Original Research Paper

Volume : 5 | Issue : 7 | July 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Prescribing Pattern of Antidiabetic Drugs in Type - 2 Diabetic Mellitus With Co-Existing Hypertension in Jln Medical College, Ajmer

Medical Science

KEYWORDS Drug utilization, sulfonylureas, type 2 diabetic mellitus and Polypharmacy

Dr. Ritesh Kumar	Resident, Department of Pharmacology, JLN Medical College, Ajmer.
Dr. Sunil Kumar Mathur	Professor & Head, Department of Pharmacology, JLN Medical College, Ajmer.
Dr. Chandana Unnikrishnan	Resident, Department of OB&G, Govt. Medical College, Kottayam, Kerla.

ABSTRACT

Introduction: Prescription order is an important transaction between the physician and patient. In recent years studies on drug utilization have become a potential tool to be used in the evaluation of health systems. The interest in drug utilization studies began in the early 1960s and its importance has increased since then because of increase in marketing of new drugs, wide variation in the pattern of drug prescribing and consumption, growing concern about delayed adverse effects and the increasing concern regarding the cost of drugs. The principle aim of drug utilization research is to facilitate rational drug use in population.
This study attempts to analyze the prescription pattern of antidiabetic drugs in type 2 diabetic mellitus (type 2 DM) with co–existing hypertension in tertiary care hospital Jawahar Lal Nehru Medical College & Hospital, Ajmer.
Aims & Objective: The purpose of present study was to evaluate the drug utilization pattern of antidiabetic drugs in type 2 DM with co- existing hypertension in medical OPD of Govt. tertiary care teaching hospital.
Material & Method: This drug utilization study was conducted descriptly after obtaining the approval & ethical clearance from the institutional ethical committee. A total of 160 copies of the prescription fulfilling the inclusion and exclusion criteria were collected from the OPD of medicine department from September 2014 to October 2015. Each prescription then was analysed to study the parameters needed to fulfill the objectives of the present study.
Results: A total of 160 prescriptions were analysed. In present study male patients was 48.75 % whereas female patients was 51.25 %. The most common diabetic complication in the study population was peripheral neuropathy and most common antidiabetic drug prescribed was sulfonylureas (81.25%). An average 4.88 drugs were prescribed per prescription.
Conclusions: Sulfonylureas were the most frequently prescribed drug group followed by Biguanides. A number of 4.88 drugs were prescribed per prescription, which were found to be higher than the recommended. It should be brought down. We recommend that periodical prescription audit as well as seminar on the rational use of drugs should be followed.

INTRODUCTION

Prescription order is an important transaction between the physician and patient. It brings into focus the diagnostic acumen and therapeutic proficiency of the physician with instruction for palliation or restoration of the patient's health.[1]

Increase in drug consumption has become a matter of concern to health authorities all over the globe. To understand the problem and solve related aspect of the problem, "Drug Utilization research Program" was developed by world health organization. Drug Utilization has been defined as the "marketing, distribution, prescription and use of drugs in the society with special emphasis on the resulting medical, social and economical consequences". [2]

A changing life style in developing countries like India has enormously increased the burden of chronic diseases like diabetes mellitus, and presence of hypertension complicates the therapy.[3]

Recent studies of WHO revealed that approximately more than 150 million people have diabetes mellitus worldwide. This number may double by 2025. In India 40.9 million people have diabetes, out of which 50% have coexisting hypertension. [4]

Bringing information on patterns of existing practice together with information on appropriate practice is an essential component of efforts to improve healthcare. This is possible only when each and every prescription in the hospital is audited by a prescription auditing team.

Drug use is a complex process. In any country a large number of socio-cultural factors contribute to the ways drugs are used. In India, these include national drug policy, illiteracy, poverty, use of multiple health care systems, drug advertising and promotion, sale of prescription drugs without prescription, competition in the medical and pharmaceutical market place and limited availability of independent, unbiased drug information. The complexity of drug use means that optimal benefits of drug therapy in patient care may not be achieved because of underuse, overuse or misuse of drugs. Inappropriate drug use may also lead to increased cost of medical care, antimicrobial resistance, adverse effects and patient mortality. Hence in recent years studies on drug utilization have become a potential tool to be used in the evaluation of health systems. The interest in drug utilization studies began in the early 1960s and its importance has increased since then because of increase in marketing of new drugs, wide variation in the pattern of drug prescribing and consumption, growing concern about delayed adverse effects and the increasing concern regarding the cost of drugs. [5]

The principle aim of drug utilization research is to facilitate rational drug use in population. Rational Drug use defined by WHO as "Rational use of drugs requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, at the lowest cost to them and their community".[6]

This study attempts to analyze the prescription pattern of antidiabetic drugs in type 2 diabetic mellitus (type 2 DM) with co–existing hypertension in tertiary care hospital Jawahar Lal Nehru Medical College & Hospital, Ajmer.

AIMS & OBJECTIVES

The purpose of this study was to analyze the prescription pattern of antidiabetic drugs in type 2 DM with co- existing hypertension.

MATERIAL & METHOD

This drug utilization study was conducted descriptly after obtaining the approval & ethical clearance from the institutional ethical committee. The prescription were collected from the OPD of medicine department from September 2014 to October 2015. A total of 160 cases of type -2 diabetes mellitus with co-existing hypertension as diagnosed by physician, fulfilling the mentioned inclusion and exclusion criteria were included in the study. Inclusion criteria were patients with type 2 DM and co-existing hypertension with or without associated chronic complications and age between of 40-70 years. Exclusion criteria included patients who do not fulfill the inclusion criteria, all patients except type 2 DM, Patients age less than 40 yrs and more than 70 yrs and patients with severe acute complication like ketoacidosis and septicemia etc. each prescription then was analysed to study the parameters needed to fulfil the objectives of the present study.

RESULTS

Results of the study are shown in tabulated form. Table 1 shows the gender wise distribution in the study population. Out of 160 patients studied, 48.75 % were male and 51.25 % were female. The mean age of the study population was 55.41 + 9.49 years (Table-2).

Table 3- shows the distribution of various diabetic complications. The most common diabetic complication in the study population was peripheral neuropathy (25%), followed by IHD (16.25 %), stroke (8.75 %), diabetic retinopathy (6.25%), diabetic nephropathy (6.25%) and diabetic foot (6.25%). Sulfonylureas (81.25%), Biguanides (79.38 %) Insulin (29.38 %), Thiazolidinediones (9.38 %) and Alpha glucosidase inhibitors (6.25 %) are the different antidiabetic class of drugs prescribed in the study populations (Table-4).

Table 5- shows the individual antidiabetic drug prescribed in the study. Metformin (79.38 %), Glimepiride (63.13 %), Insulin (29.38 %), Gliclazide, Pioglitazone (9.38 % each), glipizide (6.25 %), voglibose (5.63 %), glibenclamide (2.5 %) and least common prescribed was Acarbose (0.63 %). We found that 29.38 % of the study population was prescribed insulin and 70.62 % were prescribed only oral antidiabetic drugs (Table -6). Table -7 shows the different insulin preparations prescribed in the study population with short acting insulin and intermediate acting insulin were 21.8 % and 78.72 % respectively. Polypharmacy (5 or more than 5 drugs) was seen in 15.62 % of study population (Table -8).

DISCUSSION

Diabetes mellitus is one of the most common chronic disorder, with increasing prevalence worldwide. This is costly and chronic disease has been linked to the 'Black Death' of the 14th century.[7] A changing life style in developing countries like India has enormously increased the burden of chronic diseases like diabetes mellitus, and presence of coexisting hypertension complicates the therapy. Hypertension and diabetes mellitus are interrelated diseases. Both conditions are independently risk factor for cardiovascular disease and with coexisting together; they strongly predispose to end stage renal disease, coronary artery disease and peripheral vascular and cerebral vascular disease. [8] Recent studies of WHO revealed that approximately more than 150 million people are living with diabetes mellitus worldwide. This number may double by 2025. In India 40.9 million people have diabetes, out of which 50% have coexisting hypertension. [9]

In diabetics, presence of hypertension increases macro and micro vascular complications and causes a 7.2 fold increase in mortality. [10]

In this study, the prevalence of type 2 DM with hypertension was more in female. This result matches with the study done previously by Sachdev B. [11]

The mean age to develop type-2 DM with co-existing hypertension was 55.41 ± 9.49 years (Table-2). These results closely match with the findings in a study previously done by Rekha MB having mean value of 54.99 ± 6.65. [12]

Peripheral neuropathy was the most common complication observed. Diabetic peripheral neuropathy affects approximately 70% of diabetic patients and is the leading cause of foot amputation. [13] In a study carried by Rekha MB also found that most common complication was diabetic peripheral neuropathy. [12]

In our study population we found that the most common antidiabetic class of drug prescribed was sulfonylureas (81.25 %) followed by biguanides (79.38 %), insulin (29.38 %), thiazolidinediones (9.38 %) and alpha glucosidase inhibitors (6.25 %) (Table-4). Among sulfonylureas, glimepride (63.13 %) was the most common drug prescribed whereas in biguanides, the most common drug was metformin (79.38 %) (Table-5). These results are consistent with findings in previous study by Pooja M. et al who revaled that metformin was most common biguanides, and glimepride was most common sulfonylureas prescribed among antidiabetic agents.[14]

This could be because metformin has beneficial effects like effective glycaemic control, weight reduction, less risk of hypoglycaemia. There is rational justification for the use of combination drug formulations because blood glucose control tends to be better and the risk of side effects owing to use of maximal dose of mono therapeutic agent is reduced.

Sulfonylureas have been the mainstay of oral hypoglycemic management of type 2 DM since their development more than 50 years ago. By 1986, drugs of this class represented 1% of all prescriptions in the United States, mainly as the first-generation compounds chlorpropamide and tolbutamide. Subsequently glipizide, glyburide (glibenclamide), and glimepiride have entered the market for use as monotherapy and in combination with insulin and other oral hypoglycemic agents. [15, 16]

The glucose-lowering effects of the sulfonylurea class of drugs are well documented. These effects are due to an enhancement of insulin secretion at any given plasma glucose level and are sustained for a variable length of time until "secondary failure" occurs. [17]

Insulin secretion is stimulated in the presence of the pancreatic -cell receptor for sulfonylurea compounds, which is closely linked to an ATP-sensitive potassium ion channel in the -cell membrane. Exposure of a sulfonylurea to this receptor complex reduces the rate of outward flow of potassium across the cell membrane. The resulting change in charge of the membrane allows a voltage-dependent entry of calcium ions stimulating outward movement of insulin-containing secretory granules, resulting in exocytosis, i.e., insulin secretion. [18, 19]

Volume : 5 | Issue : 7 | July 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

There is evidence that sulfonylureas reverse the tendency to thrombosis in diabetes, which is related, for example, to increased platelet stickiness and decreased plasminogen activator concentrations. Decreased plasminogen activator inhibitor and enhanced fibrinolysis have been reported during therapy with gliclazide, a second-generation sulfonylurea. However, long-term benefit consequent to this feature of sulfonylureas has yet to be generally accepted. [20]

The frequency of the important risk factor hypertension is estimated to be double in type 2 DM. Although elevated insulin levels, as can be seen with sulfonylurea therapy, have been incriminated in this, insulin is in fact a peripheral vasodilator from a pharmacological point of view, in addition, epidemiological evidence implicating insulin in the pathogenesis of hypertension is conflicting.[21]

The advantage of the glucose-lowering effect of sulfonylureas on cardiac risk factors may be offset to some extent by a disadvantageous weight gain adversely affecting the blood pressure and lipid status.

In our study the prescribing frequency of thiazolidinediones was only (9.38%), Defronzo et al, reported that pioglitazone was found to reduce the progression to frank diabetes by 72% in patients with IGT. [22] So prescribing of thiazolidinediones should be encouraged (particular in early disease).

Alpha- glucosidase inhibitor delay sugar absorption and help to prevent postprandial glucose surges. These agents prolong the absorption of carbohydrates, but their induction of flatulence greatly limits their use, they should be titrated slowly to reduce the gastrointestinal intolerance.

In our study alpha glucosidase inhibitors had a low prescribing frequency of (6.25% only) that shows above reasons may greatly limit their use.

Type 2 DM is a progressive disease and most patients will eventually need insulin to achieve euglycemia. Data have shown that early and aggressive intervention to lower blood glucose reduces the risk of complications of the disease. [23]

In the present study population only 29.38 % patients were on insulin therapy (Table-6) In general, there are several limitations for prescribing insulin in our set-up. The major problems are difficulty in injecting the drugs, risk of hypoglycemia and socially rejection of insulin as injection. Only short and intermediate acting insulin preparations were prescribed. No long acting insulin preparations were prescribed (Table-7) due to their unavailability in Mukhyamantri Nihsulk Dava Yojna (MNDY). This study was conducted in govt. hospital which is having state-wide drug scheme (MNDY).

Polypharmacy as the "prescription, administration, or use of more medications than are clinically indicated, or when a medical regimen includes at least one unnecessary medication."[24-27]

In the present study on an average **4.88** drugs were prescribed per prescription, which is higher than the recommended value of 2. [28], this could be because diabetes mellitus and hypertension are chronic diseases usually associated with other co-morbidities like hyperlipidemia, CAD etc and for the better management of these conditions more drugs may be needed.

However, polypharmacy may be unavoidable, given that multiple drug therapy has become the standard of care in most chronic conditions. [29]

Polypharmacy is inevitable when treating a common chronic condition such as diabetes, given the large number of treatment options now available. The potential for polypharmacy will continue to increase with time, as additional therapeutic options become available. Before the approval of metformin in the United States in 1995, only insulin and the sulfonylureas were available for the treatment of diabetes. Now, there are five classes of oral agents, three rapid-acting insulin analogs, and two long-acting analogs, as well as the "traditional" insulins. The emergence of other forms of insulin (inhaled, topical patches), the incretin gut hormones, and newer mixed peroxisome proliferator–activated receptor-α and -γ agonists, a synthetic amylin analog, and still more agents to come will increase opportunities for success in treatment, as well as the potential for polypharmacy. [30]

Polypharmacy was seen in 15.62 % of the study population [Table-15], which needs to be taken care of to minimize the ill effects of polypharmacy like drug interactions, unwanted side effects, Polypharmacy also contributes for non compliance in patients.

Conclusion:

It was found that most common antidiabetic class of drug prescribed was sulfonylureas followed by biguanides. Among sulfonylureas, glimepride (63.13 %) was the most common drug prescribed whereas among the biguanides, the most common drug was metformin (79.38 %). Average number of drugs per encounter was 4.88 which were found to be higher than the recommended. It should be brought down. We recommend that periodical prescription audit as well as seminar on the rational use of drugs should be followed.

Table - 1: Gender wise distribution of patients

Gender	Number of patients	Percentage of patients
Male	78	48.75
Female	82	51.25

Table-2: Age wise distribution of patients

Age in years	**Number of patients**	**Percentage**
40-45	10	6.25
46-50	34	21.25
51-55	26	16.25
56-60	43	26.86
61-65	33	20.63
66-70	14	8.76
Total	**160**	**100**

Table-3: Incidence & prevalence of various complications in type-2 DM with coexisting hypertension

Complications	**Number of patients (n=160)**	**Percentage**
Diabetic retinopathy	**10**	**6.25**
Diabetic nephropathy	**10**	**6.25**
Peripheral neuropathy	40	25
Diabetic foot	10	6.25
IHD	26	16.25
Stroke	14	8.75
Without complication	**50**	**31.25**

Table-4: Different antidiabetic class of drugs prescribed

Class of Antidiabetic drugs prescribed	Number of drugs	Percentage
Biguanides	127	79.38
Sulfonylureas	130	81.25
Alpha glucosidase inhibitor	10	6.25
Thiazolidinediones/ Glitazones	15	9.38
Insulin	47	29.38
Total	329	

Table-5: Individual antidiabetic drugs prescribed

Antidiabetic drugs	Number of drugs **(n=160)**	**Percentage**
Metformin	127	79.38
Glimepiride	101	63.13
Gliclazide	15	9.38
Glipizide	10	6.25
Glibenclamide	4	2.5
Insulin	47	29.38
Acarbose	1	0.63
Voglibose	9	5.63
Pioglitazone	15	9.38

Table-6: Patients on insulin therapy and oral antidiabetic drug therapy

Therapy	**Number of patients**	**Percentage**
Patients only on Insulin therapy	33	20.62
Patient on insulin & oral antidiabetic	14	08.75
Patients only on oral anti-diabetic therapy	113	70.62

Table-7: Different insulin preparations prescribed

Different Insulin preparations prescribed	Number of patients	Percentage
Patients on Short acting insulin	10	21.28
Patients on intermediate acting insulin	37	78.72
Patients of long acting insulin	00	00

Table-8: Number of drugs prescribed/ patient/encounter

Number of drugs prescribed per encounter	Number of patients	Percentage
Two drugs	12	7.5
Three drugs	68	42.5
Four drugs	55	34.38
5 or more drugs	25	15.62

REFERENCES:

1. Gilman AG, Rall TW, Nies AS et al. Goodman and Gilman's The Pharmacological Basis of Therapeutics. McGraw-Hill (Tx): New York 1990; 8.
2. World Health Organization. The selection of essential drugs. WHO Technical report 1977; serial No.61536.
3. Bakris G, Sowers J, Epstein M, et al. Hypertension in patients with diabetes: Why is aggressive treatment essential? Postgraduate Medcine 2000; 107(2):53-64.
4. Arya SN. Hypertension in diabetic patients-emerging trends. Journal Indian academy of clinical medicine. 2003; 4 (2): 96-102.
5. P D Sachdeva , B G Patel. Drug utilization studies-Scope and future perspectives. International Journal on Pharmaceutical and Biological Research Vol. 1(1), 2010, 11-17.
6. World Health Organization. The rational use of drugs: concept and perspectives.Geneva:WHO(serial online)1985 (cited 2006 may 20). Available from: URL: http://www.dsprud.org/rational.htm.
7. Nicholson G and Hall GM. Diabetes Mellitus: new drugs for a new epidemic, Br J. Anaesth., 2011, 107 (1): 65-73.
8. Bakris G, Sowers J, Epstein M, et al. Hypertension in patients with diabetes: Why is aggressive treatment essential? Postgraduate Medcine 2000; 107(2):53-64.
9. Arya SN. Hypertension in diabetic patients-emerging trends. Journal Indian academy of clinical medicine. 2003; 4 (2): 96-102.
10. Ker JA. Management issues in hypertensive diabetics. SA Fam pract 2006; 48 (10): 38-40.
11. Sachdev B. Community based study on incidence of type- 2 diabetes mellitus and hypertension among nomad tribal population of Rajasthan, India. International journal of science and nature.2011; 2 (2) 211:296-301.
12. Dr. Rekha. M.B et al. A Study of Prescribing Pattern in Type-2 Diabetes with Co-existing Hypertension. Indian journal of public health and research development. 2014; Vol 5, Jan-Mar: 28-33
13. Centers for Disease Control and Prevention. National diabetes fact sheet. 2007. [Accessed November 13, 2010].
14. Pooja M, Sumeet D, Chandan R, et al. Prescribing pattern and surveillance of antidiabetic drugs in village and city hospital of Indore. Drug intervention today. 2010; 2 (9): 415-16.
15. P. M. Kearney, M. Whelton, K. Reynolds, et al "Global burden of hypertension: analysis of worldwide data," The Lancet, 2005 vol. 365, no. 9455, pp. 217–223.
16. R.Sicree, J. Shaw, and P. Zimmet. "Diabetes and impaired glucose tolerance," in Diabetes Atlas. International Diabetes Federation, D. Gan, International Diabetes Federation, Brussels, Belgium, 3rd edition , 2006. Ed., pp. 15–103.
17. Leibowitz G, Cerasi E: Sulfonylurea treatment of NIDDM patients with cardiovascular disease: a mixed blessing? Diabetologia 39:503-14, 1996.
18. Gerich JE: Oral hypoglycemic agents. N Engl J Med 321:1231-45, 1989.
19. Mogensen CE: Treatment of early diabetic renal disease, with special reference to anti-hypertensive therapy in diabetes. In Diabetes Clinical Science and Practice. Leslie RDG, Robbins DC, eds. Cambridge, U.K., Cambridge University Press, 1995, p. 405-24.
20. Asplund K, Wiholm BE and Lithner F: Glibenclamide-associated hypoglycaemia: a report on 57 cases. Diabetologia 24:412-17, 1983.
21. Kemmer W, Tacken M, Berger M: Mechanism of exercise-induced hypoglycemia during sulfonylurea treatment. Diabetes 36:1178-82, 1987.
22. DeFronzo RA, Gunnarsson R, Bjorkman O et al. Effects of insulin on peripheral and splanchnic glucose metabolism in noninsulin-dependent (type II) diabetes mellitus. J Clin Invest. 1985; 76:149–55.
23. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet. 1998; 352:837-853.
24. Monane M, Monane S, Semla T: Optimal medication use in the elderly: key to successful aging. West J Med 167:233 –237, 1997
25. Lee RD: Polypharmacy: a case report and new protocol for management. J Am Board Fam Pract 11:140 –144, 1998
26. Carlson JE: Perils of polypharmacy: ten steps to prudent prescribing. Geriatrics 51:26 –30, 35, 1996
27. Beers MH and Ouslander JG: Risk factors in geriatric prescribing: a practical guide to avoiding problems. Drugs 1989; 37:105 –112.
28. Karande S, Sankhe P and Kulkarni M. Patterns of prescription and drug dispensing. Indian J Pediatr 2005; 72: 117-121.
29. Winocour PH: Effective diabetes care: a need for realistic targets. BMJ 2002; 324:1577 –1580.
30. Veehof L, Stewart R, Haaijer-Ruskamp F et al: The development of polypharmacy: a longitudinal study. Fam Pract 2000; 17:261-267.