A Review on Classification and Pharamacotherapy of Diabetes Mellitus

K. Gayathri[1]*, M. Benzimen[2], DrD. Rama Brahma Reddy[3], Dr.T. J. Mohan Rao[4]

[1,2]Doctor of Pharmacy (PharmD) V Year,
[2]Principal,[3]Associate Professor,
Nalanda Institute ofPharmaceutical Sciences, Siddharth Nagar, Kantepudi (Village), Sattenapalli (Mandal), Dist. Guntur-522438, Andhra Pradesh, India.

ABSTRACT:
Diabetes mellitus is a group of Metabolic disturbancesin which the body has a sugar level for prolonged time (Characterized by "Hyperglycaemia").

Diabetes Mellitus is one the most common non-communicable diseases worldwide. India faces several challenges in diabetes management, including a rising frequency in urban and rural areas, lack of disease consciousness among the public, limited, health care facilities, high cost of treatment, deficient glycaemic control and risingthe prevalence of diabetic complications. Insulin therapy for diabetes is most commonly released via subcutaneous injection up to four times per day. Long -term insulin therapy, compounded by the intrusive nature of its administration, has caused problems with patient compliance, essentially influencing patient outcomes. There is an increase in the prevalence of type 1 diabetes also, but main cause of diabetic epidemic is type 2 diabetes mellitus, which accounts for more than 90 percent of all diabetic cases. Type 2 diabetes is a serious and common chronic disease resulting from a complex heredity- environment the interaction along with other risk factors such has obesity and sedentary life style. It is silent killer disease and affects the millions of people in the world. It is estimated that in 2010 there was globally 285 million people suffering from this disease. They are specially depression, anxiety disorder, eating disorders and cognitivedisorders including dementia.This systematic review summarizes the classification and pharmacotherapyofDiabetes Mellitus.**Keywords:**Diabetes Mellitus, Pharmacotherapy of Diabetes Mellitus, Classification of DM,and Type 1 DM, Type 2 DM.

I. INTRODUCTION:

Diabetes mellitus (DM) is a metabolic disorder where in human body does not produce or properly uses insulin, a hormone that is required to convert sugar, starches and other food in to energy. Absence or reduced insulin in turn leads to constant abnormally high blood sugar and glucose in tolerance. It is probably an oldest disease known to man. It is also referred as black-death from the 14th century.

In people with diabetes, blood sugar levelsremain high. This may be due to insulin is not being produced at all, is not made at sufficient levels, or is not as effective as it should be. The most common forms of diabetes are 1diabetes(5%), which is an autoimmune disorder, and type 2diabetes(95%), which is associated with obesity. Gestational diabetes is a form of diabetes that occurs in pregnancy, and other forms of diabetes are very rare and are caused by single gene tic mutation.

Insulin is a peptide hormone released by β cells of pancreatic islets which maintains the blood sugar level in the body. The hormone insulin transports sugar from the blood into cells in order to store it or use it for energy.Chronic hyperglycaemia in collaboration with the other metabolic abnormalityin patient with diabetes mellitus can cause damage to various organ system, leading to the development of disable and life-threatening health complications.

Other types of diabetes are gestational diabetes mellitus (GDM) and other specific types of diabetes due to other causes, e.g.;monogenic diabetes syndrome(such as neonatal diabetes and middle age-onset diabetes of the young), diseases of the exocrine pancreas (such as cystic fibrosis and pancreatitis and drug -or chemical -including diabetes (such as with glucocorticoid use, in the treatment of HIV/AIDS or after organ transplantation). Early competitive glycaemia control prevents or delays long-term microvascular (retinopathy, nephropathy and neuropathy) macrovascular complications (carotid artery diseases, coronary artery diseases and peripheral arterial diseases).

Diabetes mellitus is a group of metabolic disorder in which the body has sugar level for extended of time(hyperglycaemia). These arethe hyperglycaemia with disruption of carbohydrates, fats and protein metabolism resulting from defect in Insulin secretion, Insulin action or both.

CLASSIFICATION OF DIABETES MELLITUS:
1) Type1-Beta-cell neutralisation usually leading to absolute insulin deficiency
2) Type 2: Insulin resistance with insulin secretion deficiency .90-95% of people who have type 2
3) Other specific types:
- Genetic defects in beta- cell function
- Genetic deformity in insulin action
- Exocrine pancreas disease
- Endocrinopathies
- Drug or chemical induced
- Infections
- Other rare forms

3) **Gestational Diabetes Mellitus:**
- Hyperglycaemia, which is first detected during pregnancy, is classified as gestational diabetes mellitus (GDM), also known as hyperglycaemia in pregnancy. Although it can occur anytime during pregnancy, GDM generally affects pregnant women during the second and third period of time. According to the American Diabetes Association (ADA), GDM complicates 7%of all pregnancies. Women with GDM and their eldest have an increased risk of develop to type2 diabetes mellitus in the future.
- GDM can be complicated by hypertension, preeclampsia, and hydramnios and may also lead to increased operative interference. The foetus can have increased weight and size or congenital abnormalities. Even after birth, such infant may have respiratory distress syndrome, and subsequent childhood and immature obesity. Older age, obesity, excessive gestational weight gain, history congenital anomalies in previous children, or miscarriage, or a family history of diabetes are risk factor for GDM.
- This type affect females during pregnancy. Some women have very high levels of glucose in their blood, and their bodies are unable to produce enough insulin to transport all of the glucose into their cells, resulting in constantly rising levels of glucose. Diagnosis of gestational diabetes is made during pregnancy. The majority of gestational diabetes patients can control their diabetes with exerciseand diet. Between 10 to 20 percent of them will need to take some kind of blood-glucose-controlling medication. Undiagnosed or uncontrolled gestational diabetes can raise the risk of complications through childbirth.

Diabetes mellitus is divided into 2 broad categories:

1)TYPE1-Diabetes Mellitus:
Type 1diabetes is characterized bydeficient insulin production and requires daily administration of insulin in 2017 countries. Not either, its cause means to prevent it are known.
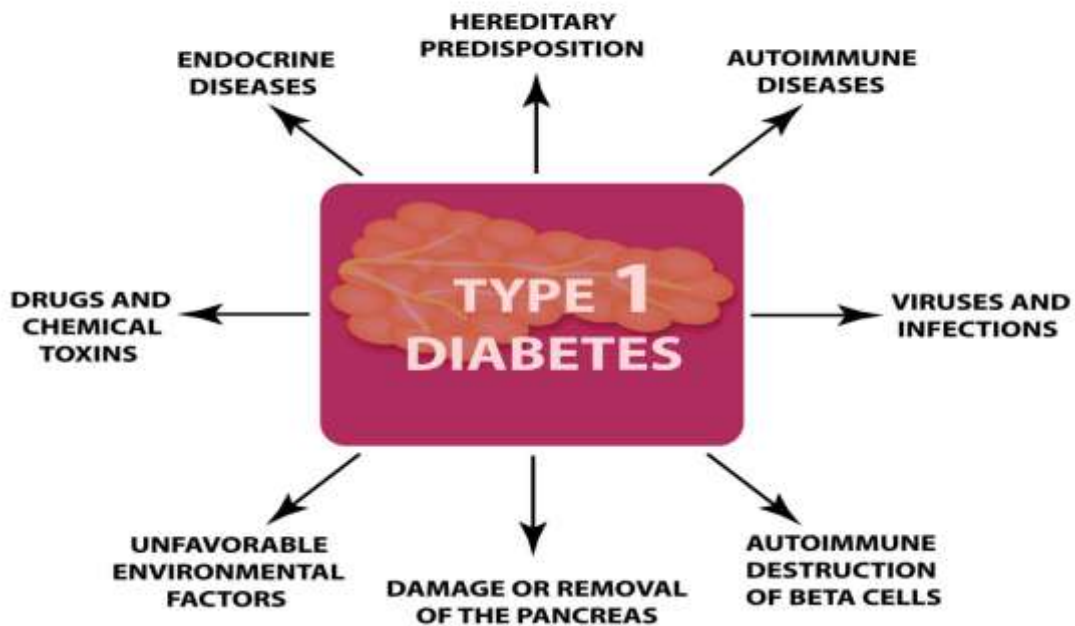Type 1 diabetes is as common as type 2diabetes.Approximately 10% of all diabetes cases are type1. Patientswith type 1 diabetes need to take insulin for the rest of their life. Theymust also ensure proper blood -glucose levels by carrying out their regular blood test and following a special diet.
A composition of genetic susceptivity and environmental factors such as viral infection, toxins, or some dietary factors, have been implicated as triggers for autoimmunity. It is most commonly seen in children and adolescents though it can develop at any age. Assuming that all type1 diabetes is incident in children might lead to underestimation the incidence of type1 diabetes in the population as a whole.

ETIOLOGY:
➤ T1-DM is characterized by the autoimmune destruction of beta(β) cells.
➤ Patients with type 1 diabetes produce little or no insulin via beta cells due to this destruction.
➤ Insulin is a hormone produced in the pancreas of beta cells.
➤ Insulin is needed to move blood sugar, glucose, into the cells where they stored and later used for energy.
➤ The body is notable to use this for energy, which leads to the symptoms of type 1 diabetes.

CAUSES OF TYPE 1 DIABETES MELLTUS

CAUSES OF TYPE 1 DIABETES

HEREDITARY PREDISPOSITION

ENDOCRINE DISEASES

AUTOIMMUNE DISEASES

DRUGS AND CHEMICAL TOXINS

TYPE 1 DIABETES

VIRUSES AND INFECTIONS

UNFAVORABLE ENVIRONMENTAL FACTORS

DAMAGE OR REMOVAL OF THE PANCREAS

AUTOIMMUNE DESTRUCTION OF BETA CELLS

➢ The cause of type 1 diabetes is unknown.
➢ It is most likely as an autoimmune disorder.
➢ An infection or some other trigger cause the body to mistakenly attack the pancreases that make insulin.

NONPHARMACOLOGICAL THERAPY OF TYPE 1 DIABETES MELLITUS:
➢ Medical nutrition therapy.
➢ Diabetes self-management dietary.
➢ Physical activities.
➢ Smoking cessation.
➢ Immunization.
➢ Psychological issues.

PHARAMCOLOGICAL THERAPYOF TYPE 1 DIABETES MELLITUS:
Insulin and other medications
Anyone who has type 1 diabetes needs insulin therapy throughout their life.
There are many types of insulin, including:
➢ **Short-acting insulin:**

It is also called regular insulin.In this type starts procedure around 30 minutes after injection. As it reaches peak effect at 90 to 120 minand lasts about 4 to 6 hours. Example; Human R,NovolinR and Afrezza.

➢ **Rapid-acting insulin:**
In this type of insulin starts working within 15 minutes. As it reaches peak effect at 60 minutes and lasts about 4 hours. This is often used 15 to 20 minutes before meals. Examples are insulin glulisine (Apidra), lispro (Humalog, Admelog and Lyumjev) and aspart (Novolog and FiAsp).
➢ **Intermediate-acting insulin.**:
Itis also called NPH insulin.In this type of insulin starts working in around the 1 to 3 hours. As it reaches peak effect at 6 to 8 hours and lasts 12 to 24 hours. Examples are insulin NPH (Novolin N, Humulin N).

➢ **Long- and ultra-long-acting insulin:**
In this type of insulin may provide gather for as long as 14 to 40 hours. Examples are glargine

(Lantus, Toujeo Solostar, Basaglar), detemir (Levemir) and degludec (Tresiba).
- Counting fats and protein.
- Monitoring blood sugars.
- Eating nutritional foods.
- Exercise regularly and keeping a beneficial weight.

2)Type2-Diabetes Mellitus:

In this Type2 diabetes mellitus (T2DM) accounts for around 90% of all cases diabetes. In T2DM, the response to insulin is reduced, and this defined as insulin resistance. In the course of this state, insulin is ineffective and is initially encountered by an increase in insulin production to maintain glucose homeostasis, insulin production decreases, resulting ssT2DM. It is most commonly seen in aged older than 45 years. It is increasingly seen in children, adolescents, and younger adults due toincreasing levels of obesity, physical inactivities, and energy-heavy diet.

In Type2 diabetes it is diagnosed by losing weight, following a nutritional diet, doing small exercise, and monitoring their glucose levels. However, type2 diabetes is typically a modern disease -it gradually gets worst -and the patient will possibly end up have to take it of insulin, usually in tablet form. Massive weight and obese people have amuch higher risk of developmentin type2 diabetes compared to those with a healthy body weight. Person with a lot of visceral fat, also known as central adiposity, flabby stomach or abdominal obesity, are especially at risk. Being obese cause the body to release their chemicals that can damage the body's cardiovascular and metabolic system.

Being overweight, physically inactive and eating the un healthy foods all supplyto our risk of developing type 2 diabetes. The scientistconsiders that the impact of sweet soft drinks on diabetes risk may be direct one, rather than simply an in controlon body weight. The risk of developing type2 diabetes is also greater as we get older.Those with a close relative who had type 2 diabetes, people of Middle Eastern, African, or South Asian descent also have a higher risk of developing of the disease. Men whose testosterone levels are low have been found to have a higher risk of developing type 2 diabetes.

In the early stage of type 2 diabetes, the pre dominate abnormality is decrease insulin sensitivity. At this stage hyperglycaemia can be reversed by variety of measures and medications that improve insulin sensitivity or reduce glucose performance by the liver.

ETIOLOGY:
- Type 2 diabetes do secrete insulin, unlike type 1 diabetics.
- Main problem in type 2 diabetes.
- Insulin receptors are insensible to the hormone.
- Insulin immunity.
- The small amount of insulin secreted does not bind to the cell receptors as it should.

CAUSES OF TYPE 2 DIABETES MELLITUS:
- Occurs due to insulin resistance (i.e. when the body does not response sto insulin).
- Tends to develop at an older age.
- Can be prevent with lifestyle changes.
- Can be managed with lifestyle modifications alone if diagnosed early. Number
- of peoples may have diabetes for years before they become diagnosed.

DIAGNOSIS:
- FASTING BLOOD GLUCOSE TEST:
- <6,1mmol/L – normal.
- 6,1 mmol/L -6,9 mmol/L -impaired.
- 7,0 mmol/L -on two occasions =diabetes.
- **CASUAL BLOOD GLUCOSE TEST**:
- If> 11, 0 mmol>/L+classic symptoms = diabetes.
- GLUCOSE TOLERANCE TEST (Oral intake 75 g of concentrated glucose solution)
- Normally blood glucose levels again to normal within 2tp 3 hoursafter ingestion of a glucose load.
- **GLYCATED HEMOGLOBIN TESTING:**
(haemoglobinA1C) provides an index of blood glucose levels over the previous 6to 12 weeks.
- Haemoglobin normally doesn't contain glucose.
- If blood glucose level is high the level of A1C is.
- Glycosylation is basicallyirreversible.
- **URINE TESTS**:
- Presence of glucose.
- Presence of ketone bodies.

PHARMACOLOGICALTHERAPYOF TYPE 2 DIABETES MELLITUS:

Drug Class	Example	Mechanism of Action	Normal Dosage	Dosage Adjustment in Patients with CLD
Biguanide	Metformin	Insulin sensitization leading to increased glucose uptake in muscle and reduced hepatic gluconeogenesis	500–3000 mg daily	Maximum dose, 1500 mg daily
Sulfonylurea	Gliclazide; glyburide; repaglinide	Stimulation of insulin release from pancreatic islet cells	80–320 mg daily; 2.5–20 mg daily; 4–16 mg daily	Dosage halved, especially if patient is not abstinent from alcohol
Alpha-glucosidase inhibitor	Acarbose	Inhibit disaccharidases to reduce glucose absorption in bowel	50–100 mg 3 times daily with meals	No dose adjustment
Thiazolidinedione	Pioglitazone	Insulin sensitization via PPAR-γ agonist effect	15–45 mg daily	Maximum, 30 mg daily with careful monitoring of liver function
Insulin	Long acting, intermediate acting, mixed, and short acting	Replacement of insulin deficiency	Variable between patients	Reduction in dose by 25% in patients with CLD, with clear warnings about risk of hypoglycemia
GLP-1 analog	Exenatide; liraglutide	GLP-1 stimulates insulin release and reduces appetite	10 µg twice daily; 0.6–1.8 mg daily	Little experience of use; hence, no dose recommendation. Use with caution.
DPP-4 inhibitor	Saxagliptin; linagliptin	Inhibit DPP-4 thereby elevating endogenous GLP-1	2.5–5 mg daily; 5 mg daily	No dose adjustment

II. CONCLUSION

This review article offers a comprehensive exploration of the classification and pharmacotherapy of Diabetes Mellitus (DM). It underscores the global significance of DM as a prevalent non-communicable disease, particularly emphasizing the challenges faced in India. The article provides valuable insights into the diverse types of DM, with a focus on Type 1, Type 2, and Gestational Diabetes Mellitus. By discussing both pharmacological and non-pharmacological therapeutic approaches, the review underscores the complexity of DM management. The article serves as a valuable resource for healthcare professionals and researchers, emphasizing the need for continuous efforts in understanding, treating, and raising awareness about diabetes for improved public health outcomes.

REFERENCES

1. Deepti B, Sowjanya K, Lidiya B, Bhargavi RS and Babu P.S, "A modern review on Diabetes mellitus: Aninhibitory metabolic disorder" Journal of silico and in vitro pharmacology 2017;3:1-14.
2. Ozougwu J.C Obima K.C, Belonwu C.D and Unkalama C.B, "The pathogenesis and pathophysiology of type 1 and type 2 diabetes mellitus",Journal of physiology and pathophysiology 2013;4(4): 46-57.
3. Mariarma Karamanou, Athanase Protogerou, Effie Poulakou Rebelakou. Milestones in the history of diabetes mellitus: The main. contributors. World 3 Diabetes. 2016; 7 (1): 1-7
4. Etiology of type 2diabetes mellitus ppt - Bing. Bing n.d. https://www.bing.com/images/search?view=detailV2&ccid=xJd0llYm&id=4990FF3A9043EBB7EF9A3A3E5233E8946DF43919&thid=OIP.xJd0llYm2dlDVYDEk5Yf2QHaFj&mediaurl=https%3a%2f%2fimage1.slideserve.com%2f3039949%2fetiology-l.jpg&exph=768&expw=1024&q=etiology+of+type+2diabetes+mellitus+ppt&simid=608017913500357422&FORM=IRPRST&ck=28D19944C45ECE81F8A88CD9ED0BF986&selectedIndex=0&itb=0&ajaxhist=0&ajaxserp=0.
5. diagnosis of diabetes mellitus ppt - Bing. Bing n.d. https://www.bing.com/images/search?view=detailV2&ccid=U78%2fBAEb&id=4E58C938A70B0F72FB28F2975D85D9D0ADAC62D5&thid=OIP.U78_BAEb60kNI6DLpK4eAAHaFj&mediaurl=https%3a%2f%2fth.bing.com%2fth%2fid%2fR.53bf3f04011beb490d23a0cba4ae1e00%3frik%3d1WKsrdDZhV2X8g%26riu%3dhttp%253a%252f%252fcf.ppt-online.org%252ffiles%252fslide%252ft%252fTyNzAZta8HVOs4E1q3epRw6ojWMcxYDK0nLdmI%252fslide-20.jpg%26ehk%3dmYBrfGSzLFHlak8cq9

ZTlRx%252bKabmqlQQmULGf4%252b%252f9qU%253d%26risl%3d%26pid%3dImgRaw%26r%3d0&exph=768&expw=1024&q=diagnosis+of+diabetes+mellitus+ppt&simid=608000445863699169&FORM=IRPRST&ck=F8D2307F012D458556EDE1E53DD9809A&selectedIndex=4&itb=0&ajaxhist=0&ajaxserp=0.

6. pharmacotherapy of dm - Bing. Bing n.d. https://www.bing.com/images/search?view=detailV2&ccid=QtA5w7rR&id=1E420C7AD85A972A6C3613890C8C0AF80146F4D6&thid=OIP.QtA5w7rRJH8t1aGSfFtb9QHaED&mediaurl=https%3a%2f%2fwww.researchgate.net%2fprofile%2fTahseen-Chowdhury%2fpublication%2f230721814%2ffigure%2fdownload%2ftbl1%2fAS%3a393481072726024%401470824606617%2fPharmacotherapy-Recommendations-for-Patients-with-Diabetes-and-CLD.png&exph=465&expw=850&q=pharmacotherapy+of+dm+&simid=608017239163431597&FORM=IRPRST&ck=53C7FDEEF7649EF16CB2B4E762395E09&selectedIndex=28&itb=0&ajaxhist=0&ajaxserp=0.

7. Aizza. PPT - Pediatric Type 1 Diabetes Mellitus PowerPoint Presentation, free download - ID:515396. SlideServe 2012. https://www.slideserve.com/aizza/childhood-and-adolescent-type-2-diabetes.

8. cause of type 1 diabetes mellitus ppt - Bing. Bing n.d..

9. Type 1 diabetes - Diagnosis and treatment - Mayo Clinic

10. Zheng Y,Le SH,Hu FB, Global aetiology and epidemiology of type 2 diabetes mellitus and itscomplications.Naturereviews.Endocrinology.2018Feb[PubMedPMID:29219149] (http://www.ncbi.nlm.nih.gov/pubmed/29219149)

11. Malek R,HannatS,Nechadi A,Zohra Mekideche F,Kaabeche M, Diabetes and Ramadan: a multicenter study in Algerian population. Diabetes research and clinical practice. 2019 Feb 16;(http://www.ncbi.nlm.nih.gov/pubmed/30779972

12. Choi YJ,ChungYS,Type 2 diabetes mellitus and bone fragility: Special focus on bone imaging.Osteoporosisandsarcopenia.2016Mar[PubMedPMID:30775463] (http://www.ncbi.nlm.nih.gov/pubmed/30775463)

13.] Picke AK,Campbel G,Napoli N,Hofbauer LC,Rauner M, Update on the impact of type 2 diabetes mellitus on bone metabolism and material properties. Endocrine connections. 2019Mar1;[PubMedPMID:30772871] (http://www.ncbi.nlm.nih.gov/pubmed/30772871)

14. Carrillo-Larco RM,Bareng NC,Albitres-Flores L,Bernabe-Ortiz A, The risk of mortality among people with type 2 diabetes mellitus in Latin America: A systematic review and meta-analysis of population-based cohort studies. Diabetes/metabolism research and reviews. 2019 Feb 13; [PubMed PMID: 30761721] (http://www.ncbi.nlm.nih.gov/pubmed/30761721)

15. Hussain S,Chowdhury TA, The Impact of Comorbidities on the Pharmacological ManagementofType2DiabetesMellitus.Drugs.2019Feb11;[PubMedPMID:30742277] (http://www.ncbi.nlm.nih.gov/pubmed/30742277)

16. KempegowdaP,Chanda JS,Abdulrahman S,Chauhan A,Saeed MA, Managing hypertension in people of African origin with diabetes: Evaluation of adherence to NICE Guidelines. Primary carediabetes.2019Jan28;[PubMedPMID:30704854] (http://www.ncbi.nlm.nih.gov/pubmed/30704854).

17. Martinez LC,Sherlin D,Holley A, The Screening and Prevention of Diabetes Mellitus. Primarycare.2019Mar;[PubMedPMID:30704659] (http://www.ncbi.nlm.nih.gov/pubmed/30704659)

18. Thewjitcharoen Y,Chotwanvirat P,Jantawan A,Siwasaranond N,Saetung S,Nimitphong H,Himathongkam T,Reutrakul S, Evaluation of Dietary Intakes and Nutritional Knowledge in Thai Patients with Type 2 Diabetes Mellitus. Journal of diabetes research. 2018; [PubMed PMID: 30671482] (http://www.ncbi.nlm.nih.gov/pubmed/30671482)

19. Willis M,Assebur C,Neslusan C, Conducting and interpreting results of network meta-analyses in type 2 diabetes mellitus: A review of network meta-analyses that include sodium glucose co-transporter 2 inhibitors. Diabetes research and clinical practice. 2019Feb[PubMedPMID:30641163]

(http://www.ncbi.nlm.nih.gov/pubmed/3064
1163)

20.] Lai LL,WaYuso WNI,Vethakkan SR,Nik Mustapha NR,Mahadeva S,Chan WK, Screening for non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus using transient elastography. Journal of gastroenterology and hepatology. 2018 Dec 14;[PubMed PMID: 30551263] (http://www.ncbi.nlm.nih.gov/pubmed/3055 1263)

21. Eckstein ML,Williams DM, O'NeilLK, Hayes J,Stephens JW,Bracken RM, Physical exercise and non-insulin glucose-lowering therapies in the management of Type 2 diabetes mellitus: a clinical review. Diabetic medicine: a journal of the British Diabetic Association.2019Mar,[PubMedPMID:30536 728] (http://www.ncbi.nlm.nih.gov/pubmed/3053 6728)

22. Massey CN,Feig EH,Duque-Serrano L,Wexler D,Moskowitz JT,Human JC, Well-being interventions for individuals with diabetes: A systematic review. Diabetes research and clinicalpractice.2019Jan;[PubMedPMID:305 00545] (http://www.ncbi.nlm.nih.gov/pubmed/3050 0545)

23. Shah SR, IqbalSM, AlweisR,Roark S, A closer look at heart failure in patients with concurrent diabetes mellitus using glucose lowering drugs. Expert review of clinical pharmacology. 2019 Jan; (http://www.ncbi.nlm.nih.gov/pubmed/3048 8734)

24.] [PubMed PMID: 30488734] [National guidelines for the prevention and control of diabetesinprimarycare(2018)].Zhonghuaneik ezazhi.2018Dec1;[PubMedPMID:30486556] (http://www.ncbi.nlm.nih.gov/pubmed/3048 6556)

25. PetersmannA,Müller-Wieland D,Müller UA,Landgraf R,Nauck M,Freckmann G,Heinemann L,Schleicher E, De nition, Classi cation and Diagnosis of Diabetes Mellitus. Experimental and clinical endocrinology & diabetes : o cial journal, German Society of Endocrinology [and] German Diabetes Association. 2019 Dec[PubMed PMID: 31860923] (http://www.ncbi.nlm.nih.gov/pubmed/3186 0923

26. Kerner W,Brückel J, De nition, classification and diagnosis of diabetes mellitus. Experimental and clinical endocrinology & diabetes : o cial journal, German Society of Endocrinology [and] German Diabetes Association. 2014 Jul [PubMed PMID: 25014088] (http://www.ncbi.nlm.nih.gov/pubmed/2501 4088)

27. Cepeda Marte JL,Ruiz-Matuk C,Mota M,Pérez S,Recio N,Hernández D,Fernández J,Porto J, Ramos A, Quality of life and metabolic control in type 2 diabetes mellitus diagnosed individuals. Diabetes & metabolic syndrome. 2019 Sep - Oct [PubMed PMID: 31425943] (http://www.ncbi.nlm.nih.gov/pubmed/3142 5943)

28. Ste ensen C,Dekkers OM,Lyhne J,Pedersen BG,Rasmussen F,Rungby J,Poulsen PL,Jørgensen JOL, Hypercortisolism in Newly Diagnosed Type 2 Diabetes: A Prospective Study of 384 Newly Diagnosed Patients. Hormone and metabolic research =Hormon- und Stowechselforschung = Hormonesetmetabolisme.2019Jan[PubMedP MID:30522146] (http://www.ncbi.nlm.nih.gov/pubmed/3052 2146

29. Liu Y, WangD, LiZS, Hu LH, Design Flaws in the Study of Distinguishing Diabetes Associated with Chronic Pancreatitis and Type 2 Diabetes Mellitus. Clinical and translational gastroenterology. 2019 Nov 1 [PubMed PMID: 31688073] (http://www.ncbi.nlm.nih.gov/pubmed/3168 8073)

30. Qin Z,ZhouK,Li Y,ChengW,WangZ,Wang J,Gao F,Yang L,Xu Y,Wu Y,He H,Zhou Y, The atherogenic index of plasma plays an important role in predicting the prognosis of type 2 diabetic subjects undergoing percutaneous coronary intervention: results from anobservationalcohortstudyin China.Cardiovasculardiabetology.2020Feb2 1[PubMedPMID:32085772] (http://www.ncbi.nlm.nih.gov/pubmed/3208 5772)

31. NowakowskaM, ZghebiSS, AshcroftDM, BuchanI, Chew-Graham C, HoltT, MallenC, Van Marwijk H, PeekN, Perera-Salazar R, ReevesD, RutterMK, WengSF, QureshiN, Mamas MA,Kontopantelis E, Correction to: The comorbidity burden of type 2 diabetes mellitus: patterns, clusters and predictions

from a large English primary care cohort. BMC medicine. 2020 Jan 25 [PubMed PMID: 31980024] (http://www.ncbi.nlm.nih.gov/pubmed/3198 0024)

32. 12/13 https://www.statpearls.com/keywords/article list/ View publication stats 5/4/2021 StatPearls Published Articles - StatPearls Akalu Y,Birhan A, Peripheral Arterial Disease and Its Associated Factors among Type 2 Diabetes Mellitus Patients at Debre Tabor GeneralHospital, Northwest Ethiopia. Journal ofdiabetesresearch.2020[PubMedPMID: 32090126] (http://www.ncbi.nlm.nih.gov/pubmed/3209 0126)

33. Patoulias D,Papadopoulos C,Stavropoulos K,Zografou I,Doumas M,Karagiannis A, Prognostic value of arterial stiness measurements in cardiovascular disease, diabetes, and its complications: The potential role of sodium-glucose co-transporter 2 inhibitors. Journalofclinicalhypertension (Greenwich,Conn.).2020Feb14[PubMedPMI D:32058679] (http://www.ncbi.nlm.nih.gov/pubmed/3205 8679)

34. Liakopoulos V,Franzén S,Svensson AM,Miftaraj M,Ottosson J,Näslund I,Gudbjörnsdottir S,Eliasson B, Pros and cons of gastric bypass surgery in individuals with obesity and type 2 diabetes: nationwide, matched, observational cohort study. BMJ open.2019Jan15;[PubMedPMID:30782717] (http://www.ncbi.nlm.nih.gov/pubmed/3078 2717).