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Original Research Article

Study on Prescribing Pattern and Rational Use of Antidiabetic Drugs in Patients with Type 2 Diabetes Mellitus in Tertiary Care Hospital

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Conflict of interest: Nil

Abstract

Background: In developing nations, diabetes mellitus (DM) is a significant public health issue. It is crucial to improve diabetics' rational drug use and provide useful information for the medical staff through drug use studies of antidiabetic medicines. The study's goal was to look into how people with type 2 diabetes used their medications.

Methods: From June 2022 to November 2022, a prospective, cross-sectional study was conducted at Department of Pharmacology, JLNMCH, Bhagalpur, Bihar. Patients selected from outpatient department of medicine, JLNMCH, Bhagalpur, Bihar. Included were patients with type-2 diabetes who had been on medication for at least a month. A pre-made proforma was used to record the sociodemographic and clinical information about the patients. Using Excel 2007 and SPSS version 20, data was analysed.

Results: A total of 114 patients were included, and their ages and diabetes durations, respectively, were 56.8±10.5 and 8.3± 9.4 years (mean, SD). The ratio of men to women was 0.72:1. The mean blood glucose levels at fasting and after meals were 147.5±73.1 and 215.6±97.3 mg/dl, respectively. Weakness or weariness was the most prevalent symptom (77.2%). Co-morbid hypertension (70.2%) was the most prevalent condition. 7.8±2.5 medicines on average were prescribed. 89.5% of patients received more than five medications in total. Biguanides, which were used the most frequently (87.7%), were followed by sulphonylureas (68.4%).

Conclusion: Biguanide, or metformin, was the most often used anti-diabetic medication for type-2 diabetes (87.7%). This study found that the prescribing pattern for anti-diabetics was logical and mostly in line with NICE (National Institute for Health and Clinical Excellence) recommendations.

Keywords: Diabetes, Blood glucose, Anti-diabetic drugs, Metformin.

Introduction

In developing nations, diabetes mellitus (DM) is a significant public health issue. Numerous anti-diabetic drug use studies from around the globe have been published in the

healthcare context and can help individuals with diabetes utilise drugs rationally. Drug use studies help identify inappropriate prescribing and offer insightful information about current prescribing patterns.

Irrational prescribing has negative effects on patients such as non-adherence to drugs, which can lead to difficulties from uncontrolled blood sugar levels and increase drug and medical expenses. The findings of drug utilisation studies can be used to offer recommendations to prescribers, policy makers, and drug and therapeutic committees regarding changes to the way drugs are currently prescribed.

According to the World Health Organization (WHO), 31.7 million people in India had diabetes in 2000, and that number is expected to increase to 79.4 million by 2030 [1]. Diabetes mellitus (DM) is a chronic condition that is increasingly becoming a serious health concern since it raises the risk of morbidity and mortality [2]. This disorder is poorly managed, which causes a number of consequences [3] Both pharmaceutical and non-pharmacological therapies are necessary for the management of type-2 DM [4].

Intercontinental Marketing Service (IMS) data show that cardiovascular medications, which are frequently prescribed alongside anti-diabetic drugs due to the coexistence of cardiovascular disorders and diabetes, are among the most widely used pharmacological classes worldwide [5] Type 2 diabetes mellitus is incredibly common among Indian people [6].

Diabetes is the most prevalent endocrine problem worldwide and is a common disease that affects both industrialised and developing nations' citizens [7]. Diabetics are more likely to engage in polypharmacy and occasionally receive nonsensical prescriptions due to the difficulty of avoiding multiple drug use when they have a concurrent condition, such as hypertension [8]. It is crucial to improve diabetics' rational drug use and provide useful information for the medical staff through drug use studies of antidiabetic medicines [9].

Therefore, the purpose of this study is to ascertain the pattern of drug prescription among type 2 diabetic patients in order to assess the level of adherence of doctors to clinical guidelines and current scientific knowledge, as well as to analyse the prescription in accordance with WHO core drug prescribing indicators.

Material and Methods

This cross-sectional study was conducted at Department of Pharmacology, JLNMCH, Bhagalpur, Bihar from June 2022 to November 2022. Data was collected from medicine outpatient department, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar.

After obtaining written informed consent, the study included all patients with type-2 diabetes who were 18 years of age or older, attending the outpatient department of medicine at a tertiary care hospital (JLNMCH), and who had been taking medication for at least one month. Patients who were newly diagnosed or unwilling to participate were eliminated. Participants' sociodemographic information and pertinent clinical data were recorded.

Age, gender, job class, marital status, number of children, and educational background were among the sociodemographic information included. Number of symptoms, fasting and postprandial blood glucose levels (FBG, PPBG), duration of diabetes, co-morbidities/complications, medications given, and non-pharmacological treatments taken by patients were among the clinical and biochemical data.

The most recent FBG and PPBG readings were used to determine glycemic control. We lacked access to the glycated haemoglobin

(HBA1c) test, which is typically used for evaluating long-term glycaemia control. SPSS statistical software version 20 and Microsoft Excel 2007 were used to analyse the data. For continuous variables, descriptive statistics were reported as means and standard deviation (SD). For the entire sample, categorical variables were described as frequencies with percentages.

Results

114 of the 140 patients who were contacted to participate in the study gave their consent, representing an 81.43% response rate. 48 (42.1%) of the participants were men, and their median age was 56.8±10.5 years. 40 (35.1%) of the 114 individuals had a history of diabetes in their families. Sociodemographic information about research participants is shown in (Table 1).

Table 1: Socio-demographic characteristics of study participants (n=114)

Parameters	**Value**	
Age (years) (Mean±Sd) [Range]	56.8±10.5 [35-78]	
		Percentage
Gender n (%)		
• Male	48	42.1%
• Female	66	57.9%
Religion n(%)		
• Hindu	58	50.9%
• Muslim	56	49.1%
Marital status n(%)		
• Married	84	73.7%
• Single	8	7%
• Widowed	22	19.3%
No. of children n(%)		
• 0-3	56	49.1%
• ≥4	58	50.9%
Weight n(%)		
• Normal/underweight	42	36.8%
• Moderately obese	50	43.9%
• Obese	22	19.3%
Educational status n(%)		
• Uneducated	32	28.1%
• Upto school level	64	56.1%
• Graduate	10	8.8%
• Postgraduate	8	7%
Occupational class n(%)		
• White collar	8	7%
• Self employed	8	7%
• Blue collar	10	8.8%
• Others (housewives, retired etc.)	88	77.2%

At the time of the interview, almost 70% of the participants had at least three symptoms present. Weakness or weariness was the most prevalent symptom (77.2%). The most prevalent co-morbid condition was ischemic heart disease, which was followed by hypertension (70.2%). In addition to their medication, about 43.8% of patients also practised non-pharmacological interventions such reduced sugar intake, walking, exercise, and yoga. Clinical information about the individuals is displayed in (Table 2).

Table 2: Clinical variables of the participants (n =114)

Clinical variables	**No. of cases**	
Symptom counts [Range]	[0-11]	
		Percentage
No symptom	4	3.5%
• 1 symptom	16	14%
• 2 symptoms	14	12.3%
• ≥3 symptoms	80	70.2%
Prevalence of symptoms		
• Polyuria	54	47.4%
• Polydipsia	36	31.6%
• Polyphagia	20	17.5%
• Weight loss	60	52.6%
• Weakness, fatigue	88	77.2%
• Blurred vision	24	21.1%
• Tingling numbness	68	59.6%
Co morbidities /Complications [Range]		
• Hypertension	[0-4]	
• Ischemic heart disease	80	70.2%
• Stroke	36	31.6%
• Diabetic retinopathy	6	5.3%
• Diabetic nephropathy	2	1.8%
	2	1.8%
Duration of diabetes (years)		
(Mean ± SD) [Range]	8.3 ± 9.4 [0.08-36]	
• 0-4.9	58)	50.9%
• 5-9.9	18	15.8%
• 10-14.9	10	8.8%
• 15-19.9	10	8.8%
• ≥20	18	15.8%
• FBG (mg/dl) (Mean ± SD)[Range]	147.5 ± 73.1 [72- 454]	
• PPBG (mg/dl)	215.6 ± 97.3 [86- 485]	
Number of drugs prescribed		
[Range]	7.58 ± 2.49 [1-12]	
• 0-4	12	10.5%
• 5-8	66	57.9%
• 9-12	36	31.6%
	28	24.6%

• Controlled diabetics n (%) • Uncontrolled diabetics	86	75.4%
Non-pharmacological measures [Range]	[0-5]	
• Compliant	50	43.8%
• Non-compliant	64	56.1%

Biguanides were the most often prescribed medication class (87.7%), followed by sulphonylureas (68.4%). Statins (56%) and antiplatelet medicines (61.4%) were the two pharmacological classes that were most frequently administered for co-morbid cardiovascular conditions. Table 3 lists the medicines that were prescribed to the study population.

Table 3: Prescribing pattern in type 2 diabetic patients (n=114)

Parameters	No. of cases	Percentage
Anti-diabetic drugs		
• Biguanides	100	87.7%
• Sulphonylureas	78	68.4%
• Insulin	26	22.8%
• α glucosidase inhibitors	24	21.1%
• Dipeptidyl peptidase 4 inhibitors	12	10.5%
• Thiazolidinediones	12	10.5%
Cardiovascular drugs		
• Antiplatelets	70	61.4%
• HMG CoA reductase inhibitors	64	56%
• AT1 antagonists	54	47.4%
• β blockers	28	24.6%
• Calcium channel blockers	28	24.6%
• Nitrates	28	24.6%
• Diuretics	24	21.1%
• ACE inhibitors	22	19.3%
Others		
• Multivitamins, Folic acid, Iron	30	26.3%
• Proton pump inhibitors	22	19.3%
• Pregabalin + Methylcobalamin	20	17.5%
• Calcium	10	8.8%
• H2 receptor blockers	8	7.0%
• Antiemetics	6	5.3%

Glimepiride + Metformin (50%) was most commonly prescribed combination followed by Metformin + Voglibose (7.02%). Table 4 shows distribution of antidiabetic combinations.

Table 4: Distribution of antidiabetic combinations (n=114)

Combinations	No. of cases	Percentage
Glimepiride + Metformin	57	50%
Metformin + Voglibose	8	7.02%
Glimepiride + Metformin + Pioglitazone	8	7.02%
Metformin + Vildagliptin	4	3.51%
Glibenclamide + Metformin	2	1.75%
Sitagliptin + Metformin	2	1.75%
Metformin + Methylcobalamin	2	1.75%

Table 5: Monotherapy and combination therapy of antidiabetic drugs prescribed in type -2 diabetic patients (n=114)

Drugs	No. of cases	Percentage
Monotherapy	93	81.58%
Two drug combination	75	65.78%
Three drug combination	8	7.02%

Table 6: Distribution of classes of antidiabetic drugs prescribed in type -2 diabetic patients as monotherapy and combination therapy

Drug group	Monotherapy n(%)	Combination therapy n(5)
Biguanides	46 (40.35%)	83 (72.8%)
Sulphonylureas	14 (12.28%)	67 (58.77%)
α glucosidase inhibitors	19 (16.67%)	8 (7.02%)
DDP4 inhibitors	6 (5.26%)	6 (5.26%)
Thiazolidinediones	8 (7.02%)	8 (7.02%)

7.58±2.49 medications were prescribed on average per prescription. 3.94% of medications were prescribed under their generic names. 22.45% of medications were prescribed from the WHO list of essential medications. 45.49% of medications were prescribed from India's 2011 National List of Essential Medicines. WHO basic drug prescription metrics are listed in Table 7.

Table 7: WHO core drug prescribing indicators

Indicators	Value
Average number of drugs perprescription	7.58 ± 2.49
Percentage of drugs prescribed bygeneric name	3.94%
Percentage of encounters with anantibiotic prescribed	0.81%
Percentage of encounters with aninjection prescribed	3.70%
Percentage of drugs prescribedfrom essential drugs list	22.45%

Discussion

Globally, diabetes mellitus is a serious public health issue. India is not an exception to the growing prevalence of it in many emerging nations. In the near future, it will emerge as the global capital of diabetes. People with Type 2 DM are given high priority since they may need to be evaluated quickly in order to stop the progression of problems [11].

The mean age of the patients in this study was 56.8±10.5 years on average, which is similar to the results of studies conducted in India

and other nations [5,12,13]. Similar to the study from the UAE [12] and in contrast to earlier reports from India, a large percentage of the diabetic patients in this study were women [11,13,14] Similar to Sutharson L *et al*., 2003, a minor majority of females was found in the current investigation [15]. Other research, however, showed a male predominance in their findings [16-19].

The observed average age of onset of diabetes mellitus was 8.3±9.4 years, which is comparable to a study from Spain that found the average age of onset of diabetes to be 11.8±8.0 years [20]. In contrast to Upadhaya *et al* [8] and Lisha Jenny *et al*., this observation was made [12] Out of 114 individuals, 40 (35.1%) had a history of diabetes in their families, which is comparable to the findings of Lisha Jenny [12] and R Ramesh study [14] In this investigation, hypertension was the co-morbidity that was shown to be most prevalent (70.2%). Studies [9,12,14] and [19] found similar findings regarding co-morbidity in diabetic patients.

The average number of prescriptions for medications was 7.58±2.49, which is high when compared to a study from the United Arab Emirates. 12 The co-morbid illnesses of study participants, who would need extra prescriptions for their other illnesses, were a major factor in the high average number of pharmaceuticals prescribed to this outpatient diabetes population. It is not unexpected that people with diabetes receive a high average number of prescriptions. It is known that patients with diabetes mellitus typically receive more prescriptions for medications than other patients [21] Although there is always room for improvement, the trend in this study indicated that earlier studies had a good impact on doctors' diagnostic abilities and prescribing practises.

In line with findings of Upadhyay *et al*., 2007 [8] Johnson *et al*., 2006 [18] Yurgin N. *et al*., 2007 [19] Sultana G. *et al*., 2010 [24] and in contrast to R Ramesh *et al*., 2011 [14] Chiang CW *et al*., 2006 [23] Al Khaja KA *et al*., 2001 [24] wherein Sulfonylurea. In the region, metformin was the anti-diabetic medication most frequently used. The results of several studies conducted in India [25] and Hong Kong [26] which claimed that glibenclamide was the most frequently prescribed anti-diabetic medication, are in contrast with this one.

According to Sudha *et al* 2008 [16] study, metformin was the medicine that was most frequently recommended. According to an Indian study, glimepiride was the second-generation sulfonylurea that was most frequently administered alongside metformin [4].

Contrary to a study from Nigeria [9], where Metformin + glibenclamide was the most frequently recommended combination for diabetes, metformin + glimepiride was most frequently administered together. Lisha Jeeny *et al* study [12] found that the most frequent combination was metformin and sitagliptin, while Al Khaja KA *et al* study [24] from 2001 found that the most frequent combination was metformin and sulfonylurea. This conclusion may be caused, in part, by the fact that metformin is thought to be a more cost-effective and safe medicine than other drugs in terms of hypoglycemia.

According to current clinical guidelines, such as those provided by the Canadian Diabetes Association in 2008, the International Diabetes Federation in 2005, the National Institute of Health and Clinical Excellence in 2010 and Nathan *et al*. in 2006, metformin is recommended as the preferred antidiabetic agent. The fact that it was the most frequently prescribed medication supports this claim [30]. It is not surprising that a substantial percentage of diabetic individuals have co-morbid hypertension because this mirrors the general situation worldwide.

Antiplatelets and hypolipidemic agents (statins) were the most frequently recommended medications together with anti-diabetic meds, in contrast to a study from Nigeria [9] where anti-hypertensives were the most frequently treated medications. The high proportion of co-morbidity between diabetes and hypertension is reflected in the large number of antihypertensive prescriptions [31].

The utilisation of critical drugs and generic medications is quite low. This emphasises even more the necessity of lowering the cost of medications for patients by increasing the prescription of drugs under their generic names and reducing the number of drugs per prescription to encourage patient compliance and sane drug prescription without lowering treatment standards in order to achieve optimal diabetic control. The flexibility of stocking and dispensing different brands of a specific drug that are less expensive and equally effective as proprietary products is made possible by prescribing by generic name. The use of the essential medications list is based on this. The positive working relationships between the doctors and the pharmaceutical sales agents who sell the drugs to the hospital may have led to some prescriptions being written under the proprietary names [5].

We only included type-2 diabetic patients in this study, and they are primarily taking oral hypoglycemic medications, hence we noticed a low percentage of injection usage. The most frequently prescribed injection was insulin, which is only used to treat type-2 diabetes when oral hypoglycemics are intolerable, when hyperglycemia cannot be controlled by diet and exercise or when doing so is impractical, to temporarily treat specific conditions, or to treat any complications of diabetes.

Conclusion

Biguanide, or metformin, was the most often used anti-diabetic medication for type-2 diabetes (87.7%). The most popular antidiabetic drug combination prescribed was glimepiride and metformin. This study found that the prescribing pattern for anti-diabetics was logical and mostly in line with NICE (National Institute for Health and Clinical Excellence) recommendations.

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