Vol 6|Issue 2| 2016 |85-93.

International Journal
of
Pharmacy Review & Research
www.ijprr.com

e-ISSN: 2248 – 9207
Print ISSN: 2248 – 9193

PREVALENCE OF DYSLIPIDEMIA ALONG WITH PRESCRIBING PATTERN OF ANTI-DIABETIC DRUGS IN DIABETIC PATIENTS

Srivastava kumar alok*[1] and Srivastava sarika[2]

[1]Mahatma Gandhi College of Pharmaceutical Sciences, Jaipur, India.
[2]Chandra Shekhar Singh College of Pharmacy, Koilaha, Kaushambi, Allahabad, India.

ABSTRACT

Diabetes is commonly associated with abnormalities in plasma lipids and lipoprotein levels commonly referred to as "Dyslipidemia". About 50% of all diabetic patients have dyslipidemia. Lipid abnormalities are more common in type 2 diabetes than in type 1 diabetes .The aim of the study was to determine the Prevalence of dyslipidemia along with prescribing pattern of Antidiabetic drugs in diabetic patients. This study was an open label prospective observational study and was undertaken for 6 months between May 2012 and October 2012 at Diabetes Thyroid & Endocrine Centre, Jaipur. All prescriptions issued to patients attending endocrinology clinic during this period following each day's consultation were recorded in case record forms. From the study it was found that Cholesterol, triglycerides and LDL was above normal whereas HDL was below normal in significant number of diabetic subjects. Most prescribed oral/ injectable antidiabetic drug were metformin, glimepiride, pioglitazone vildagliptin and gliclazide. Most prescribed insulins were pre mixed insulin 30/70, lantus, and short acting insulin.

Key words: Diabetes mellitus, Dyslipidemia, Insulin, Cholesterol , Prescription, Triglycerides.

INTRODUCTION

Insulin was discovered in 1921 by Banting and Best who demonstrated the hypoglycemic action of an extract of pancreas prepared after degeneration of the exocrine parts due to ligation of pancreatic duct. It was first obtained in pure crystalline form in 1926 and the chemical structure was fully worked out in 1956 by Sanger [1].

Insulin (as pancreatic islet cell extract) was first administered to a 14-year-old insulin-deficient patient on 11 January 1922 in Toronto, Canada [2].

According to recent estimates, approximately 285 million people worldwide (6.6%) in the 20–79 year age group will have diabetes in 2010 and by 2030, 438 million people (7.8%) of the adult population, is expected to have diabetes. The largest increases will take place in the regions dominated by developing economies. The global increase in the prevalence of diabetes is due to population growth, aging, urbanization and an increase of obesity and physical inactivity. According to the World Health Organization (WHO) criteria, the prevalence of known diabetes was 5.6% and 2.7% among urban and rural areas, respectively. Ramachandran et al. reported that age-standardized prevalence of diabetes and impaired glucose tolerance (IGT) in urban India in 2000 was 12.1 % and 14.0%, respectively, with no gender difference. Diabetes showed positive and independent associations with age, body mass index (BMI), waist-to-hip ratio, a family history of diabetes, monthly income and sedentary physical activity. Age, BMI and a family history of diabetes showed associations with IGT. Moreover, the prevalence of diabetes was also found to be increasing rapidly in rural areas, as a result of the recent socioeconomic transitions [3].

Diabetes in adults is associated with a high risk of vascular disease (2- 4 fold greater than that of individuals without diabetes), with CVD the primary cause of death among people with type 1 or type 2 diabetes (5-7).Aggressive management of all CV risk factors, including dyslipidemia, is therefore generally necessary [8].The most common lipid pattern in type 2 diabetes consists of hypertriglyceridemia (hyper-TG), low high-density lipoprotein cholesterol (HDL-C) and normal plasma concentrations of low-density lipoprotein cholesterol (LDL-C). However, in the presence of even

***Corresponding Author Srivastava kumar Alok** E mail: alokm.pharm.pharmacology@gmail.com

mild hyper-TG, LDL-C particles are typically small and dense and may be more susceptible to oxidation. Chronic hyperglycemia promotes the glycation of LDL-C and both these processes are believed to increase the atherogenicity of LDL-C. In those with type 1 diabetes, plasma lipid and lipoprotein concentrations may be normal, but there may be oxidation and glycation of the lipoproteins, which may impair their function and/or enhance their atherogenicity [4].

MATERIALS AND METHODS

Source of data

Source of data will be subject clinic file and subject lab reports.

Method of collection of data materials

Data will be collected by following methods:-

a) Medications history will be recorded from subject clinic file.
b) Current medications will be recorded from subject clinic file on day of visit.
c) Height will be recorded by making the subject stand near scale fixed on the wall.
d) Weight will be measured by making the subject stand on weighing machine.
e) Lab investigations value will be recorded from subject lab report.
f) Present illness, Relevant past history will be recorded from subject clinic file.
g) Patient's lifestyle will be recorded as per told by the subject.
h) Subject blood pressure will be recorded from the subject clinic file.
i) Waist circumference will be recorded directly at clinic on day of visit by using suitable scale.
j) Other data will be recorded either from subject clinic file or by asking subject.

Materials

Stethoscope, height measuring wall scale, waist circumference measuring foldable scale, paper CRF'S etc.

Methodology

Following methods were used:

Study Design

Short study title: Title of the selected study was "Prevalence of dyslipidemia along with prescribing pattern of antidiabetic drugs in diabetic patients.

Study site: This study was conducted at Diabetes Thyroid & Endocrine Centre, Jaipur.

Sponsor: The study was framed by the Investigator.
Clinical Phase: Phase 4.
Drugs to investigate: Oral/ Injectable Antidiabetic drugs and various types of Insulin's. **Indication:** Type1 and Type 2 diabetes.
Study type: This study was open label, prospective and observational study.
Study duration: It was of 6 months (May 2012 to October 2012).
Study population: Patients suffering from either type 1 or type 2diabetes.
Number of subject: 1200 subjects.

Eligibility: Eligibility criteria for including subjects in this study were- (i) any age group patients with Type 1 and Type 2 diabetes. (ii) Patients not part of any other clinical trial. (iii) Patients ability to give informed consent.
Eligibility criteria for excluding subjects from this study was- (i) Person with other terminal/ debilitating illness those not expecting to survive during study period. (ii) Unwilling to participate in the study or sign the informed consent (including legal representative).

Data Interpretation and Statistical analysis plan

It was assumed that study will evaluate a minimum of 1000 subjects at an average of 06 months with these assumptions; the precision of the estimate was ±10% (0.90-1.10%). However, it was recognized that the target was to have >75% complete follow-up so sample size was substantially larger at >100 patients (Up to 50% lost in follow-up or inadequate data capture or censored data).

All the qualitative data has been described as simple frequency with relative percentage. Quantitative data had been expressed using descriptive statistics as mean, median, SD, range for continuous data and counts, or percentages for categorical data. Statistical significance between different groups had been evaluated by using appropriate statistical test. Logistic regression was performed to test the impact of covariates (risk factors, subject characteristics, physician characteristics, etc) on event outcomes. All statistical analyses were considered significant at the 95% confidence limit using 2-sided tests.

Study Procedure

After ensuring presence of all the study requirements i.e. weighing machine, height measuring scale, waist circumference measuring scale, sphygmomanometer, glucometers, case report forms etc. study was started.

Diabetic patients coming to the study site were questioned by the study personnel to capture necessary data on the Case Report Forms. Remaining C.R.F. data was captured by going through subject clinic file.The above procedure to obtain C.R.F. data was done on 1200 patients.

Pre Study Activity

Before initiating study presence of following things at study site was ensured e.g. weighing balance, height measuring scale, waist circumference measuring scale, sphygmomanometer, glucometers, case report forms etc.

Investigator gives protocol training and ICH-GCP training to all the study site persons before initiating study.

Initiation of clinical operation

After ensuring presence of study related requirements at study site and imparting ICH-GCP training to all the study persons study was initiated.

Study subjects were questioned by the study personnel to capture all the data present in case report form. Measurement of height, weight and waist circumference was done by the study personnel whereas measurement of blood pressure was done by the Investigator. Informed consent was also taken by the Investigator.

Preparation of Study Protocol

Investigator prepared the study protocol.

I.E.C. Approval

Since it was an observational study approval from Institutional Ethics Committee was not compulsory.

Written Informed Consent

Written informed consent was not compulsory in this study. Therefore, signature of the subject at the bottom of the printed informed consent page was taken.

The patient was verbally told about the benefits and harms of participating in the study before taking his/her signature.

Protocol training and duty delegation

Protocol training was given by the Investigator to all the persons involved in the study. After giving protocol training Investigator delegated different duties to different persons. Investigator had also given ICH-GCP training to all the persons involved in the study.

Volunteers registration and screening

All the subjects who had received verbal information about the benefits and harms of becoming subject in the study were given sufficient time to decide whether to become subject in the study or not. If the subject decides to participate in the study and he/she passes all the inclusion criteria and fails all the exclusion criteria the subject is given a registration number which was written on top of first page of C.R.F. and the subject is said to have passed the screening successfully.

Thereafter the subjects were asked questions and subject clinic file was reviewed to obtain the required information of case report forms.

Study procedure at each visit

At each visit after screening visit, subjects were asked questions and subject clinic file was reviewed to obtain the required information of case report forms.

RESULTS

Total 1200 subjects had participated in this study. Out of 1200 subjects 638 (53.16%) subjects were Male and 562 (46.83%) subjects were Female. This study was done to evaluate (both numerically i.e. in terms of percentage and statistically) prevalence of dyslipidemia in diabetic subjects and to evaluate (both numerically i.e. in terms of percentage and statistically) prescribing pattern of anti diabetic drugs in diabetic subjects. Evaluations were as follows:

Evaluation of Prevalence of dyslipidemia indiabetic subjects

Cholesterol evaluation

Total 401 subjects were evaluated. Out of 401 subjects 244subjects were male and 157 subjects were female. Out of 401 subjects 69 subjects (17.2%) had cholesterol ≥ 200mg/dl .Out of these 69 subjects 38(15.5% of total male subjects) subjects were male and 31(19.7% of total female subjects) subjects were female.

Triglycerides evaluation

Total 79 subjects were evaluated for triglycerides. Out of total 79 subjects 56 subjects were males and 23 subjects were females. Out of total 79 subjects 34 subjects (43%) had triglycerides ≥150 mg/dl. Out of these 34 subjects 25 subjects (44.6 % of total male subjects) were males and 9 subjects (39.1% of total female subjects) were females.

LDL evaluation

Total 66 subjects were evaluated for LDL. Out of total 66 subjects 45 subjects were males and 21subjects were females. Out of total 66 subjects 40 subjects (60.6%) had LDL≥100 mg/dl. Out of these 40 subjects 29 subjects (64.4% of total male subjects) were males and 11 subjects (52.3% of total female subjects) were females.

HDL Evaluation

Total 73 subjects were evaluated for HDL. Out total 73 subjects 50 subjects were males and 23 subjects were females. Out of total 73 subjects 39 subjects (53.4%) had HDL ‹ 40/50 mg/dl. Out of these 39 subjects 23 subjects (46.0% of total male subjects) were males and 16 subjects (69.5% of total female subjects) were females.

Evaluation of prescribing pattern of anti-diabetic drugs in diabetic subjects

Evaluation was divided into 6 categories- Age and sex distribution of diabetic patients; (table2) Total of 1200 subjects were evaluated for each category of oral/injectable hypoglycemic drug; (3.2.1) 1200 subjects were evaluated for each category of insulin; (3.2.2.) Combination of metformin with different oral/injectable hypoglycemic drug was evaluated separately in 1200 subjects; (3.2.3) Percentage of drugs prescribed gender wise; (Table no. 6) Number of prescriptions per drug(Table no.7).

Evaluation of oral/injectable hypoglycemics in 1200 subjects gave following results

(a)Metformin: 982(81.83%) subjects were prescribed metformin.

(b)Gliclazide: 109 (9.08%) subjects were prescribed gliclazide.

(c) Glipizide: 3 (0.25%) subjects were prescribed glipizide.

(d)Glimepiride: 762(63.5%) subjects were prescribed glimepiride.

(e)Repaglinide: 14(1.16%) subjects were prescribed repaglinide.
(f)Nateglinide: 1(0.08%) subjects were prescribed nateglinide.
(g)Pioglitazone: 460(38.33%) subjects were prescribed pioglitazone.
(h)Rosiglitazone: 1(0.08%) subjects were prescribed rosiglitazone.
(i)Acarbose: 46(3.83%) subjects were prescribed acarbose.
(j)Voglibose: 2(0.16%) subjects were prescribed voglibose.
(k)Vildagliptin: 131(10.91%) subjects were prescribed vildagliptin.
(l)Sitagliptin: 85(7.08%) subjects were prescribed sitagliptin.
(m)Saxagliptin: 14(1.16%) subjects were prescribed saxagliptin.
(n)Exenatide: 28(2.33%) subjects were prescribed exenatide.
(o) Liraglutide: 2(0.16%) subjects were prescribed liraglutide

Evaluation of Insulin's in 1200 subjects gave following results:
(a)Short acting insulin's: 60(5.0%) subjects were prescribed short acting insulin.
(b)Long acting insulin's: 15(1.25%) subjects were prescribed long acting insulin.
(c) Pre-Mixed insulin's 25/75: 5(0.41%) subjects were prescribed premixed 25/75 insulin's.
(d) Pre-Mixed insulin's 30/70: 216(18%) subjects were prescribed premixed 30/70 insulin's.
(e) Pre-Mixed insulin's 50/50: 17(1.41%) subjects were prescribed premixed 50/50 insulins. (f)Rapid acting analogues (Lispro): 5 (0.41%) subjects were prescribed lispro.
(g)Rapid acting analogues (Aspart): 9 (0.75%) subjects were prescribed aspart.
(h)Long acting analogues (Lantus): 66 (5.5%) subjects were prescribed lantus.

Evaluation of Combination of metformin with different oral/injectable hypoglycemic drug in 1200 subjects gave following results.
(a)Gliclazide: 103(8.58%) subjects were prescribed gliclazide with metformin.
(b)Glimepiride: 643(53.58%) subjects were prescribed glimepiride with metformin.
(c)Repaglinide: 14(1.16%) subjects were prescribed repaglinide with metformin.
(d)Nateglinide: 1(0.08%) subjects were prescribed nateglinide with metformin.
(e)Pioglitazone: 441(36.75%) subjects were prescribed pioglitazone with metformin.
(f)Rosiglitazone: 1(0.08%) subjects were prescribed rosiglitazone with metformin.
(g) Acarbose: 44(3.66%) subjects were prescribed acarbose.
(h) Voglibose: 3(0.25%) subjects were prescribed voglibose.125/82/16
(i) Vildagliptin: 125(10.41%) subjects were prescribed vildagliptin.
(j) Sitagliptin: 82 (6.83%) subjects were prescribed sitagliptin.
(k) Saxagliptin: 16 (1.33%) subjects were prescribed saxagliptin.
(l) Exenatide: 32 (2.66%) subjects were prescribed exenatide.
(m) Liraglutide: 5 (0.41%) subjects were prescribed liraglutide.

Table 1. Prevalence of dyslipidemia in diabetic subjects

Variables	Total	Men	Women
cholesterol≥ 200mg/dl(N=401)Male=244,Female=157	69(17.2%)	38(15.5%)	31(19.7%)
Triglyceride ≥ 150mg/dl (N= 79), Male=56, Female=23	34(43%)	25(44.6%)	9(39.1%)
LDL≥100mg/dl(N=66) Male=45,Female=21LDL≥100mg/dl(N=66)	40(60.6%)	29(64.4%)	11(52.3%)
HDL‹40/50mg/dl(N=73)Male=50,Female=23	39(53.4%)	23(46.0%)	16(69.5%)

Table 2. Age and sex distribution of diabetic patients is shown in

Age groups(yrs)	Total N=1214	Men N= 673	Women N=541
<30	12(1.0)	5(0.7)	07(1.3)
30-39	91(7.5)	53(7.9)	38(7.0)
40-49	320(26.3)	178(26.4)	142(26.2)
50-59	432(35.6)	246(36.5)	186(34.4)
60-69	266(21.9)	140(20.8)	126(23.3)
70+	93(7.7)	51(7.6)	42(7.7)

Table 3. Percentage of hypoglycemic drugs prescribed (total-1200 subjects)

Hypoglycemic drugs	Dosage Form	Number of times prescribed	% Prescription of hypoglycemic drug
Metformin	Tablet	982	81.83%
Gliclazide	,,	109	9.08%
Glipizide	,,	3	0.25%
Glimepiride	,,	762	63.5%

Repaglinide	,,	14	1.16%
Nateglinide	,,	1	0.08%
Pioglitazone	,,	460	38.33%
Rosiglitazone	,,	1	0.08%
Acarbose	,,	46	3.83%
Voglibose	,,	2	0.16%
Vildagliptin	,,	131	10.91%
Sitagliptin	,,	85	7.08%
Saxagliptin	,,	14	1.16%
Exenatide	,,	28	2.33%
Liraglutide	,,	2	0.16%

Table 4. Percentage of Insulin prescribed (total-1200 patients)

Insulin	Total number of subjects	Number of times prescribed	% Prescription of Insulin
Short acting insulin	1200	60	5%
Long acting Insulin	1200	15	1.25%
Pre Mixed Insulin 25/75	1200	5	0.41%
Pre Mixed Insulin 30/70	1200	216	18%
Pre Mixed Insulin 50/50	1200	17	1.41%
Rapid acting analogue (Lispro)	1200	5	0.41%
Rapid acting analogue (Aspart)	1200	9	0.75%
Long acting analogue (Lantus)	1200	66	5.5%

Table 5. Evaluation of Combination of metformin with different oral/injectable hypoglycemic drug in 1200 diabetic subjects

Combination of metformin with oral/injectable anti diabetic drug	Dosage form	Number of times prescribed	% Prescription of total
Gliclazide	Tablet	103	8.58%
Glimepiride	,,	643	53.58%
Repaglinide	,,	14	1.16%
Nateglinide	,,	1	0.08%
Pioglitazone	,,	441	36.75%
Rosiglitazone	,,	1	0.08%
Acarbose	,,	44	3.66%
Voglibose	,,	3	0.25%
Vildagliptin	,,	125	10.41%
Sitagliptin	,,	82	6.83%
Saxagliptin	,,	16	1.33%
Exenatide	Injection	32	2.66%
Liraglutide	Tablet	5	0.41%

Table 6. Percentage of drugs prescribed gender wise

Variables	Total N=1200	Men N= 665	Women N=535
Oral hypoglycemic agents			
Metformin	982(81.83%)	539(81.0)	443(82.8)
Sulfonyl urea	874(72.8%)	491(73.8)	383(71.5)
Pioglitazone	460(38.3)	286(43.0)	174(32.5)
A-Glycosidase inhibitors	48(4.0)	27(4.0)	21(3.9)
DPPIV inhibitors	230(20.9)	126(18.9)	104(19.4)
Incretin analogues	30(2.5)	12(1.8)	18(3.3)
Insulin therapy			
Any one insulin regimen	320(26.6)	171(25.7)	149(27.8)
Complex (≥2)Insulin regimen	64(5.3)	35(5.2)	29(5.4)
Short acting Insulin	60(5.0)	32(4.8)	28(5.2)
Long acting Insulin	15(1.2)	09(1.3)	06(1.1)
Premix Insulin	238(19.8)	126(18.9)	112(20.9)

Rapid acting analogues	14(1.1)	09(1.3)	05(0.9)
Long acting analogues	66(5.5)	37(5.5)	29(5.4)

Table 7. Number of prescriptions per drug

No. of drugs	Number of prescriptions	Oral Hypoglycemics	Insulin	Oral hypoglycemics + Insulin
1	10	6	4	0
2	25	18	9	2
3	34	32	7	5
4	62	58	19	15
5	84	80	15	11
6	91	88	24	21
7	100	94	29	23
8	51	51	21	21
9	28	27	13	12
10	14	14	7	7
11	1	1	-	-

Table 8. Prevalence of lifestyle and cardio metabolic risk factors in the study cohort

Variables	Total	Men	Women
	N=1214	N=673	N=541
Smoking			
Nonsmoker	901(74.2)	396(58.8)	505(93.3)
Former	75(6.2)	69(10.2)	06(1.1)
Current smokers	235(19.3)	208(30.9)	27(5.0)
Other tobacco use	89(7.3)	74(11.0)	09(1.7)
Passive	203(16.7)	110(16.3)	93(17.2)
Alcohol consumption	91(7.5)	85(12.6)	06(1.1)
Dietary intake			
High fat	176(14.5)	118(17.5)	58(12.0)
High calorie	223(18.4)	139(20.6)	84(15.5)
High salt	205(16.9)	127(18.9)	78(14.4)
Low fibre	728(59.9)	409(60.8)	319(58.9)
Low fruit/Vegetables	386(31.8)	212(31.5)	174(32.1)
Family history			
Diabetes	530(43.6)	283(42.0)	247(45.6)
Stroke	92(7.6)	43(6.4)	49(9.0)
Premature CAD	54(4.4)	31(4.6)	23(4.2)
Endocrine disorder	49(4.0)	23(3.4)	26(4.8)
Dyslipidemia	6(0.5)	3(0.4)	3(0.5)
Body mass index	Total (N=1197)	Male (N= 662)	Female (N= 535)
<18.5 kg/m2	31(2.6)	17(2.5)	14(2.6)
18.5-22.9 kg/m2	208(17.4)	132(19.9)	76(14.2)
23-24.9 kg/m2	184(15.4)	111(16.7)	73(13.6)
25-29.9 kg/m2	505(42.2)	282(42.5)	223(41.7)
30-34.9 kg/m2	207(17.3)	97(14.6)	110(20.5)
35-39.9 kg/m2	48(4.0)	18(2.7)	30(5.6)
>40 kg/m2	14(1.2)	05(0.7)	09(1.7)
Truncal obesity			
Waist >90/>80 cm, men/women (Male= 525, Female= 380)	770(85.1)	415(79.0)	355(93.4)
WHR >0.90/>0.80, men/women (Male= 508, Female= 375)	830(94.0)	467(52.9)	363(97.0)
Depression	22(1.8)	12(1.7)	10(1.8)
Stress			
None	657(54.1)	389(57.8)	268(49.5)
Mild	454(37.4)	211(31.3)	243(44.9)
Moderate	84(6.9)	57(8.4)	27(5.0)
Severe	19(1.5)	16(2.3)	03(0.5)

Hypertension	820(67.5)	423 (62.8)	397(73.4)
CVD	58(4.8)	35(5.2)	23(4.2)
Retinopathy	147(12.1)	82(12.2)	65(12.0)
Nephropathy	27(2.2)	21(3.1)	06(12.0)
Neuropathy	31(2.5)	18(2.0)	13(2.4)
Diabetic foot	110(9.0)	52(7.7)	58(10.7)
Thyroid	142(11.7)	28(4.1)	114(21.1)
Endocrine disorder	55(4.5)	32(4.7)	23(4.2)
Cholesterol≥200 mg/dl (N=401) Male=244, Female=157	69(17.2)	38(15.8)	31(19.7)
Triglyceride≥150 mg/dl (N=79) Male=56, Female=23	34(43.0)	25(44.6)	9(11.4)
LDL≥100 mg/dl (N=66) Male=45,Female=21	40(60.6)	29(64.4)	11(52.4)
HDL<40/50 mg/dl (N=73) Male=50, Female=23	39(53.4)	23(46.0)	16(69.5)

Table 9. Drug therapies used in study population

Cardiovascular drugs (Without CVD, Primary prevention)			
Variables	**Total N=1214**	**Men N= 673**	**Women N=541**
Antiplatelets	779(66.2)	448(69.1)	331(62.6)
Beta blockers	92(7.8)	42(6.4)	50(9.4)
ACE inhibitors	266(22.6)	152(23.4)	114(21.5)
ARB	357(30.3)	163(25.1)	194(36.7)
Statins	794(67.4)	457(70.5)	337(63.7)
Diuretics	200(17.0)	93(14.3)	107(20.2)
CCB	139(11.8)	71(10.9)	68(12.8)
Cardiovascular drugs (With CVD, Secondary prevention)			
Variables	Total N=37	Male N=25	Female N=12
Antiplatelets	24(64.8)	19(76.1)	05(41.7)
Beta blockers	11(29.7)	08(32.0)	03(25.0)
ACE inhibitors	10(27.0)	9(36)	01(8.3)
ARB	11(29.7)	07(28.0)	04(33.3)
Statins	24(64.8)	16(2.4)	08(66.6)
Diuretics	17(45.9)	05(20.0)	12(100.0)
CCB	05(13.5)	03(12.0)	02(16.7)
Nephropathy (Documented) ((Male=21,Female=06)			
ACEI	03(14.2)	-	03(11.1)
ARB	14(58.3)	05(83.3)	09(70.3)

Table 10. Patients Glycemic control status (HbA1c level) in study population

HbA1c level	**Total (N=1003)**	**Male (N=561)**	**Female (N=442)**
<7%	187(18.6)	102(18.2)	85(19.2)
7-8%	312(31.1)	170(30.3)	142(32.1)
8-9%	127(12.7)	64(11.4)	63(14.2)
≥9%	377(37.5)	225(40.1)	152(34.4)

Table 11. Medication adherence & glycemic control (Mean& Standard Deviation) status:

Drug adherence	**Number (N=1178)**	**FBG**	**PPG**	**RBG**	**HbA1c**
Patients regularly taking medicines as prescribed	1038(88.1)	148.4±67.4	211.4±71.2	180.9±83.6	8.5±1.8
Patients forgot to take medication more than once a week	73(5.7)	165.1±71.8	248.8±77.0	231.7±105.1	8.8±1.5
Stop medication on his/her own due to non compliance or bad feeling	73(6.2)	187.1±78.3	264.0±83.3	263.8±125.5	9.2±1.7

DISCUSSION

In type 2 diabetes mellitus patients who are centrally obese, increased lipolysis causes the liver to increase glucose & very LDL output, while muscle uses less. This leads to a rise in blood glucose and triglycerides, a drop in HDL cholesterol & an increase in small, dense LDL particles. The frequency of dyslipidemia is greater in individuals with type 2 diabetes mellitus.

The above study data clearly indicates association of dyslipidemia with diabetes.

In the management of diabetes drugs play a vital role and become unavoidable in the vast majority of patients. In this study we also found the general prescription trend in diabetes mellitus patients; physician preferred the well established compounds. Absence of generic drugs reveals that physician is prescribing by brand name.

It was found that biguanide was the most prescribed drug category followed by sulfonylurea> thiazolidinediones> DPP-IV Inhibitor > α glucosidase inhibitor> incretin analogue> meglitinide.

Metformin was the most prescribed drug followed by glimepiride> pioglitazone> vildagliptin> gliclazide> sitagliptin> acarbose> exenatide> saxagliptin= repaglinide> glipizide> voglibose=liraglutide> nateglinide=rosiglitazone. Rosiglitazone was the least prescribed drug; this might be due to the fact that the drug is expensive.

Metformin acts by suppressing hepatic gluconeogenesis and glucose output from liver. It is the first-line drug of choice for the treatment of type 2 diabetes, in particular, in overweight and obese people and those with normal kidney function. Metformin is the only antidiabetic drug that has been conclusively shown to prevent the cardiovascular complications of diabetes. Metformin helps reduce LDL cholesterol and triglyceride levels, and is not associated with weight gain. Nateglinide acts by binding to sulfonylurea receptors followed by insulin release whereas rosiglitazone is a selective agonist for the nuclear peroxisome proliferator-activated receptor γ (PPARγ) which enhances the transcription of several insulin responsive genes. Rosiglitazone was the least prescribed because this drug is controversial and is estimated to have caused 83,000 heart attacks in the United States alone. Some reviewers have recommended rosiglitazone be taken off the market, but a Food and Drug Administration panel disagreed, and it remains available in the U.S., subject to significant restrictions.

Glibenclamide (glyburide) is associated with an incidence of hypoglycemia of up to 20–30%, compared to 2% to 4% with glimepiride. Glibenclamide also interferes with the normal homeostatic suppression of insulin secretion in reaction to hypoglycemia, whereas glimepiride does not have this property. Furthermore, glibenclamide diminishes the glucagon secretion in reaction to hypoglycemia, whereas glimepiride does not suppress this counter-regulatory reaction.

DPP4 plays a major role in glucose metabolism. It is responsible for the degradation of incretins such as GLP-1. Among various Insulins premixed 30/70 was the most prescribed insulin followed by long acting analogue (lantus)> short acting insulin> premixed 50/50> long acting insulin> rapid acting analogue (aspart)>rapid acting analogue (lispro) = premixed 25/75.

NPH insulin (or neutral protamine Hagedorn), is an intermediate-acting insulin given to help control the blood sugar level of those with diabetes. When injected subcutaneously, it has an intermediate duration of action, meaning longer than that of regular insulin, and shorter than ultralente, glargine or detemir.

International clinical studies have confirmed the advantages of insulin glargine in the treatment of heavy hypoglycemia compared to standard NPH insulin. Insulin glargine reduces the risk of severe nocturnal hypoglycemia. Extensive clinical studies (ACCORD) have confirmed the higher risk of mortality with higher incidence of severe hypoglycemia. A comparison trial of insulin detemir and glargine proved that subjects randomized to detemir used slightly higher daily insulin doses, but gained less weight on average than glargine-treated subjects.

The major co morbidity with diabetes mellitus was found to be hypertension (811 subjects out of 1214 patients i.e. 67.5%). Cardiovascular drug was the most prescribed class after antidiabetes medications.

CONCLUSION

This study revealed the association of dyslipidemia with diabetes as many diabetic subjects had cholesterol, triglycerides, LDL levels above normal and HDL levels below normal, suggesting that diabetics should be regularly monitored for cholesterol, triglyceride, LDL and HDL levels and if found dyslipidemic their lipid profile should be managed accordingly. Combination lifestyle therapies i.e., enhanced physical activity and dietary modification and therapeutic intervention would help in treatment and management of dyslipidemia.

In this study several oral/ injectable hypoglycaemic drugs were prescribed. Metformin was the most prescribed oral hypoglycaemic drug whereas nateglinide and rosiglitazone were the least prescribed oral hypoglycaemic drug. Rosiglitazone was the least prescribed because this drug is controversial and is estimated to have caused 83,000 heart attacks in the United States alone.

Physician has considered the safety of the patients first while prescribing antidiabetic drugs and has prescribed metformin to maximum number of subjects because metformin is the first-line drug of choice for the treatment of type 2 diabetes, in particular, in overweight and obese people and those with normal kidney function.

For treating type 1 diabetes subjects Physician has prescribed premixed 30/70 to maximum number of subjects followed by long acting analogue (lantus). Since less number of hypoglycemic events was reported by subjects, physician has considered hypoglycemia while prescribing dose for the respective insulin.

ACKNOWLEDGEMENT: None

CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

REFERENCES

1. Tripathi KD. Essential of medical pharmacology. Jaypee Brother Medical Publishers New Delhi, 6, 2010.
2. Bennet PN and Brown MJ. Clinical pharmacology. Elsevier Limited. Publishers, 10, 2009.
3. Ramachandran A, *et al*. Current status of diabetes in India and need for novel therapeutic agents. *Supplement to journal of the association of physicians of India (JAPI)*, 58, 2010, 7-8.
4. Lawrence A, Jacques G, Stewart B, Gary L, *et al.* Dyslipidemia in Adults with Diabetes. *Canadian Journal of diabetes*, 2006, 231-232.
5. Das S and Moses CR. Moses manual on diabetes mellitus. *IJCP Group of Publications*, 2007.
6. Ahren B. Best practice and research. Clinical endocrinology and metabolism. *Pub Med.Gov*, 2007, 517-33.
7. Deborah H, Loretta L, Amy W, Pamela K. Incretin Mimetics and DPP-IV Inhibitors: New Paradigms for the Treatment of Type 2 Diabetes. *Journal of the American Board of Family Medicine*, 19, 2007, 612-620.
8. Owens D. New horizons alternative routes for insulin therapy. *Nature reviews drug discovery*, 2007, 529-540.
9. http://www.diabetes.webmd.com/guide/diabetes-types-insulin.
10. Insulin resistance, Carbology 103- Insulin resistance Vs Insulin sensitivity, 2008.
11. Rang HP, Dale MM, Ritter JM, Flower RJ. Clinical uses of insulin. *Elsevier Limited. Publishers*, 2007.
12. Holt RIG and Hanley NA. Hypoglycemia; Essential Endocrinology and diabetes. Blackwell Publishing, 5, 2007.
13. http://www.dbshoes.co.uk
14. Vengurlekar S, *et al*. Prescribing Pattern of Antidiabetic Drugs in Indore City Hospital. *Indian Journal of Pharmaceutical Scienes*, 70(5), 2008, 637-640.
15. Jeganathan PS, *et al*. A correlative study of status of serum cholesterol, triglyceride and HDL-cholesterol In Type 2 diabetes mellitus patients with and without hypertension. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 1(3), 2010, 377.
16. Ashavaid TF, *et al*. Prevalence of Dyslipidemia in Young Adult Indian Population, *The Journal of the Association of Physicians of India*, 56, 2008, 99-102.
17. Parikh RM, *et al.* Prevalence and pattern of diabetic dyslipidemia in Indian type 2 diabetic patients. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 4(1), 2010, 10–12.
18. Abdel NM, *et al*. Prevalence of dyslipidemia in patients with type 2 diabetes in Jordan. *Saudi Medical Journal*, 29(10), 2008, 1423-8.
19. Jisieike NN *et al*. Prevalence of dyslipidemia among adult diabetic patients with overt diabetic nephropathy in Anambra state south-east Nigeria. *Nigerian journal of clinical practice*, 14(2), 2011, 171-5.
20. Adibe MO, *et al*. Outpatient utilization of anti-diabetic drugs in the south eastern Nigeria. *International journal of drug development and research*, 1(1), 2009, 27-36.
21. Manchandani Pooja, *et al.* Prescribing Pattern and Surveillance of Antidiabetic Drugs in Village and City Hospital of Indore district. *Drug Invention Today*, 2(9), 2010, 415-416.
22. Brophy JM, *et al*. Trends in the prescription of anti-diabetic medications in the United Kingdom: a population-based analysis. *Pharmacoepidemiology and drug safety*, 18(10), 2009, 973-6.
23. John L, *et al*. Age and gender based utilization pattern of antidiabetic drugs in Ajman, UAE; Gulf Medical College Hospital and Research Centre, Ajman, UAE. *Malaysian Journal of Pharmaceutical* Sciences, 10(1), 2012, 79-85.