RESEARCH ARTICLE

A STUDY OF DRUG PRESCRIBING PATTERN AND COST ANALYSIS AMONG DIABETIC PATIENTS IN A TERTIARY CARE TEACHING INSTITUTE IN NORTH INDIA

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder associated with significant morbidity and mortality due to diabetic complications and other co-morbid conditions. Therefore, other drugs are also used commonly with antidiabetic drugs for the treatment of diabetic patients. A prescription is a written advice, mentioning the drugs and other instructions to a pharmacist to dispense the drugs properly to treat the disease. It becomes necessary to write the drugs and other parameters in a candid, concrete and clear manner on the prescription slip. It has been observed that prescriptions are generally vague which lead to misinterpretations and thereby resulting in failure of drug therapy, drug-drug interactions, overuse or underuse of drug and adverse drug reactions. WHO has set quality and quantity indicators to evaluate the use of drugs to be used in the hospitals/dispensaries. Prescription slips were randomly collected from the diabetic patients visiting the OPDs of the Guru Gobind Singh Hospital attached to Medical College, Faridkot, for analysis and evaluation. Prescriptions slips were taken from the patients after taking written consent and analyzed for quality and quantity prescriber indicators recommended by WHO. A total of 366 prescriptions were collected and analyzed for drugs used in diabetic patients. Average number of drugs prescribed is 4.98. The most commonly prescribed drugs were Oral antidiabetic agents, CVS related (antihypertensive, nitrate, antiplatelet, etc.), vitamins and minerals, insulin, GIT related drugs, lipid lowering drugs, antimicrobial, CNS related and NSAIDs and their percentages were 20.55%, 26.97%, 22.20%, 7.8%, 6.57%, 5.86%, 5.75%, 2.63% and 1.48% respectively. All the drugs were prescribed by non-generic (Trade) names, which included 31.36% drugs from the Essential Drugs List. Oral forms prescribed were 85.85% and injectable were 14.15% (insulin 7.8% and other injectable 6.35%).The average cost of the oral antidiabetic agent per day per prescription was □7.95/- and this cost increased to □ 10.15/- with addition of CVS related drugs, □17.23/- with vitamins& minerals and □ 10.57/- with lipid lowering agents and it was seen that if a patient was prescribed all these drugs then the average cost of the treatment got raised to □ 45/- (approx.) or $ 0.82 USD per day per prescription. There is a high tendency and frequency to prescribe more than two drugs but less used from the essential drugs list for the treatment of the diabetesand other co-morbid conditions. Most of the drugs prescribed were cardiovascular related drugs and multivitamins along with oral antidiabetic drugs. There is an urgent need to develop the prescription writing skills for budding doctors regarding the use of Essential Drugs List to reduce the cost of treatment.

Key words: Prescription audit, prescribing indicators, Essential Medicine List (EML), Co-morbid conditions.

INTRODUCTION

A prescription is a written advice that mentions drugs and other instructions given to either pharmacist or chemist to dispense the drugs to patients for the proper treatment of disease. It provides information like an adequate dose of the drug to be given, its duration and the way it has to be taken[1,2]. Diabetes mellitus is a chronic metabolic condition and requires treatment for long time/life long. It has been seen that diabetic patients also have other co-morbid conditions/complications like Hypertension, CAD, dyslipidemia, neuropathy, nephropathy etc[3]. The prevalence of this disease across the world was estimated to be 2.8% in 2000 and 4.4 % in 2030.The number of people affected with diabetes is projected to increase from 172 million in 2000 to 366 million in 2030[4,5]. It is important to treat the diabetic patients wiselyto keep in mind all these co-morbid conditions too. In diabetes, the complications can be prevented only if the patient maintains strict glycaemic control[3]. Carrying out a drug utilisation study can provide valuable information to the researchers, policy makers and the drug and therapeutics committee members to determine the drug use pattern[6,7]. During our literature review, we found that a few studies have been conducted in South Asia. Hence, the present study was designed to keep in mind the diabetic patients who took treatment for long time and to asses the type of drugs used by the physicians and cost analysis of the prescriptions.

Rational use of drugs for the treatment of a disease is of utmost importance for the well being of patients[6]. A doctor must treat the patient and not only a disease for the well being of patient. It will help in reducing the patient's expenditure, lower adverse drug reaction, drug interactions and extra burden on medical as well as paramedical staff[6,7].

WHO has given a list of prescribing indicators to analyze the drugs prescribing pattern and the cost of a prescription[7].The current study has been taken up to evaluate the drugs prescribing pattern along with demographic profile among diabetic patients in tertiary care teaching institute at Faridkot.

MATERIALS AND METHODS:

Prescriptions were randomly collected from the OPDs (outdoor patients' departments) of Guru Gobind Singh Hospital, attached to Guru Gobind Singh-Medical College, Faridkot, over a period of six months. Prescriptions slips were taken from the patients after taking the written consent

and the relevant information was entered into the pretested proforma and analyzed fordemographic details of the patients andother parameters of Prescribing Indicators (as per the WHO guidelines) as follows:

I. Demographic details of the Patients:
a. Average age of the patients
b. Sex (male and female ratio)
c. Co-morbid conditions prevalent in diabetic patients
II. To study the pattern of drug prescribing among diabetic outpatients
III. To analyse the prescription as per the WHO Prescribing Indicators[7]**:** The following are the parameters:

1. Average number of drugs per prescription (encounter)

2. Percentage of drugs prescribed by generic name

3. Percentage of prescriptions with an antibiotic prescribed

4. Percentage of prescriptions with an injection prescribed

5. Percentage of drugs prescribed from an Essential Medicine List

6. Average drug cost per prescription or encounter

This study was approved by the Institutional ethical committee (IEC).

Inclusion criteria:

Diabetic patients visiting the OPDs (out patient doors) of the hospital and patients who gave written informed consent to analyze their prescription after photocopy.

Exclusion criteria: patients who are admitted in the ward, pregnancy induced diabetes mellitus and paediatric diabetic patients, patients who have surgery of pancreas (pancreatectomy) and recently got operation for any other surgery.

RESULTS:

I. Demography details

A total of 366 prescriptions were collected that contained 1824 drugs. Therewere patients of type 2 (n=360) and Type 1 diabetes mellitus (n=06). Among type 2 diabetes patients Males and females were 48.34% and 51.66% respectively (Table I). Among these patients, the greatest number were in the age group of 60–69 years, followed by 50–59 years, 40–49 years, 30-39 years and more than 70 years respectively(Table I). The mean ±SD age of the patients was 56.9 ±12.55 years.

It has been seen that 78.68% patients of diabetes mellitus have co-morbid conditions like cardiovascular diseases (HT, CAD, stroke and peripheral vascular disease), dyslipidemia, GIT, diabetic foot, asthma, nephropathy etc (Table II).

Table I: Distribution of patients according to Age and Sex

Age	Male (n)	% age	Female (n)	% age	Total (n)	% age
30-39	12	6.89	10	5.37	22	5.8
40-49	39	22.41	36	19.35	74	20.55
50-59	66	37.94	54	29.03	120	33.35
60-69	45	25.86	81	43.54	126	35
>70	12	6.89	5	2.68	18	4.4
Total	174	100	186	100	360	100
Type 1 DM	6					
<30	6	100%	4	66.67	2	33.33

Table II: Co-morbid Conditions Prevalent in Type 2 Diabetic patients

Other Diseases	N	Percentage
DM+HT	117	40.63
DM+CAD	18	6.25
DM+HT+ CVA	3	1.041
DM+HT+CAD	9	3.125
Total DM + CVDs	147	51.04
Dyslipidemia	111	38.54
Asthma	12	4.166
Diabetic foot	9	3.125
GIT disorders	6	2.083
Nephropathy	2	0.694
Ostioarthritis	1	0.347
Total	288	100%

DM- Type 2 Diabetes Mellitus, HT-Hypertension, CAD-Coronary artery disease, CVA-Cardiovascular accident, CVDs- Cardiovascular diseases

II. Drugs prescribed from different groupsamong diabetic patients

It has been observed that 28.45% of the drugs belong to antidiabetic groups (oral hypoglycaemic and insulin) while 71.55% belong to other groups.Among oral antidiabetic drugs 85.6 % of the drugs prescribed as monotherapy and combination therapy was 14.4% either two drugs or three drugs (10.4% and 4% respectively). Insulin is prescribed in 7.8% cases (Table III).

Table III: Antidiabetic Drugs Used in Diabetic Patients

Classification of Antidiabetic	N	% age
Total Drugs used for Diabetes mellitus	***519***	***28.45%***
Oral Antidiabetic Agents	375	20.55 % age
Name of Monotherapy	321	85.6%
Glimepride	138	36.8%
Gliclazide	18	4.8%
Metformin	114	31.4%
Pioglitazone	30	8%
Voglibose	15	4%
Vildagliptin	06	1.6%
Combination Therapy- Oral	54	14.4%
Glimepride+Metformin	24	6.4%
Gliclazide+Metformin	12	3.2%
Pioglitazone+Metformin	3	0.8%
Glimepride+Metformin+Pioglitazone	15	4%
Injectable Insulin	144	7.8%

Table IV: Other Drugs Commonly Used in Diabetic Patients

Drug's Group	N	Percentage	Remarks
CVS	492	26.97	Out of Total Drugs
RAAS	204	41.46	Out of Total CVS drugs
ACEI	90	18.29	Out of Total CVS drugs
Ramipril Enalapril	78 12	15.85 2.44	Out of Total CVS drugs
ARB	114	23.17	Out of Total CVS drugs
Telmisertan Olmesertan Losartan	75 36 3	15.24 7.32 0.61	Out of Total CVS drugs
Diuretics	90	18.29	Out of Total CVS drugs
Hydrochlorothiazide Torsemide Furosemide	51 27 12	10.36 5.49 2.44	(used in combination with ACE and ARB)
Beta blockers	48	9.75	Out of Total CVS drugs
Metoprolol Atenolol	21 21	4.26 4.26	Out of Total CVS drugs
Alpha blockers	6	1.21	Out of Total CVS drugs
CCBs	36	7.32	Out of Total CVS drugs
Nitrate	39	7.92	Out of Total CVS drugs
Antiplatelet	75	15.24	Out of Total CVS drugs
Aspirin Clopidogrel	66 9	13.41 1.83	
Lipid Lowering	111	5.86	Out of Total Drugs
Atorvastatin (A)	60	54.05	Out of Total lipid lowering agents
Rosuvastatin (R)	12	10.81	
A +Fenofibrate R+ Fenofibrate	24 15	21.62 13.51	

 ISSN: 2250-1177 CODEN (USA): JDDTAO

CVS related drugswere prescribed in 26.97% and majority of them belong to antihypertensive group (77.34%), Diuretics 18.29% and 15.24% antiplatlets respectively (Table IV).

Multivitamins and minerals were prescribed in 22.20% (n=405) and commonly prescribed were B-complex (n= 284, 42.96%)(Chart I). Methylcobalamine along with other(pargablin and gabapentin) were 34.07%. Vitamine D (n=72, 17.77%), Ca (n=24, 5.92%), Vit E (n= 6, 1.72%) and iron (n=12, 2.96%) were also prescribed in diabetic patients.

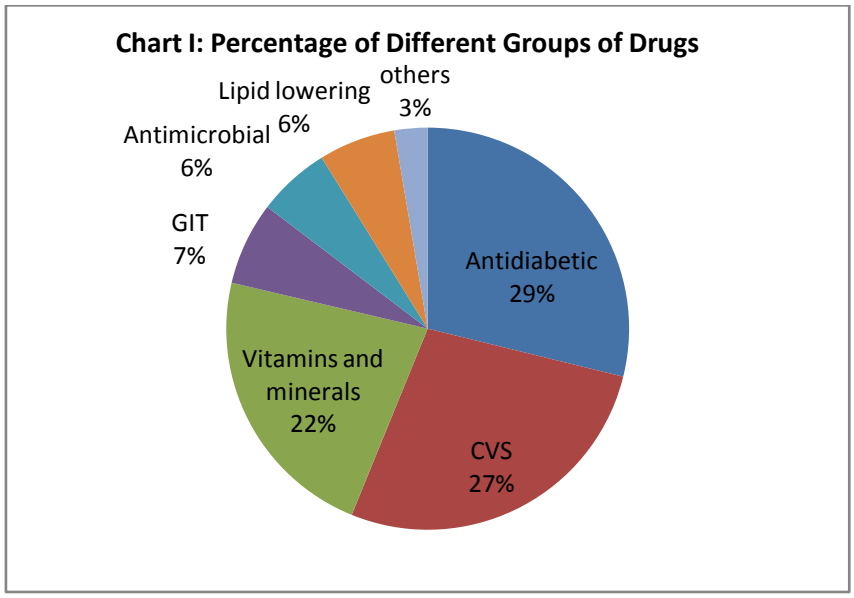
Lipid lowering drugs were share 5.86% and commonly prescribed drugs were Atorvastatin, Rosuvastatin and combination of these drugs with Fenofibrate was 35.13%(Table IV and Chart I).

GIT related drugs prescribed by 6.57% (n=120) (Chart 1) cases and commonly prescribed were PPIs [(n=93, 77.5%, pantprazole (n=45, 37.5%),rabeprazole (n=42, 35%) and omeprazole (n=6, 5%)]. Other drugs used were rantidine (n=6, 5%), prokinetics (n=21, 12.5%), domperidone (n=21, 17.5%), itapride (n=6, 5%) and laxative (n=6, 5%).

Antimicrobials were prescribed by 5.75% (n=105) and commonly prescribed was Beta Lactam group 60% (n= 45) [Cephalosporin (n= 27, 25.71%), Penicillin (n=18 17.14%) and combination of beta lactam with pencillinase inhibitors (n= 18, 17.14%)] and metronidazole 18.14% (n= 18), macrolide 11.42% (n= 12), Flouroquinolone5.71% (n=6) and others groups were 5.71% (n=6).

CNS related drugs were prescribed by 2.19% (n=40), and benzodiazepines (chlorodizepoxide and clonazepam) commonly prescribed as compared to other CNS related drugs.

NSAIDs were prescribed by 1.48% (n= 27) and Non-selective COX inhibitors (Diclofenac, Paracetamol, etc) were commonly prescribed than selective COX inhibitors



III. Prescribing Indicators:

It has been observed that average number of drugs prescribed per prescription was 4.98. Prescription with single drug (n=9, 2.4%), two drugs (n=12, 3.2%) and three drugs (n=18, 4.9%) were prescribed very less, while four (n=66) and more than four (n=261) drugs were prescribed by 89.24% (n=1628). All (100 %) the drugs were written with trade (non-generic) names, while none of the drugs was mentioned with their generic name.

Drugs from WHO- EML (Essential Medicine list's) drugs are prescribed by 27.41% while from Indian EML contains 31.36%, most of these drugs belong to oral antidiabetics, insulin, vitamins and minerals, CVS, antimicrobial agents, bronchodilator and NSAIDs.

Oral forms prescribed were 85.85% and injectable were 14.15% (insulin 7.8 %, n=144 and other injectable 6.35%, n=115).

Table V: Prescribing Indicators

Parameter	N	
Average number of drugs per prescription	-	4.98
Number of encounters with an injectable preparation prescribed	188	10.36%
Number of fixed dose combinations prescribed	306	16.77%
Number of drugs prescribed form EML of India	572	31.36%
Number of drugs prescribed form EML of WHO	500	27.41%
Number of encounters with an antibiotics prescribed	104	5.75%
Number of drugs prescribed by generic name	Nil	Nil

 ISSN: 2250-1177 CODEN (USA): JDDTAO

The average cost of the oral antidiabetic agent per day per prescription was □7.95/- and□ 8.28/- for injection Insulin. This cost increased to □10.15 with addition of CVS related drugs, □17.23/- with multivitamins and □ 10.57/- with lipid lowering agents and it was seen that if a patient was prescribed all these drugs then the average cost of the treatment got raised to □ 45/- or $ 0.82 USD (approx. with Oral antidiabetic) and □ 46/- or $ 0.83 USD (approx. with Injection insulin) per day per prescription.

DISCUSSION:

I. Demography details:

The incidence of diabetic mellitus is slightly less in malesthan females(Table I) which is contrast to as observed in Updhayay DK et al (56.59% vs. 43.41%)[8] which show higher incidence among male.

Patients in the age group of 50–69 years have more incidence of diabetes mellitus than the other age group, this incidence is more as observed in the other study [Updhayay DK et al (59.89%)][8], followed by, 40–49 years and less than 30-39 years and more than 70 years (Table I). The mean ±SD age of the patients is 56.9 ±12.55 years.

It has been seen that 78.68% patients of diabetes mellitus have co-morbid conditions (like cardiovascular diseases (HT, CAD, stroke and peripheral vascular disease), dyslipidemia, GIT, diabetic foot, asthma, nephropathy etc) (Table I) which is higher than as observed in Updhayay DK et al (70.33%)[8]. Co-morbidconditions like CVDs and nephropathy is less while asthma is more as observed by Updhayay DK (76.42%, 1.13% and 1.13% respectively)[8]. It has been observed that Dyslipidemia, diabetic foot and GIT disordersare also present in diabetes patients of this region as compared to study done by UpdhayayDK et al[8].

II. Prescriber indicators:

In this study, average number of drugs prescribed is more as compared to Upadhyay DK et al (3.76 per prescription)[8] and Enwere et al (4.0 per prescription)[9]studies.

Maximum number of drugs prescribed is nine (4.1%). Sixdrugs(25.4%) are prescribed more frequently as compared to other study (four drugs, 21.98%)[8].Four and more than four drugs are prescribed (89.5 %) more as observed in other study (52.75%)[8].It is observed that single drug (2.4%), two drugs (3.2%) and three drugs (4.9 %) prescribed are less as comparedto other study (6.59%, 21.43% and 19.23% respectively)[8]indicating that more than three drugsprescribed is frequently used to treat a disease which is a cause of concern may be due to other co-morbid conditions in diabetes patients.

It has been observed that 28.35% of the drugs belong to antidiabetic groups (oral hypoglycaemic and insulin) while 71.65% belong to other groups. Oralantidiabetic drugs are used more than Updhayay DK et al (65%)[8]. While monotherapyused for treatment is more than as observed in Updhayay et al (58.34%)[8] and combination therapy is used less(Table III). Monotherapy with sulfonylurea and pioglitazone are used more while metformin is less as compared to UpdhayayDK et al (35.35%, 4.78% and 51.27% respectively)[8]. Combinationtherapy is used two drugs and three drugs, frequently used dual therapy are glimepride with metformin (6.4%), gliclazide with metformin (3.2%)and three drugs (glimepride with metformin and pioglitazone) (4.1%)(Table III) that less is prescribed as seen in Dhwani K et al (8.7%, 5.5% and 7.9% respectively)[10]. Injectable Insulin (7.8%) also prescribed less as compared to Dhwani K et al (35%) study[10].

CVS related drugs were prescribed in 26.97%and majority of them belong to antihypertensive group 77.34%. CVS drugs prescribed is less as observed in UpdhayayDK et al (35.91%)[8].It have been seen that antihypertensive drugs like RAAS related drugs, CCB and antiplatlets are prescribed less while diuretics is more as observed in Enwere OO et al (53%, 36.7%, 56.4% and 18.29% respectively) study[9].

Lipid lowering drugsshare 6.08% which are slightly more than Enware OO et al (5.5%)[9]and commonly prescribed drugs are Atorvastatin, Rosuvastatin and combination of both these drugs with Fenofibrate.It has been seen that Vitamins and mineralsand antimicrobials are prescribed more as explored by the Upadhayay DK et al (2.92% and 0.88%)[8].

Injectable medicines are prescribed by 14.15% cases which are very less as observed by Updhyay et al (15.38%)[8] and Enwere et al (26.4%)[9].

It has been observed that Drugs from WHO-EML[11] and Indian EML[12] are prescribed (Table V) very less as observed by UpdhayayDK et al (40.20% and 54.1%)[8], most of these drugs belong to oral antidiabetics, insulin, vitamins and minerals, CVS, antimicrobials and NSAIDs.Fixed dose combination share 16.77% that is more than UpdhayayDK et al (2.34%)[8].

Drug consumption and Cost analysis:

The average cost per prescription is □ 26.67/- or $ 0.49 USD that is less as observed inUpdhayaDK et al ($ 16.17)[8]and Enware OO ($1.42)[9].

The average cost of the oral antidiabetic agent per day per prescription is □7.95/- and □ 8.28/- for injection insulin. This cost increased to □ 10.15/- with addition of CVS related drugs, □ 17.23/- with multivitamins and □ 10.57/- with lipid lowering agents and it was seen that if a patient was prescribed all these drugs then the average cost of the treatment got raised to □ 45/- or $0.82 USD (approx. with Oral antidiabetic) and □ 46/- or 0.83 USD (approx. with Injection insulin) per day per prescription. (1USD= 55 INR)

IMPLICATIONS OF THIS STUDY

Diabetes mellitus is a chronic metabolic condition and patients require long treatment. This study was done in North India in Malwa region of Punjab.This is an agricultural land and people have traditional diet habits, style of living.By doing this study, we have seen that dyslipidemia is frequently present in diabetic patients as compared to other studies which is the cause of concern. By this study,we get an idea about the co-morbid condition present in diabetic patients in this part of India. By use of this kind of data we can treat the patients rationally and advice the patient for proper treatment, improve the adherence to therapy and reduce the cost of treatment. Thus, this study has provided a baseline data regarding the prescribing pattern in diabetes patients. Since diabetes is a common problem in South Asia and prescription cost is one of the major reasons for non-

adherence to drug therapy, there is a need to prescribe cheaperalternatives for these patients. This study also provides a scope for further research in this area.

LIMITATIONS

Our study had a few limitations. The diabetes patients admitted in the hospital were not included in the study. The diabetic patients who underwent surgery recently and paediatric diabetic patients and pregnancy induced patients were also excluded. Moreover, our study was done for a short period of time and the number of patients studied was low. Hence, similar studies covering large number of patients are needed to confirm our findings.

CONCLUSION:

Most of diabetic patients have co-morbid conditions; therefore, they require more than one medication for their proper treatment. Thereis a high tendency and frequency to prescribe more than two drugs but less prescribed from the Essential Medicine List. Most of the drugs prescribed aregenerally cardiovascular related drugs and vitamins combined with oral antidiabetic drugs. There is an urgent need to develop the prescription writing skills for budding doctors regarding the use of Essential Medicine List to reduce the cost of treatment and better compliance of the patients.

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