulin creation at spans, by gathering and estimating little examples, intermittently. The microphysiometer can recognize insulin levels constantly and in a roundabout way, by assessing the exchange of electrons which are created when insulin particles get oxidize, by the glucose. Generally, when the cells produce more insulin atoms, the on-going which is produced inside the sensor, increments as well as the other way around, permitting continuous checking insulin focuses in . Nanostructured implantable sensors use polyethylene glycol dabs, covered with fluorescent atoms to screen diabetes glucose levels. The dabs are infused under the skin, remaining in the interstitial liquid. If the glucose in the interstitial liquid tumbles to perilous levels, glucose uproots the fluorescent particles and makes a gleam, which is seen on a tattoo put on the arm. This technique is thought of as extremely successful. In any case, sensor microprocessor is another other option, which is being created to ceaselessly screen significant body boundaries such as heartbeat, blood glucose and temperature . In these applications, the computer chip is embedded under the skin, sending a sign that could be checked constantly. As of late a microchipbased test to recognize the two principal types of diabetes mellitus, permitting differential conclusion has been created. In reality, this modest, compact, computer chip based test can analyse type-1 diabetes. Conventional strategies for identifying diabetes are costly, very sluggish and they are accessible just in exceptional medical services places. The proposed test applies fluorescence to identify the antibodies. The glass plates which are shaped the foundation of every microprocessor are covered with gold nanoparticle-sized, permitting the enhancement of the fluorescent sign to get dependable immunizer recognition. The gold nanoparticles guarantee the creation of Nano gaps, supporting the improved electric field. This innovation is supposed to work on understanding consideration, aiding a superior comprehension of the sickness.

# Nanomaterials and Diabetes Treatment

Various types of nanomaterials are currently studied for insulin delivery in diabetes treatment. Ceramic nanoparticles, liposomes, dendrimers, polymeric biodegradable nanoparticles and polymeric micelles are the most promising among the proposed ones, (Figure 1). Depending on the type of administration each and every one of these categories of nanomaterials gathers some advantages.



# Figure 1: Nanomaterials suitable for diabetes treatment.

* 1. **Oral administration**

Oral insulin organization is thought of as the most helpful strategy for diabetes mellitus support. Notwithstanding, the digestive epithelium is considered as a significant hindrance to the retention of hydrophilic medications, similar to insulin, as lipid-bilayer cell films don't permit the dispersion of these medications to the circulation system. Drug conveyance frameworks in view of gastric chemicals guarantee the exchange and the corruption of the insulin in the stomach. A defensive lattice is important to install the dynamic substance, safeguarding it from the cruel climate inside the stomach. A blend of calcium phosphate- polyethylene glycol-insulin with casein is shown as a powerful decision. Mansooretal. Present polymer- based nanoparticle systems for insulin conveyance, in different structures. Polymeric nanoparticles are thought of as very effective contrasted with customary oral furthermore, intravenous organization techniques which are generally utilized. To frame insulin conveyance frameworks, biodegradable, pH-delicate polymers encompassed by nonporous film are utilized, permitting controlled arrival of insulin. In creature studies, the oral conveyance of insulin polymeric nanoparticles is accomplished using Nano-pellets stacked with insulin. N-isopropylacrylamide, polyethylenimine and polymethacrylic corrosive are a portion of the polymer-based nanoparticles which are utilized for oral insulin organization. Additionally, co-polymers like N, N- dimethylaminoethyl methacrylatem, polyurethanes, polyacrylic acids, polyanhydrides and polyacrylamide are being under examination to be utilized as insulin transporters. Hydrogels furthermore, microspheres can assume a twofold part, acting both as protease inhibitors by safeguarding the embodied insulin from enzymatic corruption inside its grid as well as pervasion enhancers by actually crossing the epithelial layer post oral organization. In this manner, they can really convey insulin, giving a promising procedure to oral insulin organization. Moreover, chitosan nanoparticles are demonstrated to upgrade the gastrointestinal retention of insulin to a more prominent degree than fluid arrangements of chitosan. Specifically, insulin stacked chitosan nanoparticles which are covered with mucoadhesive chitosan appear to draw out their home in the small digestive tract. These composite nanomaterials can productively invade into the bodily fluid layer, intervening transient opening inside the tight intersections between epithelial cells, becoming unsound lastly debasing because of their pH awareness. Subsequently, the insulin which is delivered from the fallen to pieces Nano composites can pervade through the Para cellular pathway into the circulation system.

# Inhalation

The new nanotechnology-put together insulin framework is centering with respect to breathing in the insulin, rather than infusing it, permitting its controlled discharge into the circulation system. Contrasted with the gastrointestinal course, inhaler frameworks give the professionals of gentle climate, counting low catalyst fixations and unbiased pH. Different kinds of inhaler frameworks can be utilized to convey the dynamic items. Dry powder definitions and arrangements are among the most normal. The epitome of insulin inside the nanoparticles, permits the inward breath of the dry powder definition of insulin into the lungs . Insulin corruption is kept away from, guaranteeing the conveyance of insulin to the circulation system. To amplify the viability, ordinary lung capability tests are expected to be applied to the patients, before the treatment, expanding the expense of this methodology proposed a controlled insulin conveyance framework, in view of injectable polymeric nanoparticle-cross-linked network, ready to be painlessly set off by an Engaged Ultrasound Framework (FUS) . As a grid material biodegradable poly (lactic-coglycolic corrosive) (PLGA) was utilized. They showed that the coming about FUS-enacted insulin epitomized Nano-organization could manage blood glucose levels of type 1 diabetic mice in a long haul. For the treatment of type 2-diabetes, chitosan nanoparticles are viewed as reasonable for the advancement of an inward breath conveyance framework. Since, insulin is a hydrophilic medication; it is hard to be diffused through gastrointestinal epithelium. Chitosan can upgrade the assimilation of insulin. High level composite nanomaterials, delivered via carboxylated chitosan united with poly (methylmethacrylate) appear to build the productivity of the controlled arrival of insulin.

# Nanopump

The Nanopump is a strong gadget with numerous clinical applications. It is a little volumetric siphon with a couple of really looks at valves that is coordinated into a Miniature Electromechanical Frameworks (MEMS) or on the other hand a Nano Electromechanical Frameworks (NEMS) chip. From as primary perspective, the chip is a heap of three layers fortified together. The first is a Silicon-on-Encasing (SOI) layer with micromachined siphon structures, and the two others are Pyrex cover plates. Insulin conveyance is the fundamental utilization of the siphon, presented by Debiotech. The siphon can infuse insulin to the patient's body in a steady rate, adjusting how much glucose in the blood. It can likewise regulate little medication portions over a long timeframe.

# Artificial pancreas

The advancement of a fake pancreas framework, including a constant glucose screen, glucose meter and an insulin implantation siphon for the screen adjustment could be the extremely durable arrangement for the patients who experience the ill effects of diabetes mellitus. The first starting thought was first shown in 1974. The central of this idea incorporates a sensor cathode which can over and over measure the degree of blood glucose, with the information taking care of into a small PC. This interaction can set off an implantation siphon, and the suitable units of insulin can enter the circulatory system from a little supply. The use of a minuscule silicon box, containing pancreatic beta cells acquired from creatures is another option approach. This application is utilized to safeguard relocated cells from the invulnerable framework. It additionally permits the adequate dispersion of glucose, insulin and oxygen. It tends to be embedded under the skin of diabetes patients. This case is typified in a material with a explicit Nano pore size. These pores permit glucose and insulin to pass through them, while hinder the section of a lot bigger immune system particles. A brilliant insulin fix is the promising accomplishment for insulin conveyance. This gadget can deliver contingent upon the body's requirements and consequently it is classified "savvy". It contains a pack of more than 100 microneedles, which are loaded with insulin and glucose-detecting proteins.

# Future perspective for type 2 diabetes mellitus

In the special issue "Diabetes Mellitus: Current Research and Future Perspectives," the significance of personalized medicine in treating type 2 diabetes (T2D) and monogenic diabetes of the young (MODY) is highlighted. Five pieces in this collection examined cutting-edge topics related to this subject

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As to on-going advancement in MODY, in this Exceptional Issue, the predominance of changes of the quality encoding Hepatocyte Atomic record Element 1 Beta (HNF1B) was recognized in 5.9% of the patients screened, in light of the clinical doubt of MODY. Testing this quality permitted the creators to recognize two beforehand obscure changes and various clinical introductions of HNF1B-related MODY. Different extra-pancreatic organ frameworks could be associated with certain types of MODY, and in HNF1B-related structures kidney contribution was the most regular extra-pancreatic appearance. In past examinations, HNF1B changes in individuals evaluated for diabetes and imperfections of the urogenital parcel impacted 3 subjects among 210 with MODY. In one more review remembered for this Unique Issue, liver sores, neuropsychiatric side effects, hyperlipidemia, hyperuricemia, and hypomagnesaemia were accounted for as additional predominant appearances than renal ones, growing the comprehension of HNF1B-related MODY. It is realized that hereditary testing assumes a pivotal part in the execution of customized medication for MODY, as it is fundamental not just for diabetes treatment and hereditary directing (autosomal prevailing legacy) yet additionally for follow-up timing and methodology, as various organ screening should be carried out. Notwithstanding, the exemplary clinical rules for MODY finding are frequently unfit to recognize all subjects, and utilizing an up-and-comer quality methodology prompts missing hereditary conclusion. Subsequently, this study supports the significance of utilizing cutting edge sequencing (NGS) boards as a profoundly touchy technique in any event, for uncommon types of monogenic diabetes.

As of late, accuracy medication in T2D has zeroed in on pharmacogenomics to give individualized drug treatment in light of a patient's hereditary and genomic data, as different classes of oral hypoglycemic specialists are accessible. The papers in this Unique Issue address the holes in the customized administration of T2D complexities. Subjects with T2D face higher dangers for full scale and microvascular intricacies than their no diabetic partners , and accuracy medication plans to distinguish patients who can profit from a particular treatment more than from others, with the focal point of lessening the gamble of diabetic entanglements . Prognostic models can gauge a singular's gamble for pertinent difficulties in view of individual gamble profiles, and various applications are accounted for in this Exceptional Issue.

The job of dyslipidemia, which is viewed as a gamble factor for cardiovascular occasions, has been dissected through huge information examination utilizing the Code Translator module of ChatGPT for improved prescient demonstrating. Twelve biochemical boundaries were viewed as in subjects with T2D; HDL was viewed as conversely related with the greater part of the boundaries, and the vital indicators of HDLs were fatty oils, LDL cholesterol, and HbA1c levels. These outcomes recommend that a similar methodology could be utilized to determine novel administration techniques and restorative methodologies in T2D , performing complex examinations with negligible computational and programming assets utilizing the accessible estimations on subjects with T2D and sound controls.

An inconvenience of T2D that is under-considered is mental brokenness, as the current administration procedures for T2D don't basically target it, regardless of whether many examinations have delineated that T2D expands the gamble of mental impedance because of hindered insulin flagging, expanded oxidative pressure, and irritation. In this Unique Issue, we remembered examinations that analysed the effect of diabetes for mental impedance. In India, a high predominance of mental debilitation, obvious from lacklustre showing in practically all mental spaces surveyed, was recognized in subjects with T2D contrasted and solid ones. A critical impact old enough socioeconomics on mental disability was found, and the relationship

between metformin use and the gamble of dementia among individuals with T2D was examined. In any case, the examination didn't uncover a portion reaction connection between metformin use and episode dementia in T2D patients. These examinations recommend that evaluating for mental impedance in individuals with T2D ought to be integrated into routine clinical practice and upheld with early treatment through way of life and pharmacological mediations.

Taking into account another continuous diabetic difficulty, diabetic foot ulcers, we investigated the job of customized treatment, as careful treatment choices incorporate debridement furthermore, revascularization. Interestingly, little examination has been directed on ozone treatment. This Extraordinary Issue incorporates a survey of late examinations that gives data on ozone treatment in the injuries of patients with diabetic foot ulcers. It prompted the end that this treatment is compelling, safe, and valuable, with few antagonistic impacts for treating diabetic foot ulcers. Contrasted and different medicines, its utilization speeds up injury mending, which prompts a decrease in expenses and emergency clinic stays, and it is contraindicated in a couple of conditions .

All in all, with the constant headway of new treatments, innovation, and cost decrease, customized medication is supposed to turn into the standard model in the field of MODY and T2D later on, furnishing patients with better wellbeing the board and treatment administrations.

Studies have found proof that GLP-1 applies various advantageous extra pancreatic activities on the two tissues positive and negative for GLP-1R articulation, and clinical preliminaries have found that some GLP- 1 mimetic-based treatments mitigate cardiovascular pathology related with T2D. This suggests that the GLP- 1R agonists might have the option to lighten the fundamental pathology that is related with T2D, and not simply have the option to expand insulin discharge from islet beta-cells of T2D patients.

A new report found by utilizing live-cell imaging that the capacity of insulin vesicles to effectively dock onto the plasma film relates with insulin emission from human islet beta-cells and this was demonstrated to be diminished in T2D.318 This investigation discovered that faulty insulin discharge in T2D islet beta-cells was brought about by a radically diminished pace of fruitful docking occasions (docking occasions were viewed as 5-crease more successive in non-diabetic beta-cells contrasted with diabetic beta-cells), as opposed to decreased conveyance of insulin vesicles to the plasma layer, which was viewed as comparable between non-diabetic and diabetic beta-cells. Articulation examination found that the outflow of proteins engaged with granule docking was down regulated in T2D. Thus, this proposes in T2D that deficient sub- atomic connection of insulin vesicles to the delivery site brings about lacking plasma insulin levels to advance norm glycaemia, and that the diabetic pheno type isn't because of intracellular insulin content as well as the quantity of insulin vesicles being inadequate in diabetic islet beta-cells. Further developing islet beta-cell granule docking, in this way, addresses an alluring and new helpful objective for the advancement of Antidiabetic treatments.

A new deliberate survey and meta-investigation detailed that utilizing hematopoietic foundational microorganisms and mesenchyme undifferentiated cells got from bone marrow, placenta or umbilical line tissue to treat T2D is by and large protected. The undeveloped cell treatment likewise works on at least one of the accompanying for T2D patients: levels of C-peptide, HbA1c, personal satisfaction score, and insulin requirements. However, there have been irregularities with these discoveries created in different examinations and one review revealed extreme diseases in T1D patients after the undifferentiated organism treatment. Also, the system by which these immature microorganisms apply any constructive outcomes is discussed. Likewise, the examinations that were utilized to create these discoveries had a few configuration defects with respect to deriving exact ends and the all-out example size was not enormous enough

# Conclusion

Type 2 DM is a metabolic disease that can be prevented through lifestyle modification, diet control, and control of overweight and obesity. Education of the populace is still key to the control of this emerging epidemic. Novel drugs are being developed, yet no cure is available in sight for the disease, despite new insight into the pathophysiology of the disease. Management should be tailored to improve the quality of life of individuals with type 2 DM.

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