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# UNDERSTANDING PRESCRIPTION TRENDS OF METFORMIN FORMULATIONS IN TYPE 2 DIABETES MANAGEMENT AT A CLINICAL TEACHING FACILITY

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**ABSTRACT**

Establishing the Scene:

Medications are necessary for the long-term control of Type 2 Diabetes Mellitus (T2DM), a metabolic condition. Whether used alone or in conjunction with other antidiabetic medications, metformin continues to serve as the foundation of treatment for type 2 diabetes. In order to optimise patient care and evaluate the logic of medication usage, it is helpful to understand the prescription patterns of Metformin and its formulations.

Patient adherence to different Metformin formulations and combination therapy for type 2 diabetes mellitus (T2DM) at a tertiary care teaching hospital will be assessed in this research.

The researchers used a tertiary teaching hospital's outpatient department to administer a prospective observational study over a set length of time. Metformin formulation (immediate-release vs. extended-release), dosing patterns, patient demographics, and whether the patient was receiving monotherapy or combo medication were among the data points culled from T2DM prescriptions.

The majority of prescriptions were for combination treatment, with sulfonylureas and DPP-4 inhibitors being the most common medications combined with Metformin. Patients who had gastrointestinal side effects were advised to use extended-release Metformin. Prescribers significantly adhered to clinical recommendations, and there were age-related patterns in formulation choice, according to the research.

Using Metformin and its formulations rationally in combination treatment is strongly preferred for the management of type 2 diabetes, according to the data. Ensuring evidence-based and patient-centered diabetic treatment requires continuous monitoring of prescription patterns. Findings from this research highlight the value of local medication utilisation reviews in improving treatment efficacy while reducing side effects.

## I. INTRODUCTION

The metabolic disease known as type 2 diabetes mellitus (T2DM) develops over time and is marked by insulin resistance as well as relative insulin insufficiency. In terms of healthcare expenditures, mortality, and morbidity, it ranks high among the world's most common non-communicable illnesses. The International Diabetes Federation reports that type 2 diabetes (T2DM) accounts for more than 90% of all occurrences of diabetes, and that the incidence of diabetes is steadily increasing across the world.

The goal of effective treatment of type 2 diabetes is to achieve glycaemic control and reduce the risk of complications using a combination of lifestyle adjustments and pharmaceutical therapies. Metformin is still the gold standard among oral antidiabetic medicines (OADs) because of its cost-effectiveness, safety

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record, and other advantages including weight neutrality and possible protection for cardiovascular health.

To help patients reach their unique glycaemic goals, doctors may prescribe metformin in a variety of forms, the most common of which are immediate-release (IR) and extended-release (ER) tablets. Other antidiabetic medications that are commonly prescribed alongside metformin include sulfonylureas, DPP-4 inhibitors, SGLT2 inhibitors, and thiazolidinediones. Factors unique to each patient, such as age, comorbidities, tolerability, and doctor preferences, govern the selection of formulation and combination treatment.

The prescription patterns of Metformin might fluctuate greatly between healthcare settings owing to different clinical procedures, formulation availability, and prescriber understanding, even though Metformin is widely used. In order to comprehend the reasoning behind prescription behaviour and find ways to enhance diabetes care, it is essential to assess medication utilisation patterns of Metformin and its combinations.

The purpose of this research is to examine the patterns of treatment with different combinations of Metformin and other medications among type 2 diabetic patients seen at a large academic medical centre. The objective is to find out how well existing procedures match up with clinical recommendations and where treatment tactics may be improved.

## II. METHODS

Fifty patients hospitalised to the medicine wards of Dhiraj hospital—a tertiary care teaching rural hospital linked to SBKS medical institute and research centre, managed under Sumandeep Vidyapeeth—with diabetes were the subjects of a prospective, non-interventional, observational study. The institutional ethics committee had to provide its stamp of approval before this research could go forward. Written Informed Consent (ICF) was obtained from all participants after they were informed about the study's goal and nature in a language they understood.

The research included all male and female participants who were at least 18 years old and had a diagnosis of type II diabetes mellitus; participants with a diagnosis of gestational diabetes or type I diabetes were not included.

Data on the participants' ages, sexes, occupations, pertinent medical histories, prior medical records, and medications were documented in the Case Record Form (CRF) after retrieving it from their case files. Additionally, information was documented on the diabetic therapy, including the medications used, the dosage, the length and frequency of administration, the kind of dosage form used, and so on. Throughout their hospital stay, the participants in the trial were monitored for management, prognosis, adverse medication reactions, and therapy modifications (if applicable) until they were released.

Data analysis using statistics

Percentiles are used to express the collected data.

## III. RESULTS

Fifty people were included in the study; 33 (or 66%) were men and 17 (or 34%) were women (Figure 1). The largest number of cases was 26 (52%), which was found in the 60-70 age bracket, followed by 19 (38%), in the 70-80 age

bracket, and 5 (10%) in the 50-60 age bracket. Fifteen people (30%) out of fifty had a very significant history of diabetes in their family. Of the people who took part, 27 (or 54% of the total) could read and write, while 23 (or 46% of the total) could not. Nevertheless, out of the total number of participants, 17 (or 34% of the total) had a sedentary lifestyle, while the remaining 43 (or 56% of the total) led an active one. Twelve people, or 24% of the sample, had a history of alcohol use, but no one else reported a habitual chewer or smoker.

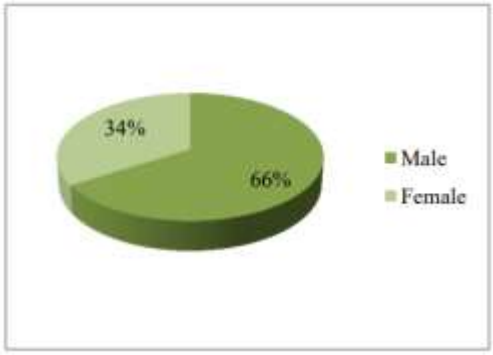


Figure 1: Occurrence of diabetes in male and female.

Eight participants were diagnosed with type II diabetes upon admission and began treatment immediately; forty-two (84%) of the 50 participants were already taking medication for their diabetes; thirty-eight (76%) were taking their medication regularly; and the remaining participants were found to be irregular with their diabetes management.

We found that out of 42 participants who were already on medication when they were admitted, 17 were taking only metformin, 4 were on irregular, 6 were taking a combination of two oral hypoglycemic agents (OHA) (Metformin + glimepiride = 4, metformin + pioglitazone = 1, metformin + glipizide = 1), 3 were taking a combination of three OHA (Metformin + glimepiride + pioglitazone), 12 were taking only insulin preparations (Regular insulin = 9, NPH insulin = 3), and 4 were taking metformin with an irregular dose of insulin. Nevertheless, the eight individuals who were identified as having type II diabetes upon hospital admission for various reasons were initiated on the following treatment plans: two were given oral hypoglycemic agents (OHA) (Metformin = 1, metformin + glimepiride + pioglitazone = 1), three were given regular insulin while in the hospital, and they were all advised to keep taking metformin upon discharge. Due to likely inadequate glycaemic management, our research only included 33 individuals who had their HbA1c tested.

The research found that diabetes was linked to hypertension (8% of cases), atherosclerosis (4% of cases), chronic renal disease (12% of cases), diabetic foot (8% of cases), and susceptible infections (68%) including UTIs, septicaemia, pleural effusions, to name a few. Among the 50 individuals, 13 (26%) were given insulin alone throughout their hospital stay, 27 (54%) were given both insulin and OHA, and 10 (20%) were given just OHA (Figure 2).

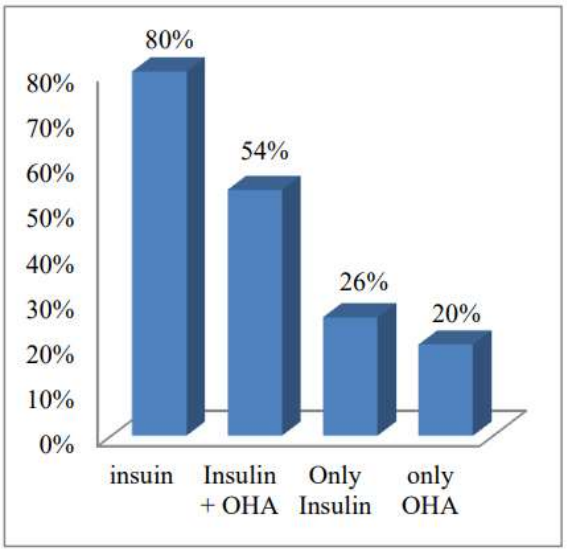


Figure 2: Treatment pattern for diabetes in hospitalized patients.

Out of the 40 patients who were given insulin, 21 received regular insulin, 7 aspart, 4 received a combination of isophane and regular insulin, 4 received a combination of regular insulin and Lantus, and only 1 patient received a combination of regular, isophane, and Lantus. Of the patients included in our research, 37 (or 74% of the total) were administered OHA either alone or in conjunction with Insulin; ten patients got just OHA. The most popular oral hypoglycemic agent (OHA) prescribed to these patients was metformin, which was well-received both on its own and in combination with other drugs like pioglitazone, rapeglinide, glimepiride, and glipizide, according to Table 1.

Table 1: Monotherapy and combination therapy of antidiabetic agents prescribed in type-2 diabetic patients.

| Drugs | Frequency |
|---|---|
| Monotherapy | 18 (36%) |
| Combination of two OHA | 14 (28%) |
| Combination of three OHA | 5 (10%) |

The antibiotic combinations that were most often used to treat co-morbid infections were amoxicillin + clavulanic acid, cefoperazone + sulbactam, piperacillin + tazobactam, amoxicillin + levofloxacin, ciprofloxacin, norfloxacin, and azithromycin. Hypolipidemic drugs, including the often recommended atorvastatin and rosuvastatin, were also added to the treatment of 24 individuals. Paracetamol, ondansetron, losartan, telmisartan, ramipril, pantoprazole, ranitidine, multivitamin, cyanocobalamin, folic acid, etc. were also included on the treatment charts of these diabetic individuals.

Despite the use of polypharmacy in the pharmaceutical regimens of diabetic patients, thankfully, there were no reports of adverse drug events throughout their hospital stays.

## IV. DISCUSSION

At 41 million, India has more diabetics than any other country; in fact, one out of five people with diabetes are from India. Not only that, it's the most common cause of obesity and metabolic syndrome. In India, 68 million people would be overweight or obese by 2025, with 20 million of those people falling into one of the categories of childhood obesity. 7 Hence, it is necessary to raise public knowledge of diabetes risk factors and effects due to the alarmingly high incidence of diabetes in India. 8

Being a chronic and disabling condition, diabetes requires ongoing control throughout one's life. In addition to a preponderance of hereditary factors, environmental variables such as a sedentary, stressful lifestyle, insufficient physical activity, and irregular dietary habits raise the chance of developing type II diabetes mellitus. 9

Regular medication therapy is necessary to postpone the expected long-term consequences of diabetes, even while food, exercise, and lifestyle adjustments continue to be the cornerstones of diabetes care. 10

Contrary to the findings of Sudha V et al. (2008), Boccuzzi SJ et al. (2004), Johnson et al. (2001), and Yurgin N et al. (2007), which all examined drug utilisation studies for antidiabetic agents, other studies have shown a high proportion of female patients with diabetes, such as Lisha et al. (2012), Saiyad et al. (2012), and R. Ramesh et al. (2011). 3,15 Our results are consistent with those of previous research showing that men are more likely than females to have diabetes mellitus (the male-to-female ratio is 2:1).

One key aspect of diabetic therapy is frequent monitoring of glycaemic control, as specified in the National Institute for Clinical Excellence (NICE) recommendations for diabetes. Patients were examined and closely watched to ensure

they maintained glycaemic control in our trial. 16 Therefore, it was clear that all the doctors did their best to adhere to the NICE recommendations and get the hospitalised patients' blood sugar levels under control. Metformin was the medicine of choice among oral hypoglycemic treatments because of its low cost, relative safety from hypoglycemia episodes, and accessibility to low-income patients at our institution. This finding demonstrates that the patient's socioeconomic position was definitely considered when the antidiabetic drugs were prescribed.

Metformin, a biguanide, is a regularly given antidiabetic medicine, either alone or in combination with other drugs. Biguanides were shown to be the most recommended class of oral health agents in our study. Our study's finding was in line with several other research that have come to the same conclusion. 2,10,13,14,and 17 The sulfonylurea group of antidiabetic drugs has been the subject of some research, however metformin is often administered in conjunction with glimepiride, glibenclamide, or sitagliptin, according to other studies. ages 18–20 Nevertheless, metformin with glimiperide was the most often recommended combination. 17

In our investigations, we observed that diabetic persons had a hard time achieving excellent glycaemic control according to NICE standards. This might be due to their irregular or incorrect medication usage or other health issues. Patients who were not controlling their blood sugar levels to a desired level were best treated with insulin preparations, either by themselves or in conjunction with oral hypoglycemic medications. Although Lantus was administered the fewest number of times, regular insulin was prescribed the maximum number of times (30). Good glycaemic control and prognosis were both aided by this.

The care of diabetes sometimes involves polypharmacy, where several drugs are chosen for their ability to decrease glucose levels and other factors that are relevant to each patient's situation. 9 Nevertheless, the synergy of certain combinations and other interactions were taken into account while adding second and maybe third antihyperglycemic drugs. Insulin plus metformin21 and insulin plus thiazolidinediones (TZD)22 are two of the most effective ways to reduce hyperglycemia, but you should be aware that the latter combination increases the risk of fluid retention. (The European Union has not yet authorised the use of TZD in conjunction with insulin.) Despite their similarities, TZDs and metformin work to raise insulin sensitivity in various ways. Adding TZD to metformin reduces HbA1C by 0.3-0.8%, although their target organs are different. 23,24 The results of our research show that individuals with diabetes who were administered insulin and who had access to HbA1C tests both before and after medication benefited greatly from starting insulin. While a small number of patients did not achieve their goal blood glucose levels, significant clinical improvement was seen, leading to their admission.

## V. CONCLUSION

Insights about the patterns of Metformin and combination therapy for the treatment of type 2 diabetes mellitus at a tertiary care teaching hospital are gained from this research. Consistent with changing treatment recommendations and a focus on the patient, the results show that combination medication is preferred over monotherapy, especially when it comes to sulfonylureas and DPP-4 inhibitors.

It was common practice to administer extended-release formulations to patients in an effort to increase compliance and decrease gastrointestinal side effects. Metformin and its combinations are used rationally in this scenario,

which shows that healthcare workers are well-informed about current clinical standards.

Nevertheless, there must be ongoing endeavours to keep an eye on prescription practices, guarantee the most efficient use of drugs, and tailor treatment to each individual's requirements. The relationship between prescription trends and patient outcomes could be better understood in future research with bigger samples and data from several centres.

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