

## An Observational Assessment of the Drug Utilization Pattern in the Treatment of Diabetes Mellitus

Veena Kumari<sup>1</sup>, Ashwani Kumar Mishra<sup>2</sup>

<sup>1</sup>MBBS, MD (Pharmacology), Associate Professor, Department of Pharmacology, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India.

<sup>2</sup>MBBS, MD (Medicine), Assistant Professor, Department of Medicine, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India.

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Corresponding author: Dr. Veena Kumari

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### Abstract

**Aim:** To analyze the utilization pattern of antidiabetic agents in patients visiting medicine OPD in DMCH Darbhanga, Bihar

**Methodology:** The study was conducted in the Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar for 12 months. 150 patients with diabetes were analyzed for their prescription pattern and the data was recorded on a case record form (CRF). Data for drug utilization as per the core prescribing indicators of WHO for drug utilization studies and data for evaluating drug consumption was calculated in terms of defined daily dose (DDD). Drug utilization was expressed as average dose prescribed per day and DDD/1000 patients/day. DDD/1000 patients/day was calculated by applying a formula.

**Results:** Amongst the 150 patients' studies for diabetes 64% of the patients were male and most commonly affected age group was 51-60 years of age followed by 41-50 years of age. The average number of drugs encountered per prescription were 5. Whereas prescriptions with generic name were 38% and drugs from essential drug list were found to be 78%. During the study, indicators of patient care such as mean consulting time was found to be 7.4 min. Out of 150 patients with diabetes mellitus type 2, 45 prescriptions (30%) were found with just one drug (monotherapy) whereas 105 (70%) of the patients were prescribed either dual therapy or more than 2 drugs. Most commonly prescribed antidiabetic group was biguanides (48.9%) in monotherapy followed by thiazolidinediones (37.7%) and dipeptidyl transferase and alpha glucosidase inhibitors with similar prescriptions (0.07%). In combination therapy, most common prescribed combination was found to be thiazolidinediones + biguanides (65.7%) followed by dipeptidyl peptidase-4 (DPP-4) inhibitors + biguanides, (34.3%).

**Conclusion:** Among the antidiabetic drugs prescribed, metformin 500mg was the most commonly prescribed drug in monotherapy while in combination therapy glimepiride 2mg + metformin 500mg was most commonly prescribed. The prescription showed adherence to most of the parameters of rational drug utilization. But lesser prescription drugs from the essential medicine list points towards the need to revise and update the national essential drug list.

**Keywords:** Antidiabetic agents, metformin, biguanides, thiazolidinediones.

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## Introduction

Diabetes mellitus (DM) is becoming an important public health problem in developing countries, especially in India. The number of people with diabetes has risen from 108 million in 1980 to 463 million adults in 2021 [1]. Type 2 DM is very common among the elderly [2]. Various classes of anti-diabetic drugs including insulin and oral hypoglycemic agents (OHAs) are currently being used in the treatment of diabetes, which acts by various mechanisms to reduce the blood glucose levels in order to maintain optimal glycemic control. The utilization study of these medications is important in clinical practice because it serves as the foundation for implementing changes to drug dispensing policies at the local and national levels. Irrational drug use can lead to adverse outcomes including an increase in the risk of hypoglycemia, a decline in medication adherence, the risk of drug-drug interactions, all of which can invariably lead to an increased risk of hospitalization, fatality rate, and healthcare costs [3].

According to the International Diabetes Federation, 387 million people globally suffer from diabetes which is estimated to rise to 592 million by 2035 [4]. The prevalence of diabetes in India, which was 31.7 million in 2000, [5] has since climbed to 65.1 million in 2013 and is projected to reach 79.4 million by 2030. India has the dubious distinction of being the diabetes capital of the world with the number of diabetics far exceeding that of China and America. India is also the largest contributor of diabetes-related mortality in Southeast Asia accounting for 1.1 million deaths in 2013. Diabetes is thus a major health problem worldwide and even more so in India. Diabetes remains a major risk factor for macrovascular and microvascular complications such as retinopathy, nephropathy, neuropathy, atherosclerosis, ischemic heart disease (IHD), stroke, and peripheral vascular

diseases. With a plethora of complications associated with the disease, it is no wonder that diabetes has major implications on the quality of life and life expectancy. Diabetes-related complications and disease progression can only be impeded by timely detection, lifestyle modification, and optimal glycemic control, by making the best use of currently available therapeutic options [6].

Without knowledge of how drugs are being prescribed and used, it is difficult to suggest measures to change prescribing habits for the better [7]. It, therefore, becomes important to assess the pattern of the usage of anti-diabetic drugs among the diabetic patients of the geriatric age group and to see to what extent there may be scope for improvement in the light of current knowledge. A previous drug utilization study for OHA done in India was by Sultana et al. in 2010 [7, 8]. In their study, the majority of type 2 diabetic patients were treated with multiple antidiabetic drug therapy. The most commonly prescribed antidiabetic drug class was biguanides followed by sulphonylureas, thiazolidinediones, insulin, and alpha-glucosidase inhibitors. They have reported that the metformin was most commonly prescribed monotherapy followed by insulin. They had emphasized the need for patient education for promoting rational use of medications to promote drug adherence. The current pharmacotherapy of diabetes mellitus includes treatment with drugs such as insulin and oral antidiabetic agents. The drug utilization data from diabetic patients can provide data for determining pattern of prescription, rationalize drug therapy and ascertain adherence to standard recommendations for treatment of diabetes.

## Methodology:

The study was conducted in the Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar for 12 months. 150

patients with diabetes were analyzed for their prescription pattern and the data was recorded on a case record form (CRF). Data for drug utilization as per the core prescribing indicators of WHO for drug utilization studies and data for evaluating drug consumption was calculated in terms of defined daily dose (DDD). Drug utilization studies as per the prescribing parameters:

1. Average number of drugs per encounter.
2. Percentage of drugs prescribed by generic name.
3. Percentage of encounters with an antibiotic prescribed.
4. Percentage of encounters with an injection prescribed.
5. Percentage of drugs prescribed from the Essential medicine drug list (WHO/National).
6. Patient care indicators include:

Average consultation time

World Health Organization (WHO) has defined the unit of drug utilization research as measure of defined daily dose (DDD) which uses anatomical therapeutic

chemical [ATC] classification. Thus, the drug utilization was expressed as average dose prescribed per day and DDD/1000 patients/day. DDD/1000 patients/day was calculated by applying the following formula.

Total amount of drug consumed during the study period  $\times 100$

WHO recommended DDD of a drug  $\times$  duration of treatment  $\times$  sample size?

### Results:

Amongst the 150 patients' studies for diabetes 64% of the patients were male and most commonly affected age group was 51-60 years of age followed by 41-50 years of age.

### Drug utilization pattern

The average number of drugs encountered per prescription were 5. Whereas prescriptions with generic name were 38% and drugs from essential drug list were found to be 78%. During the study, indicators of patient care such as mean consulting time was found to be 7.4 min and availability of key drugs in the hospital was scarce.

**Table 1: Drug use indicators for antidiabetic medications**

| Indicators                                         | Number and % |
|----------------------------------------------------|--------------|
| Average no. of drugs per prescription              | 5            |
| Average no. of hypoglycemic drugs per prescription | 2.73         |
| Prescription by generic name                       | 38%          |
| Drugs in essential drug list                       | 78%          |
| Availability of essential drug list                | Yes          |
| Availability of key drugs                          | 84%          |
| Average consulting time                            | 7.4 minutes  |

Out of 150 patients with diabetes mellitus type 2, 45 prescriptions (30%) were found with just one drug (monotherapy) whereas 105 (70%) of the patients were prescribed either dual therapy or more than 2 drugs.

**Table 2: Pattern of drug therapy in diabetic patients**

| Drug therapy   | N (%)    |
|----------------|----------|
| Monotherapy    | 45 (30%) |
| Dualtherapy    | 69 (46%) |
| Triple therapy | 36 (24%) |

Most commonly prescribed antidiabetic group was biguanides (48.9%) in monotherapy followed by thiazolidinediones (37.7%) and dipeptidyl transferase and alpha glucosidase inhibitors with similar prescriptions

(0.07%). In combination therapy, most common prescribed combination was found to be thiazolidinediones + biguanides (65.7%) followed by dipeptidyl peptidase-4 (DPP-4) inhibitors + biguanides, (34.3%).

| Classes of therapy                                              | N (%)      |
|-----------------------------------------------------------------|------------|
| Single antidiabetic drugs used in order of their frequency      |            |
| Biguanides                                                      | 22 (48.9%) |
| Thiazolidinediones                                              | 17 (37.7%) |
| Dipeptidyl peptidase-4 (DPP-4) inhibitors                       | 3 (0.07%)  |
| Alpha glucosidase inhibitor                                     | 3 (0.07%)  |
| Antidiabetic drug combinations used in order of their frequency |            |
| Thiazolidinediones + Biguanides                                 | 69 (65.7%) |
| Dipeptidyl peptidase-4 (DPP-4) inhibitors + Biguanides          | 36 (34.3%) |

Metformin 44.44% was most commonly prescribed in monotherapy and glimepiride + metformin in 33.8% of the patients in combination therapy was most common prescribed drug in combination therapy. According to our study all drugs were prescribed in doses either equal to or less than the WHO DDD prescribed except telmisartan which was prescribed in a higher dose.

While comparing the average daily dose of oral antidiabetics with WHO/ATC defined daily dose it was found that all antidiabetic drugs were less than their DDD. Tenepliptin could not be compared as the DDD and the WHO ATC code is not available.

### Discussion:

The WHO defines drug utilization studies as “The marketing, distribution, prescription, and the use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences.” Prescription pattern surveys are an important methodological instrument of drug utilization research, which help to provide an in-depth insight into the disease profile of patients and prescribing behavior of clinicians. Such studies can contribute to the promotion of

rational, evidence-based drug therapy that can in turn help to improve patient care and treatment.

Metformin monotherapy and combination therapy was used in 66% of the patients and was additionally the single most frequently prescribed anti-diabetic drug. This finding is in line with that of Upadhyay *et al.* [9], where biguanides accounted for 51.2% of the total antidiabetic medications. A study by Johnson *et al.* in Canada, similarly, observed that 65% of the patients received metformin, alone or in combination [10]. Another study in Nepal also noted metformin to be the most frequently prescribed antidiabetic agent [11]. However, in some studies conducted in India [12-14] and abroad, [15, 16] the sulfonylureas group of antidiabetics were observed to be the most commonly prescribed drug class.

The fact that metformin was the most frequently prescribed drug in this study is in accordance with its endorsement as the preferred anti-diabetic agent by current clinical guidelines [17, 18]. It has even been recommended as the first-choice oral medication in the large subset of elderly diabetics (>65 years) [19]. Advantages of

metformin that make it the preferred antidiabetic agent include its efficacy in blood sugar reduction without risk of hypoglycemia, greater general tolerability, and relatively lower cost [17]. In obese diabetic patients, it has also been found to significantly reduce glycosylated hemoglobin and all-cause mortality as compared to sulfonylureas and insulin [20].

The use of combination antidiabetic therapy (70%) was more frequent than that of monotherapy (30%), a finding also observed in a study by Rajeshwari *et al.* [21], in which polytherapy was used in 71.8% and monotherapy in 28.1% patients. A total of 48% of all combinations used, comprised metformin and sulfonylurea. This was also the most frequently used two drug combination. Several other studies have also reported the combination of metformin and a sulfonylurea to be used most widely [21, 23].

A combination of metformin and glimepiride, in particular, was the most commonly used drug combination in a study conducted in Gujarat where it was prescribed in 76.2% of the patients [22]. Clinical studies have shown that a combination of sulfonylureas with metformin can achieve optimal glycemic control even in advanced NIDDM [24]. Rational prescribing practices and the safe use of drugs are very important in the management of diabetic patients since they are likely to be on lifelong therapy.

### Conclusion:

Among the antidiabetic drugs prescribed, metformin 500mg was the most commonly prescribed drug in monotherapy while in combination therapy glimepiride 2mg + metformin 500mg was most commonly prescribed. The prescription showed adherence to most of the parameters of rational drug utilization. But lesser prescription drugs from the essential medicine list points towards the need to

revise and update the national essential drug list.

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