



Available Online through

www.ijptonline.com

TRENDS IN PRESCRIBING ANTIDIABETIC DRUGS OVER A PERIOD OF THREE YEARS IN SOUTH INDIAN TERTIARY CARE HOSPITAL

Leelavathi D Acharya^{1*}, N R Rau², N Udupa¹, Surulevel Rajan M¹, Vijayanarayan K¹

¹Department of Pharmacy Practice, Manipal College of pharmaceutical sciences, Manipal University, Manipal-576 104.

²Department of Medicine, Kasturba Medical College, Manipal University Manipal.

Email: Leela.da@manipal.edu

Received on 10-05-2016

Accepted on 09-06-2016

Abstract

Objective: To determine the trends in prescribing antidiabetic drugs among patients with type 2 diabetes mellitus (DM) over a period of three years

Methods: The study was conducted as a cross sectional observational study. Prescription pattern of diabetic patients who admitted during 2008 to 2010 in medicine wards was collected from tertiary care hospital in south India. And analysed using SPSS version 20.

Results: As per the study criteria, data were collected from 773, 700 and 647 type 2 diabetes mellitus patients who were admitted during the years 2008, 2009 and 2010 respectively in the medicine wards. The study showed that most of the patients were males. The mean age of the study population was 57.8 years. Type 2 DM patients had a prevalence of microvascular complications from 8-18.14% and macro vascular complications from 7.6-11.8% of the diabetic population over a period of three years.

On evaluation of trends in prescribing for patients with type 2 DM over a period of three years, in monotherapy, there is a decrease in rate of prescription in 2009, but again it increased in 2010($p=0.020$). Monotherapy was the predominant way of management with insulin followed by sulfonylureas and metformin. Combinations of sulphonylureas and metformin commonly used as dual therapy.

Insulin, Sulphonylureas and metformin combination are commonly used as triple drug therapy. There is no difference in rate of prescription in dual therapy ($p=0.419$) and also three drug combinations ($p=0.361$) over a period of three years. And few cases four and five drug combinations were used.

Conclusion: We observed there is no changes in trends in prescribing antidiabetic drugs over a period of three years and also shows physicians are adhering to standard guidelines for diabetic treatment in this hospital.

Key words: Trends, prescription pattern, antidiabetic drugs, type 2 diabetes mellitus.

Introduction

Diabetes Mellitus (DM) is a metabolic disorder characterized by hyperglycemia, which are associated with abnormalities in carbohydrate, fat and protein metabolism, and results in chronic complications including microvascular, macrovascular and neuropathic disorders. As a result of an aging population, changes in lifestyle and higher levels of obesity, diabetes affects an increasing number of patients, and the number is expected to reach more than double, worldwide, by the year 2030¹.

Tight control of blood sugar levels is the primary goal of management of diabetic patients to prevent the further complications. The Diabetes Control and Complications Trial (DCCT) and United Kingdom Prospective Diabetes Study (UKPDS) have reported that tight control of blood sugar level in DM management can reduce the risk of various complications. Therefore vigorous drug therapy is necessary for diabetic patients to achieve proper control of blood glucose level. Oral antidiabetic drugs can be used alone or in combination with different classes of oral antidiabetic drugs on insulin. Until 1994, only sulphonylureas and biguanides are available oral antidiabetic drugs for the management of type 2 DM. In the last few years, four new classes were available for the treatment. These classes include an alpha-glucosidase inhibitor, the newest sulphonylurea glimepiride (1999), meglitinides (2002), glitazones (2000) and gliptins is released in 2008²⁻⁴.

There are various guidelines available for the management of type 2 DM. Actual practice by physician may differ from the recommended standards based on the results of clinical trials/ experience. Surveillance of variations in clinical practice may raise questions concerning current patterns of practice and thus help to refine policies or inform interventions to promote change⁵.

Guidelines for the treatment of type 2 DM have increasingly favored tighter control of blood glucose level, which requires use of more vigorous pharmacological therapy. However, the process by which physicians choose glucose-lowering medicines is poorly recorded. There is a need for systematic study of how the drugs are being used together, whether monotherapy, combination therapy or insulin in combination with oral therapy among patients with type 2 DM⁶.

The objective of this study was to determine the trends in prescribing antidiabetic drugs among patients with type 2 DM over a period of three years.

Methods

A cross sectional observation study was conducted in the General Medicine units of a tertiary care hospital in South India, which is multispecialty hospital. Ethical committee approval obtained from the Institutional Ethical Committee. Diabetic patients with or without complications and comorbidities admitted during the study period (2008 to 2010) included for the study. There are 7 units in the medicine department. Patients admitted (alternative patients) in each of the unit with type 2 DM as per study criteria, are included in the study. Patient data are collected prospectively over a period of three years (2008-2010). For data collection each patient's data were reviewed and data were documented in the patient profile form prepared for study purpose. These diabetic patients are monitored from day of admission till day of discharge. Collected data of type 2 diabetic patients were analyzed for trends in prescription of antidiabetic drugs. All the data were presented as descriptive statistics. Chi square test for trend (linear- by-linear association) was used to evaluate the statistical significance of trends over a period of three years (2008-2010). P-value < 0.05 was considered statistically significant.

Results

Kasturba Hospital, Manipal is a 2000 bedded multidisciplinary hospital with seven medicine units. Present study is conducted in the Department of Medicine during the year 2008 to 2010. As per the study criteria, data were collected from 773, 700 and 647 type 2 diabetic patients who were admitted during the year 2008, 2009 and 2010 respectively in the medicine wards. Collected data were analyzed for following parameters.

Demographic data

Gender and age wise distribution of the diabetic patients:

Most of Type 2 DM patients who are admitted during all the three years were males (62.45% in 2008, 63.4% in 2009 and 64.1% in 2010). Mean age (mean±SD in years) of the patients was 57.1±11.35 in 2008, 57.56 11.665 in 2009 and 58.62±11.8 in 2010.

Status of complications of diabetic patients:

36.3% DM patients in 2008, 44.7% in 2009 and 47.4% in 2010 DM patients had diabetic related complications. Details of these complications are presented in Table 1.

Table -1: Status of diabetic complications.

Complications	Number of Patients (%)		
	2008	2009	2010
No complications	492(63.7)	387(55.29)	340(52.60)
Micro vascular	62(8.0)	127(18.14)	92(14.2)
Macro vascular	91(11.8)	53(7.6)	76(11.7)
Infections	90(11.7)	63(9.0)	78(12.1)
Acute complications	3(0.4)	2(0.2)	6(0.9)
Combination of complication	35(4.5)	78(11.1)	55(8.5)
Total	773(100)	700(100)	647(100)

Status of fasting and postprandial blood sugar levels and glycosylated haemoglobin level of the diabetic patient during admission:

Most of the diabetic patients had ≥ 126 mg/dL fasting glucose level that is 67.2% in 2008, 64.5% in 2009 and 62.8% in 2010. Similarly ≥ 200 mg/dL postprandial glucose levels of 59.3% patients in 2008, 61.5% in 2009 and 61.7% in 2010.

Also observed maximum number of DM patients had Glycosylated haemoglobin $\geq 7\%$. That is 81.6% in 2008, 85.1% in 2009 and 83.7% in 2010.

Choice of anti-diabetic drugs:

On evaluation of the prescription pattern of anti-diabetic drugs, 27(3.5%) in 2008, 41(5.9%) in 2009 and 62 (9.6%) patients are on life style modifications. 331 (42.8%) in 2008, 258 (36.9%) in 2009 and 267 (41.3%) patients were on monotherapy. 265 (34.3%) in 2008, 271 (38.8%) in 2009 and 210 (32.5%) in 2010 are on two drug combinations. 121 (15.7%) in 2008, 105 (15%) in 2009 and 95 (14.7%) patients were on three drug combinations. 28 (3.6%) in 2008, 21 (3%) in 2009 and 12 (1.9%) in 2010 patients were on four drug combinations. And 1 (0.1%) in 2008, 4 (0.6%) in 2009 and 1 (0.2%) in 2010 patients had five drug combinations

Insulin (I) is most prescribed monotherapy in all the three years, Suphanylurea(SU)+metformin combination was most commonly prescribed two drug combinations, Among three drug combinations, I+SU+metformin are frequently prescribed, of the four drug combinations commonly prescribed was I+SU+Metformin+Glitazone(G) and few patients were on five drug combinations. Details are shown in Table 2.

Table-2: Choice of anti-diabetic drugs.

Regimen	Number of Patients (%)			p-value
	2008	2009	2010	
No drugs	27(3.5)	41(5.9)	62(9.6)	
Monotherapy	331(42.8)	258(36.9)	267(41.3)	
Insulin (I)	130(16.8)	143(20.4)	141(21.8)	
SU	121(15.6)	62(8.9)	63(9.7)	
Metformin	75(9.7)	52(7.4)	61(9.4)	0.020
Alphaglucoisidase Inhibitors	2(0.3)	-	-	
Glitazones	2(0.3)	1(0.1)	2(0.3)	
Repaglinide	1(0.1)	-	-	
Two-drug combination	265(34.3)	271(38.8)	210(32.5)	
SU+Metformin	174(22.5)	145(20.7)	119(18.4)	
Insulin+SU	29(3.8)	49(7.0)	42(6.5)	
Insulin+Metformin	37(4.8)	50(7.1)	32(4.9)	
Insulin+G	8(1.0)	6(0.9)	4(0.6)	
SU+G	6(0.8)	6(0.9)	4(0.6)	
Metformin+G	6(0.8)	2(0.3)	2(0.3)	0.419
Su + A	1(0.1)	1(0.1)	3(0.5)	
Insulin+A	4(0.5)	9(1.3)	3(0.5)	
Insulin + N	-	1(0.1)	1(0.2)	
Metformin + Repaglinide	-	1(0.1)	-	
Glitazones + N	-	1(0.1)	-	
Three drug combination	121(15.7)	105(15.0)	95(14.7)	
Insulin+Su+Metformin	68(8.8)	71(10.1)	66(10.2)	
Insulin+SU+G	11(1.4)	9(1.3)	8(1.2)	
Insulin+metformin+A	1(0.1)	-	-	
SU+Metformin+G	31(4.0)	17(2.4)	13(2.0)	
Insulin+Su+A	4(0.5)	1(0.1)	-	0.361
Insulin+metformin+G	5(0.6)	2(0.3)	4(0.6)	
Su + G+A	1(0.1)	1(0.1)	-	

SU+Metformin+A	-	2(0.3)	2(0.3)	
I+metformin+New drug	-	-	1(0.2)	
I+SU+ new drug	-	-	1(0.2)	
Insulin+A+N	-	1(0.1)	-	
Su+metformin +N	-	1(0.1)	-	
Four drug combinations	28(3.6)	21(3.0)	12(1.9)	
Insulin+Su+metformin+G	22(2.8)	14(2.0)	6(0.9)	
Insulin+Su+metformin+A	1(0.1)	4(0.6)	4(0.6)	
Insulin+Su+G+A	1(0.1)	-	-	0.348
Su+Metformin+G+A	4(0.5)	-	1(0.2)	
SU+ Metformin+G+new drug	-	2(0.3)	1(0.2)	
Insulin+SU+A+N	-	1(0.1)	-	
Five drug combinations	1(0.1)	4(0.6)	1(0.2)	
Insulin+Metformin+Su+A+G	1(0.1)	1(0.1)	-	0.429
Insulin+Metformin+Su+A+N	-	1(0.1)	1(0.2)	
Insulin+SU+Metformin+G+N	-	2(0.3)	-	
Total	773	700	647	

I, Insulin; Su,Sulfonylurea; G,Glitazones; A, Alpha-glucosidase inhibitor; N, New drug

Usage pattern of individual anti-diabetic drugs:

On evaluation of prescribing trends for individual class of drugs used in management of type 2 diabetes, among insulin combination of short acting and intermediate acting (30/70) insulin commonly used. Glybenclamide is the commonly prescribed sulfonylureas. Among bugunides only metformin is available in the market. Voglibose was commonly used alphaglucoisidase inhibitors in diabetic patients, pioglitazone is the commonly prescribed glitazones in diabetic patients admitted in all the three years. Details are shown in Table 3.

Table-3: Usage pattern of individual antidiabetic drugs.

Drugs	Number of Patients (%)			p-value
	2008(n=773)	2009(n=700)	2010(n=647)	
Insulin	317(41.0)	368(52.6)	314(48.5)	
Shortacting	36(11.4)	60(16.3)	38(12.1)	

Mixture of short and intermediate Acting (30/70)	275(86.8)	278(75.5)	247(78.7)	0.001
Short acting +Mixtard	-	8(2.2)	18(5.7)	
Long acting	3(0.9)	12(3.3)	6(1.9)	
Mixtard+long acting	1(0.30)	10(2.7)	3(1.0)	
Mixtard 50/50	2(0.6)	-	2(0.6)	
Sulfonylurea	480(62.0)	391(55.9)	340(52.6)	
Glybenclamide	226(47.1)	229(58.6)	146(42.9)	
Glimipride	159(33.1)	108(27.6)	123(36.2)	0.664
Glipizide	74(15.4)	30(7.7)	58(17.1)	
Gliclazide	21(4.4)	24(6.1)	13(3.8)	
Biguanides	434(56.0)	366(52.3)	311(48.0)	
Metformin	434(100)	366(100)	311(100)	
AlphaglucoSIDase inhibitors	21(2.7)	22(3.1)	14(2.2)	0.744
Voglibose	19(90.5)	22(100)	12(85.7)	
Acarbose	2(9.5)	-	2(14.3)	
Glitazones	97(12.5)	64(9.1)	44(6.8)	
Pioglitazone	95(97.9)	60(93.8)	44(100)	0.814
Rosiglitazone	2(2.1)	4(6.3)	-	
Repaglinide	1(0.1)	1(0.1)	-	
Newer drugs(sitagliptin)	-	10(1.4)	09(1.4)	

Discussion

As per the diabetic atlas 2011, there were 366 million diabetic patients worldwide, which is expected to increase to 552 million by 2030. India had about 61.3 million diabetic patients in 2011, estimated to reach 101.2 million in

2030⁷. Diabetes is a chronic disorder that requires continuing treatment, patient self- management education and support to prevent acute complications and also to reduce the risk of long term complications⁸. The disease has an impact on mortality and morbidity of patients because of its association with long-term complications⁴.

As per the study criteria, data were collected from 773, 700 and 647 type 2 diabetic patients who were admitted during the years 2008, 2009 and 2010 respectively in the medicine wards. Among them majority of the patients were males, that is 62.4%, 63.4% and 64.1% in 2008, 2009 and 2010 respectively. Number of studies had reported that females were more commonly diagnosed with type2 DM patients than male patients^{4, 9-12}. Whereas studies in India showed male predominance in diabetic patient^{13, 14}. It may be due to geographical difference and selection of patients from a single center compared to other countries where they used the data base for the study. Prevalence of DM in southern India conducted over a period of 10 years (1994 to 2004) showed that the prevalence in males increased from 20% to 26% and prevalence in women increased from 19% to 31% over the period of 10 years¹⁵.

As per the International Diabetic Atlas 2011, the highest number of people with type DM are between 40 to 59 years of age⁷. In a study conducted in Gorakhpur, India by Poonam et al shows 61% of diabetic patients were between 40-60 years of age.¹³ Study conducted by Chiang et al in Taiwan revealed that average age of the diabetic patients for all the year from 1997 to 2003 was 62 years. Mean age of the type 2 DM patients was 56.5 years in Bahrain⁹. Mean age of type 2 DM patients was 64 years in United Kingdom⁶. Colombian study showed mean age of type 2 DM patients was 60.7 years. In the Present study maximum number of the type 2 DM patients were in the age group of 41-65 years i.e. 71.1% in 2008, 63.9% in 2009 and 66.9% in 2010 (Mean age of the study population was 57.8 years). The burden of diabetes is mainly due to a result of long term complications such as macrovascular complications like coronary artery disease, peripheral vascular disease and atherosclerosis & microvascular complications like retinopathy, neuropathy and nephropathy. To study the prevalence of these complications in diabetic patients in India, many studies were carried out, particularly at Chennai, New Delhi, Vellore, and Hyderabad. Summary of these studies showed the prevalence of retinopathy ranged from 7.3% to 34.1%. Prevalence of nephropathy ranged from 6.9% to 36.3%. Prevalence of coronary artery disease ranged from 11.4% to 21.4%. Gupta V reported in his review related to type 2 DM in India, there was 6.3% Prevalence of peripheral vascular disease is observed in Chennai (by Premalatha et al, in 2000) and prevalence of peripheral neuropathy varies from 19.1% to 27.5% in type 2 DM patients in population based study in Chennai by three different authors^{16,17}.

In the present study, the prevalence of microvascular complications from 8.0% to 18.14%, macrovascular complications from 7.6% to 11.8%, infections from 9.0% to 12.1% , acute complications from 0.2% to 0.9%, and combinations of complications from 4.5% to 11.1% of diabetic population over a period of three years (2008-2010).

Diabetes Control and Complications Trial (DCCT) and United Kingdom Prospective Diabetes Study (UKPDS) are the landmark trials for diabetic patients. Reports of these two trials showed that, tight control of blood sugar levels in diabetic patients to near normal will reduce the microvascular and macrovascular complication of the disease.

Study conducted by Al Khaja et al in Bahrain showed various laboratory parameters of the study population as follows. Mean glycated haemoglobin (HbA1c) was $9.2 \pm 2.1\%$ ⁹. In the present study, majority of patients have glycosylated haemoglobin more than 7% in 83.5% patients.

Recent guidelines suggests pharmacotherapy for type 2 DM aimed at to achieve more tight control of blood sugar levels. Symptomatic diabetic patients may initially require treatment with either insulin or combination of oral therapy to reduce glucose toxicity. Patients with HbA1c equal to 7% or less are usually recommended with lifestyle changes and treated with drugs which will not cause hypoglycemia. Those with HbA1c > 7% but < 8.5% could be starting with single oral agents, or low dose combinations. Patients with higher initial HbA1c may benefit from initially with two oral antidiabetic agents or even with insulin. If the HbA1c is > 8.5% to 9% on multiple therapies, insulin therapy should be considered¹⁰.

In our study during the period 2008- 2010, majority of the type 2 DM patients were on mono-therapy with either insulin(I) or oral anti-diabetic drugs (OADs), Followed by two- drug combinations either insulin with OADs or two OADs. Three drug combinations, insulin with two OADs or three OADs were also prescribed. Among four drug combinations along with insulin, three OADs were prescribed but in some cases, four different classes of OADs were also prescribed. Among five drug combinations all the patients received insulin with four different classes of OADs.

When we observed the trends in prescribing in type 2 diabetic patients in the period 2008-2010, in mono-therapy, there is a decrease in rate of prescription in 2009, but again it increased in 2010($p=0.020$). Among mono-therapy, insulin was the commonly prescribed drug, followed by sulfonylureas (SU) and metformin. Only in few cases alpha-glucosidase inhibitors (A), glitazones (G) and repaglinide were prescribed as mono-therapy in type 2DM patients. The two drug prescription rate was slightly higher in 2009 and again dropped in 2010. The difference in rate of prescription is not statistically significant ($p=0.419$). Among two drug combinations, SU with metformin was the most commonly prescribed

followed by insulin with SU and Insulin with metformin. A few patients received two drug combination of glitazone with sitagliptin in 2009. The three drug combination, prescription rate was constant in all the three years. There was no statistical difference ($p=0.361$) in rate of prescription in 2008, 2009 and 2010. Among three drug combinations, Insulin+SU+metformin were the most commonly prescribed combination followed by SU+Metformin+G and Insulin+SU+G combinations. Few patients received sitagliptin in three drug combination in 2009 and 2010. The four drug combination prescription rate decreased during the period from 3.6% in 2008 to 1.9% in 2010, but this difference is statistically not significant($p=0.348$). Most commonly prescribed four drug combination was Insulin+SU+metformin+G. In five drug combinations, there was rise in the rate in 2009, from 0.1% to 0.6%. This difference is statistically not significant ($p=0.429$). Insulin with four OADs is used in five drug combinations.

Evaluation of individual class of drugs used in the treatment of type 2 DM patients, sulfonylureas were used more commonly followed by metformin and Insulin. When we evaluated individual classes of drug use pattern, the prescription for insulin increased from 317(2008) to 368 in 2009 and again decreased to 314 in 2010 which was statistically significant ($p=0.001$). Among insulin preparations, mixture of short acting and intermediate acting insulin in 30/70 proportion was used in most of the DM patients. Very few long term data were available to decide the best initial insulin regimen. A few short- term trials conducted by comparing basal insulin regimens with either prandial or mixed insulin's, with varying results¹⁸.

Physicians in the current setting prefer mixture of short acting and intermediate acting (30/70) insulin for the management of type 2 DM patients. They were recommending two third of daily required dose in the morning and 1/3rd in the evening. This regimen helps to avoid nocturnal hypoglycemia and control of Post prandial blood sugar level.

Sulfonylureas are the commonly prescribed OAD in most of the diabetic patients. Statistically there is not any difference in prescription rate of SU over a period of three years ($p=0.664$). Among SUs, the second generation SUs was only prescribed. These 2nd generation SUs are more potent and also safer than first generations SUs¹⁹. Among them Glybenclamide and glimepiride were the most prescribed drugs.

In the Biguanide (BG) class of OADs, only metformin was available in our hospital formulary. Though the prescription for BG class is lesser than SU class of drugs, on evaluation prescription rate of individual drugs, metformin is most frequently used drugs among oral antidiabetic drugs. Metformin is as effective as SU is reported by the literature ²⁰.

Additionally, this drug does not cause weight gain when compared to SUs and therefore it can be prescribed in obese patients and has a lesser chance of hypoglycemic episodes¹⁰. In addition to this, as per the reports of the UKPDS group indicates metformin may decrease the incidence of diabetes related complications and all-cause mortality more than diet, SUs or insulin in obese patients with newly diagnosed type DM patients²¹.

Recent report by Roumie et al shows that use of sulfonylureas compared with metformin for initial management of type DM were associated with an increased risk of CVD events or death²².

During our study, the use of alpha glucosidase inhibitors (AGIs), glitazones and repaglinide was less. These drug classes were rarely used as monotherapy and are prescribed along with either with insulin or with SUs and metformin. Because of their side effect profile, there is no advantage of using these classes of drugs as monotherapy, over SUs and metformin. Various studies are conducted in different countries during different time periods. The results showed differences in prescription trends due to change in the time period, availability of drugs, method of data collections, various patient characteristics etc.

The study is conducted by Filion et al from 2000 to 2006 using the General Practice Database in the United Kingdom, which represents UK population. They found a sharp increase in the overall prescription of anti-diabetic medications between 2000 and 2006. The greatest increase was observed in prescription of metformin and TZDs. During the study period TZDs entered the market and it results in rapid use of this class of drugs. There was also an increase in the use of insulin during this period, particularly among incident type2 DM⁶. This increasingly vigorous pharmacological management is according to recent practice guidelines. However, the effect of these pattern on clinical outcomes at the population level remains unknown.

Chiang et al conducted a study during 1997 to 2003 in Taiwan using National Health Insurance Research Database. During the study period 1997-2003, the numbers of OAD prescriptions increased by 1.23-fold. The SU class was the most frequently used OAD (particularly 2nd generation SUs), but the prescribing rates for this class decreased over time. The biguanide (BG) class was the second most commonly prescribed OAD class and its prescribing rate initially raised, peaked in 2000, and subsequently reduced.

The largest increase in its prescription was for acarbose use. Prescribing rates of two new classes of OAD, meglitinide (MG) and thiazolidinedione (TZD), also significantly increased within a short period of time. Combination therapy was

the more commonly used in all the study years ($\geq 50\%$). Dual therapy with SU and BG was widely used combination.

There was fast increase in triple oral therapy, with around nine fold. Moreover use of any four OAD increase in five-fold

4.

A study was conducted in USA by Cohen et al over a period of 1997-2000 using Market Scan Research Database. In USA, until 1990, only two drugs, SUs and insulin were available for the management of diabetes. Metformin and Acarbose were introduced in 1995, troglitazone in 1997.

Based on this, they evaluated trends in prescribing anti-hyperglycemic agent over a period of four years. Study showed overall use of any insulin therapy reduced from 1997 to 2000. Mono-therapy with SUs reduced and mono-therapy with TZDS and metformin enhanced (newer drugs at that period).

Combinations of SUs and metformin; SUs and TZDs; metformin and TZDs; and SUs, metformin and TZD each increased over the study period. The anti-hyperglycemic prescription pattern in the U.S. has changed during 1997-2000, due to introduction of newer drugs in the market. Also, they used combination therapy for better control of blood sugar ².

Conclusions

Significant finding in the study was male predominance as compared to female predominance in studies from western countries. Majority of diabetic patients were in the age group of 41 to 65 years and mean age of study population was 57.8 years resulting in development of diabetic related complications in most productive years of life, as compared to Western studies where mean age is around 60 years.

Prescription pattern analysis showed that most patients were on mono-therapy (37% to 43%) followed by a combination of two drugs (33% to 39%). Commonest drugs used in mono-therapy were insulin, sulphonylureas and metformin. The commonest two drug combinations were metformin with sulphonylureas and metformin with Insulin.

There are no overall changes in prescription pattern by the clinicians during the three year study period and physicians are adhering to the standard therapeutic guidelines for the treatment of diabetes in this hospital.

Acknowledgments

The authors would like to thank Head of all medicine units of Kasturba Hospital, Manipal for allowing to collect the data from their patient medical records.

References

1. Doro P, Benko R, Kosik E, Matuz M, Toth K, Soos G. Utilization of oral antihyperglycemic drugs over a 7 year period (1998-2004) in a Hungarian population and adherence to drug therapy. *Eur J ClinPharmacol.* 2005; 61(12):893-897.
2. Cohen FJ, Conklin JE, Neslusan CA, Song X. Recent antihyperglycemic prescribing trends for US privately insured patients with type 2 diabetes. *Diabetes Care.* 2003; 26(6):1847-1851.
3. Diabetes India Association. Oral hypoglycemic agents [Internet]; 2012 [Cited 2012 February 18] Available from: http://www.diabetesindia.com/diabetes/oral_hypoglycemic_agents.Htm
4. Chiang CW, Chiu HF, Chen CY, Wu HL, Yang CY. Trends in the use of oral anti-diabetic drugs by outpatients in Taiwan: 1997-2003. *J Clin Pharm Ther.* 2006; 31(1):73-82.
5. Gulliford MC, Charlton J, Latinovic R. Trends in antihypertensive and lipid –lowering therapy in subjects with type II diabetes: clinical effectiveness or clinical discretion? *J Hum Hypertens.* 2005; 19(2):111-117.
6. Filion KB, Joseph L, Boivin JF, Suissa S, Brophy JM. Trends in the prescription of anti-diabetic medications in the United Kingdom: a population-based analysis. *Pharmacoepidemiol Drug Saf.* 2009; 18(10):973-976.
7. International Diabetes Federation. Diabetes Atlas. Fifth Edition. [Internet]; 2011 [cited 2012 October 11] Available from: <http://www.idf.org/diabetesatlas/news/fifth-edition-release>.
8. American Diabetes Association. Standards of Medical Care in Diabetes-2011. *Diabetes Care.* 2011; 34(1):11-61.
9. Al KhajaKaj, Sequeira RP, Damanhori AH. Comparison of the quality of diabetes care in primary care diabetes clinics and general practice clinics. *Diabetes Res ClinPract.* 2005; 70(2):174-182.
10. Triplitt LC, Reasner CA. Diabetes Mellitus. In: Dipiro JT, Talbert RL, Yee GC, Matzke G, Barbara W, Posey LM, editors. *Pharmacotherapy a pathologic approach.* 8th Ed. New York: The Mcgraw-Hill; 2011: 1265-1288.
11. Alba JE. Antidiabetic drugs prescription patterns among a group of patients in Colombia. *Rev PanamSaludPublica.* 2007; 22(2):124-131.
12. Seong JM, Choi NK, Jung SY, Chang Y, Kim YJ, Lee J, and Park BJ. Thiazolidinedione use in elderly patients with type 2 diabetes: with and without heart failure. *Pharmacoepidemiol Drug Saf.* 2011; 20(4):344-350.

13. Poonam T, Awinash P, Rishabh P, Shambaditya G, Rashmi S. Drug use evaluation in diabetic patients at out-patient department Gorakhpur. Arch Pharm Pract. 2010; 1(2):5-6.
14. Thiyagu R, Arulmani R, NarmadhaT. Drug use pattern study of antidiabetic in an outpatient setting of a secondary care hospital. Ind J Hosp Pharm.2008; 45:176-179.
15. Sridhar GR, Putcha V, Lakshmi G. Time trends in the prevalence of diabetes mellitus: ten year analysis from southern India (1994-2004) on 19,072 subjects with diabetes. JAPI. 2010; 58:290-294.
16. Mohan V, Sandeep S, Deepa R, Shah B, Vargese C. Epidemiology of type 2 diabetes: the Indian scenario. Indian J Med Res. 2007; 125(3):217-230.
17. Gupta V. Type 2 Diabetes Mellitus in India. South Asia Network for Chronic Disease, New Delhi. 2010; 2-3.
18. Fonseca VA, Kulkarni KD. Mangement of type 2 diabetes: Oral agents, insulin, and injectables. J Am Diet Assoc. 2008; 108(4 Suppl 1):29-33.
19. Inzucchi SE. Oral antihyperglycemic therapy for type 2 diabetes: scientific review. JAMA. 2002; 287:360-372.
20. United Kingdom Prospective Diabetes Study (UKPDS) 13: Relative efficacy of randomly allocated diet, sulfonylurea, insulin or metformin in patients with newly diagnosed non-insulin dependent diabetes followed for three years. BMJ. 1995; 310(6972):83-88.
21. United Kingdom Prospective Diabetes Study (UKPDS) 39. Efficacy of atenolol and captopril in reducing risk of macrovascular and microvascular complications in type 2 diabetes. BMJ. 1998; 317(7160):713-720.
22. Roumie CL, Hung AM, Greevy RA, Grijalva CG, Liu X, Murff HJ, Elasy TA, Hung AM. Comparative effectiveness of sulfonylurea and metformin monotherapy on cardiovascular events in type 2 diabetes mellitus. A cohort study. Ann Intern Med. 2012; 157(9):601-610.

Corresponding Author:

Dr.Leelavathi D Acharya

Email: Leela.da@manipal.edu