Original Article

COMPARATIVE ASSESSMENT AND EVALUATION OF ANTI DIABETIC DRUGS TREATMENT OF TYPE II DIABETES MELLITUS PATIENTS

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ABSTRACT

Diabetes is a serious, habitual condition that occurs when the body cannot produce enough insulin or cannot effectively use the insulin it does produce, leading to high situations of glucose (hyperglycemia). The main aim is to evaluate the safety and efficacy of anti-diabetic drugs; a prospective observational study was carried out at the department of general medicine in a tertiary care teaching hospital for a period of more than 6 months. For this study we selected the patients above 18 years of either sex, with co-morbidities, diabetes was included. It was observed that there was predominance of male 284 (56.80%), female 216 (43.20%) in the age group of 18-80 years, among that widely distributed in the age group of 51–60 years with frequency of 53%. we noted, larger numbers of patients were prescribed with metformin (16.60 %) as oral hypoglycemic agents. It was found that majority of patients were administered with regular insulin (21%) as an insulin analogue, (because of co-morbid conditions, patients were often switched to insulin therapy in comparison with the metformin). Various other combinations of oral hypoglycemic agents and insulin analogues were also prescribed. The significant risk factor was found to be age (65%) followed by sedentary lifestyle (52%) and hypertension (43%). While counselling it was recognized that the majority of patients were illiterate about the disease and counselling for the diabetes lifestyle management had a positive impact in maintaining their blood glucose levels and improved their condition. This study determined that by analyzing prescription patterns and evaluating drug-related problems, we can focus on increasing medication adherence and thereby improve patients' health related excellence of life.

KEYWORDS: diabetes mellitus, anti-diabetic drugs, counselling, risk factors.

INTRODUCTION

Type 2 diabetes is the most common type of diabetes, accounting for over 90% of all diabetes worldwide. It's presently the 8th leading cause of complaint burden, encyclopedically and estimated to come the second leading cause by 2050. In type 2 diabetes, the incapability of the body's cells to respond completely to insulin is nominated insulin resistance. The presence of insulin resistance prompts an increase in insulin product, which, over time, may affect in shy insulin product as pancreatic beta cells fail to keep up with demand. Type 2 diabetes may have symptoms analogous to those of type 1 diabetes, but the onset is generally much less dramatic and frequently fully asymptomatic.[1]

The lack of symptoms makes the exact time of the onset of type 2 diabetes delicate or insolvable to determine. As a result, there's frequently a long period before the diabetes is diagnosed. At any given time, as numerous as one- third to one- half of people with type 2 diabetes in the population may be undiagnosed. However, complications may develop, If the opinion is delayed for a prolonged time. Numerous are diagnosed because they formerly have one or further of the complications associated with the condition. The causes of type 2 diabetes are not fully understood, but there's a strong link with redundant body weight, advanced age, race and a family history of diabetes. Contributors to type 2 diabetes threat are allowed to include multi-gene predilection and environmental triggers.[1,2]

The foundation of type 2 diabetes operation is promoting a life that includes a healthy diet, regular physical exertion, smoking conclusion and conservation of healthy body weight. However, oral drug is generally initiated, with metformin as the first- line drug. If changes to life are not sufficient to control blood glucose levels. However, a range of combination remedy options are also available. If treatment with a single drug is not sufficient. These include sulphonylureas, nascence glucosidase impediments, thiazolidinediones, dipeptidyl peptidase 4 (DPP- 4) impediments, glucagon- suchlike peptide 1 receptor (GLP- 1R) gastric inhibitory peptide (GIP) agonists, and sodium- glucose transporter 2 impediments. Insulin injections may be necessary to control hyper glycaemia to recommended situations if non-insulin specifics do not help people with type 2 diabetes to achieve glycaemia control. Beyond controlling blood glucose situations, it's critically important to manage blood pressure (BP) and blood cholesterol (LDL) situations and assess control of these threat factors on a regular base (at least annually). Regular webbing for the development of early diabetes-

related complications, similar as order complaint, retinopathy, neuropathy, supplemental roadway complaint and bottom ulceration, helps help the development and progression of these complications.[2]

With regular check- ups and effective life operation along with drug as demanded and support in the form of diabetes education people with type 2 diabetes can lead long and healthy lives. Encyclopedically, the frequency of type 2 diabetes is high and rising across all regions.[2,3]

This rise is driven by population ageing, profitable development and adding urbanization leading to lesser exposure to type 2 diabetes threat factors including further sedentary cultures, lesser consumption of sugar-candied potables, reused and red meat, unrefined grains, and other unhealthy foods linked to rotundity, and lesser exposure to air pollution. Still, the salutary results of early discovery and further effective treatment are helping people with type 2 diabetes to live longer, which also contributes to the rise in frequency.[3]
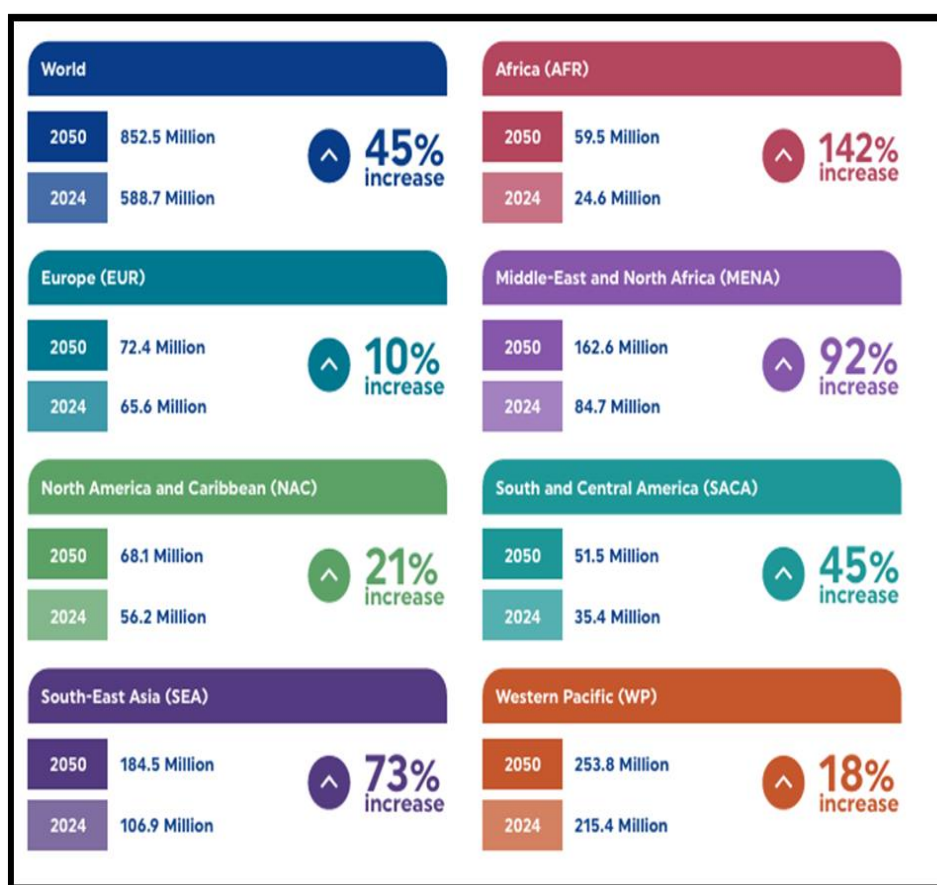

Fig. No. 1: Number of people with diabetes worldwide as per International Diabetes Federation Diabetes Atlas 11th Edition – 2025 Region, in 2024–2050 (20–79 years)

The frequency of type 2 diabetes has increased specially in grownups under 40 and has also come a concern in children and youthful people due to the adding frequency of rotundity in childhood and adolescence. The

frequency of type 2 diabetes varies by race and ethnicity, as reported by the IDF Diabetes Atlas.[3]

Lifestyle choices, including eating a strong diet, working out and continuing at a healthy weight, are key to

managing type 2 diabetes. But you also might need to take medicine to keep your blood sugar, also called glucose, at an energetic level. Sometimes one medicine is sufficient. In other cases, taking several medicines works better.[4]

Diabetes medications
No one diabetes treatment is best for everyone. What works for one person may not work for another. Your health care provider can explain how one medication or multiple medications may fit into your diabetes treatment plan. Sometimes combining medicines may increase the effectiveness of each individual medicine to lower blood sugar. Talk to your provider about the pros and cons of specific diabetes medications for you.

A medicine may work by.
- Producing the pancreas to make and release more insulin.

- Restrictive the liver's ability to make and release sugar.
- Obstructive the action of enzymes in the intestines that break down carbohydrates, slowing how quickly cells take in carbohydrates.
- Improving cells' sensitivity to insulin.
- Limiting the kidneys' ability to take in sugar, which increases the amount of sugar that leaves the body in urine.
- Slowing how quickly food moves through the stomach.

Below is a list of common diabetes medications.[5]

Table No. 1. Diabetes medications.

Medications	Drug	Action	Advantages	Possible side effects
Meglitinides	Repaglinide Nateglinide	Trigger the release of insulin from the pancreas	Work quickly	Blood sugar levels drop too low a condition called hypoglycemia Weight gain
Sulfonylureas	Glipizide (Glucotrol XL) Glimepiride (Amaryl) Glyburide (DiaBeta, Glynase)	Trigger the release of insulin from the pancreas	Low cost Effective in lowering blood sugar	Blood sugar levels drop too low Weight gain Skin rash Nausea or vomiting if you drink alcohol
Dipeptidyl-peptidase 4 (DPP-4) inhibitors	Saxagliptin (Onglyza) Sitagliptin (Januvia) Linagliptin (Tradjenta) Alogliptin (Nesina)	Cause the release of insulin when blood sugar is rising Limit the liver's ability to release glucose	Don't cause weight gain Don't cause blood sugar levels to drop too low when used alone or with metformin	Upper respiratory tract infection Sore throat Headache
Biguanides	Metformin	Limit the liver's ability to release sugar Improve cells' sensitivity to insulin	Very effective May lead to minor weight loss Low cost	Nausea Stomach pain Diarrhea Very rarely, the harmful buildup of lactic acid — a condition called lactic acidosis —in people with kidney failure or liver failure
Thiazolidinediones	Rosiglitazone (Avandia) Pioglitazone (Actos)	Improve cells' sensitivity to insulin Limit the liver's ability to make and release sugar	May slightly increase high-density lipoprotein (HDL) cholesterol, the "good" cholesterol	Weight gain Fluid retention Increased risk of broken bones Increased risk of heart problems, including heart failure Possible increased risk of bladder cancer with pioglitazone People with liver problems or a history of heart failure shouldn't take this kind of diabetes medicine.
Alpha-glucosidase inhibitors	Acarbose Miglitol (Glyset)	Slow the body's ability to breakdown starches and some	Don't cause weight gain Don't cause blood sugar	Gas Stomach pain Diarrhea

		sugars	levels to drop too low unless you take them with insulin or a sulfonylurea	
Sodium-glucose transporter 2 (SGLT2) inhibitors	Canagliflozin (Invokana) Dapagliflozin (Farxiga) Empagliflozin (Jardiance) Ertugliflozin (Steglatro)	Limit the kidneys' ability to take in sugar, which increases the amount of sugar that leaves the body in urine	May lead to weight loss May lower blood pressure	Urinary tract infections Yeast infections
Bile acid sequestrants	Colesevelam (Welchol)	Lower cholesterol and have a small effect in lowering blood sugar when used with other diabetes medications	Likely safe for people with liver problems	Gas Constipation Indigestion Rise in blood fats called triglycerides
Amylin mimetics	Pramlintide (Symlin)	Help regulate blood sugar Slow food moving through the stomach Used with insulin shots	May decrease hunger May lead to minor weight loss	Blood sugar levels drop too low Nausea Abdominal pain
Incretin mimetic (GLP-1 receptor agonists)	Dulaglutide (Trulicity) Exenatide (Byetta, Bydureon Bcise) Liraglutide (Saxenda, Victoza) Lixisenatide (Adlyxin) Semaglutide (Ozempic, Rybelsus, Wegovy) Tirzepatide (Mounjaro), a similar kind of medicine called a dual-acting GLP-1/GIP agonist.	Cause the release of insulin as blood sugar levels are rising May be used with metformin, basal insulin or a sulfonylurea	May decrease hunger May lead to weight loss	Nausea Vomiting Diarrhea Abdominal pain Increased risk of inflamed pancreas — a condition called pancreatitis

Method of Study
Over the course of six intriguing months, from October 2024 to April 2024, a vibrant cross-sectional study unfolded. The researchers meticulously gathered demographic information and comprehensive prescriptions, all documented on a thoughtfully designed case record form. Each diabetic patient who wandered into the bustling outdoor medicine department was carefully recruited, all while being gently informed about the study's purpose. They gave their written informed consent, a crucial step in this collaborative journey. Before diving into the research, approvals were secured from several pivotal figures, the Institutional Ethics Committee, the hospital superintendent, and the head of the medicine department all crucial gatekeepers ensuring that the study adhered to ethical standards. The inclusivity of the study was notable; any patient on anti-diabetic medications, regardless of gender, was welcomed into the fold, while those who were pregnant or lacking sufficient data were set aside to maintain the study's integrity. Each prescribed medication was classified using anatomical therapeutic categories, a systematic approach that added clarity to the data.[7]

Interestingly, the majority of medications were noted by their brand names, a common practice in the field. For prescriptions lacking the generic name or price details, the researchers turned to reliable sources like the Current Index of Medical Specialties (CIMS) and the Indian Drug Review (IDR) to fill in the blanks.[8]

Inclusion criteria[9]
1. Newly diagnosed patients of diabetes mellitus type 2.
2. Patients with age more than 18 years.
3. Patients of either sex
4. Patients having base line (pretreatment) biochemical parameters other than blood sugar (i.e. liver function test, kidney function test) within normal range.
5. Patients having no associated comorbidities.

Exclusion criteria[9]
1. Patients who were unwilling to participate and did not give consent in the study.
2. Patients who were unable to give interview.
3. Patients with incomplete medical records.
4. Patients with chronic liver disease such as cirrhosis, chronic hepatitis and acute viral hepatitis
5. Terminally ill patients.
6. Patients with concurrent major psychiatric illness and/or concurrent major medical illnesses.

Data Management and Analysis
Statistical analysis[10]
Categorical variables were presented in number and percentage (%). Qualitative variables were compared using Chi-Square test /Fisher's exact test as appropriate. A p value of <0.05 was considered statistically significant. Statistical analysis was performed using Graph Pad Quick Calcs software available online at http://graphpad.com/quickcalcs/. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULT AND DISCUSSION
1. Gender-Wise Distribution of Patients: Based on the data collected from 500 cases of Type 2 Diabetes Mellitus, results were evaluated. We found that diabetes was prevalent among (284) 56.80% Males followed by (216) 43.20% Females as in figure No. 2.
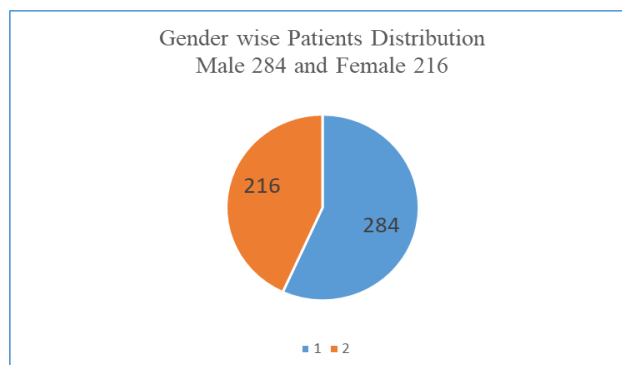

Fig. No. 2: Gender-Wise Distribution of Patients.

2. Distribution of Data Based on Oral Hypoglycemic Drugs: Based on data collected during the study, it was found that most of the patients an oral hypoglycemic drug were on Canagliflozin + Metformin 02.00 %, Glibenclamide + Metformin + Pramlintide 03.60 %, Glimepiride + Metformin + pioglitazone 04.40 %, Glyburide + Metformin, 07.40 %, Glipizide+ Metformin 08.40 %, Metformin 16.60 %, Glibenclamide + Metformin 18.20 %, Glipizide + Metformin 18.80 %, and followed by Human Mix insulin+ Metformin 20.60 %. as in shown in table No.2.

Table No. 2. The Anti-Diabetic Drug Usage Pattern prescription.

Drugs Prescribed	Numbers of Patients	Percentage (%)
Canagliflozin + Metformin	10	02.00 %
Glibenclamide + Metformin + Pramlintide	18	03.60 %
Glimepiride + Metformin + pioglitazone	22	04.40 %
Glyburide + Metformin	37	07.40 %
Glipizide+ Metformin	42	08.40 %
Metformin	83	16.60 %
Glibenclamide + Metformin	91	18.20 %
Glipizide + Metformin	94	18.80 %
Human Mix insulin+ Metformin	103	20.60 %
Total	500	100%

3. Age-Wise Distribution of Patients: All the patients were grouped as per the age. Majority of the patients in the study belonged to the age group of 18-30 years is 04.60 %, 31-40 years (07.60 %), 41-50 (26.40%) 51-60 years (31.60 %), 61-70 years (21.40 %) followed by age group 71-80 (8.40 %) as in Table. No. 3.

Table No. 3: Age-Wise Distribution of Patients.

Sl. No.	Age Group	Number of Patients	%
1	18-30	23	04.60
2	31-40	38	07.60
3	41-50	132	26.40
4	51-60	158	31.60
5	61-70	107	21.40
6	71-80	42	8.40

4. Distribution of Patients Based On Addiction: Among the study population, 77.40% of the patients were with no addictions followed by 02.40% of alcoholics, 05.20% of smokers and 09.20 % of tobacco chewers as in Table No. 4.

Table No. 4: Distribution of Patients Based On Addictions.

Characteristics	Frequency (n)	Percentage
Gender		
Males	284	56.80
Females	216	43.20
Family History		
Yes	122	24.40
No	378	75.60
Social Habits		
No addictions Alcohol /Smoking	387	77.40
Alcoholic	21	02.40
Ex-alcoholic	72	14.40
Occasional alcoholic	34	06.80
Smoking	26	05.20
Ex- Smoking	87	17.40
Occasional Smoking	20	04.00
tobacco chewers	53	09.20

5.   Distribution of Patients Based On Comorbidities:
Among the study population, 58% of patients had cardiovascular diseases as comorbid condition followed by Hypertension 16.20 % Peptic Ulcer 13.80 % Urinary tract infection 09.20 % Heart disease 11.20 % respiratory tract infections 04.80 %. With nil Comorbidities 23.80 %.

Table No. 5: Distribution of Patients Based on Comorbidities.

Co morbidities	Incidence (N)	Percentage %
Depression	27	05.40
Heart disease	56	11.20
Hypertension	81	16.20
Nil	119	23.80
Osteoarthritis	23	04.60
Peptic Ulcer	69	13.80
Sexual dysfunction	23	04.60
Urinary tract infection	46	09.20
Visual Problems	32	06.40
Respiratory tract infections	24	04.80

6.   Distribution of Data Based on Hba1c Levels:
Based on the above data collected, 69.00 % patients had not performed the HbA1C test whereas 23.00 % had their Hb1AC >6.5 followed by 08.00 % having their Hb1AC levels between 5.7-6.4.

7.   Distribution of Data Based on Complication of Disease: Among the study population, 70% of the patients were found to exhibit no complications followed by 12% exhibiting Diabetic Ketoacidosis and 10% Diabetic Foot Ulcers as in figure.
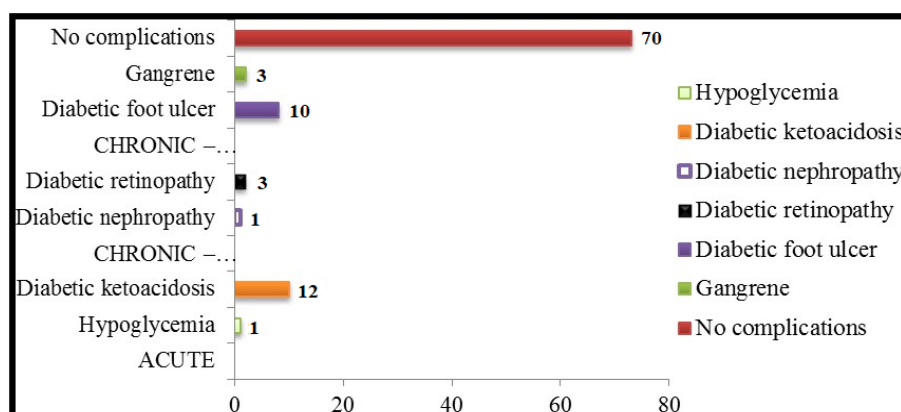

Fig. No. 3: Distribution of Data Based On Complication of Disease.

8. Distribution of Patients Based on Risk Factors:
Upon the data collected, patients were classified based on risk factors. 73% of the patients were above 45 years of age, followed by 58% of the patients who were habituated to sedentary lifestyles and 44% of the patients having high blood pressure and 11% having high cholesterol levels as in figure.
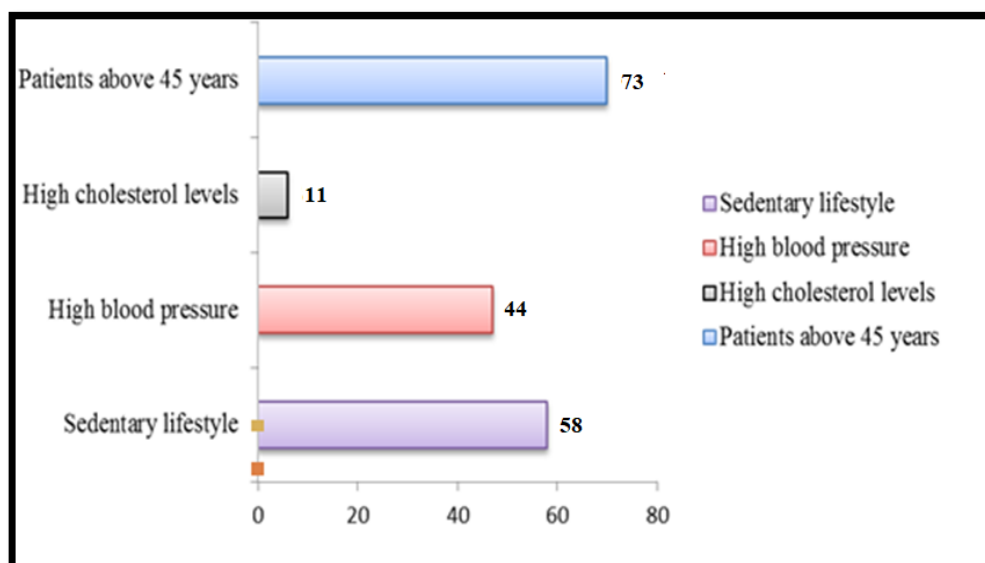

Fig. No. 4: Distribution of Patients Based On Risk Factors.

CONCLUSION
Type 2 diabetes can be prevented or delayed, and there is accumulating evidence that remission of type 2 diabetes may be possible in the early stages of the condition.

In this learning Efficiency of the treatment was projected and diabetes mellitus associated threat factors were linked and effective case comforting was done for implementation the quality of life in cases with diabetes.

It can be concluded from our findings that; male cases were more affected than female cases and those between the age group of 41- 60 times are more prone to type 2 diabetes mellitus and the study also concludes that maturity of the cases had a diabetic duration.

The learning shows the prevalence of colorful threat factors, among them Age> 45 times of the age followed by sedentary life and hypertension were the major threat factors associated with diabetes, whose revision and threat operation could lead to positive health issues precluding further complications. We've also studied several complications; among them the most current bone was Diabetic ketoacidosis followed by the Diabetic bottom ulcer. Each diabetic case in this study had one or further co morbid conditions; cardiovascular conditions were the most current.

The most generally specified medicine for the treatment of Type 2 Diabetic Mellitus in convalescents was insulin (Regular Human Insulin), followed by Biguanides (Metformin) and Sulfonylureas. Subcutaneous route of administration was the most favored route for insulin. It was set up that maturity the medicines specified were according to AHA guidelines.

The current study has showed that involvement of clinical druggist in assessing the stylish treatment issues with effective case comforting can surely have a positive impact on health issues and also improves the quality of life in case.

During our consultation, we encountered many patients who lacked understanding in managing their lifestyle, diet and physical activity. So, through this consultation, they learned many different ways to control their blood sugar besides taking medicine.

The prescribing and dispensing trend of anti-diabetic drugs appears to be moving towards combination therapy and use of newer drugs is becoming prevalent. In light of availability of newer anti-diabetic drugs, there exists a need to review and modify Type 2 Diabetes Mellitus treatment guidelines to achieve better glycemic control.

Conflict of interest: None declared.

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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