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Research Article

# EVALUATION OF PRESCRIPTION PATTERN AND ASSOCIATED DRUG INTERACTIONS IN TYPE 2 DIABETES MELLITUS PATIENTS WITH COMORBIDITIES AND COMPLICATIONS IN A TEACHING CARE HOSPITAL

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**ABSTRACT**

Type 2 Diabetes Mellitus is a group of metabolic disorders which develops when insulin secretion can no longer compensate for insulin resistance. The effects of diabetes mellitus include organ damage, dysfunction, etc. Physician's plays a vital role to prescribe anti-diabetic medications and pharmacist plays a keen job to evaluate the prescription pattern in order to optimize a successful therapy. The objectives of our study was to evaluate the prescription pattern of Type 2 Diabetes Mellitus, estimate the occurrence of Diabetes with its comorbidities and complications, monitor the possible drug interactions in the prescription and assess its severity and to assess the occurrence of polypharmacy in Type 2 Diabetes Mellitus patients with comorbidities and complications. A prospective observational study was carried out on type 2 diabetic comorbid and complication patients aged ≥18 years for a period of six months at General Medicine Department of Basaveshwara Medical College Hospital and Research Centre, Chitradurga, Karnataka. A total of 102 patient's data were collected among which 54 were males and 48 were females. Hypertension was more prevalent in 46-60 age group people. Commonly prescribed antidiabetic drug was Insulin. Diabetes with hypertension comorbidity was more as compared to diabetes with complications. Out of 307 drug interactions 157 were of moderate type followed by 150 minor types of drug interactions. Polypharmacy was assessed and most patients were prescribed with 8-16 drugs per prescription. A successful treatment will come true when a pharmacist maintains good rapport with the physician which would result in safe and effective therapy.

**Key Words:** Diabetes mellitus, Anti-diabetic medications, Comorbidities, Drug interactions, Polypharamcy.

## INTRODUCTION

The incidence of DM has increased dramatically in recent decades.[1] It is estimated that prevalence of diabetes will rise from 6.4% in 2010 to 7.7% in 2030 with an estimated 69% rise in the number of adults with diabetes in developing countries. Diabetes is a debilitating illness characterized by an asymptomatic phase between hyperglycemia and clinical diagnosis.[3] This phase is estimated to last for 4–7 years and 30–50% cases of type 2 diabetic patients remain undiagnosed. This leads to the development of chronic complications of diabetes.[1] Diabetes is an increasingly prevalent independent risk factor for cardiovascular diseases and stroke.[2] The incidence of hypertension in patients with T2DM is approximately two-fold higher than in age-matched subjects without the disease.[4] The issue of drug interactions is a global concern. Drug therapy becomes more complex with polypharmacy. The incidence of potential DDIs (pDDIs) is close to 40% in patients taking 5 drugs, and exceeds 80% in patients taking 7 or more medications.[6] The involvement of pharmacists gives the opportunity to cater these demands and to involve in the provision of drug related therapy which is not only effective as well as free from any kind of toxicity.[5]

## MATERIALS AND METHODS

**Study design:** A prospective observational study.

**Study site:** The study was conducted at General Medicine department of Basaveshwara Medical College Hospital & Research Centre, Chitradurga.

**Study period:** The study was conducted over a period of six months.

**Study approval:** This study was approved by the "Institutional Human Ethical Committee" of the S.J.M College of Pharmacy, Chitradurga. (SJMCP/IEC/677D/2013-14).

**Study subjects:** All patients who were presented to the General Medicine department of the hospital during a six month period were eligible for enrolment.
Patient who met the following criteria were enrolled.

**Inclusion Criteria**
1. Patients aged ≥ 18 years of both the genders
2. Patients with Type 2 Diabetes Mellitus
3. Patients with co-morbid conditions and complications

**Exclusion Criteria**
Patients with type 1 Diabetes Mellitus

**Study procedure**
The patients who met the study criteria were enrolled in the study.

Ethical clearance from Institutional Ethical Committee, by SJM College of Pharmacy, Chitradurga was obtained prior to the study.

Diabetic comorbid and complication patients were identified and collected their demographic details, medical and medication history, family history, social history, clinical data such as diagnosis, clinical condition; therapeutic data such as name of the drug, dose, route, frequency and other relevant details were obtained and documented in a suitably designed case record form (CRF).

Evaluated the prescription pattern of antidiabetic agents and other drugs prescribed for management of diabetic comorbidities and complications. The comorbidities like cardiovascular diseases and respiratory diseases and the complications such as nephropathy, neuropathy and urinary tract infections were considered.

Monitored the possible drug-drug interactions between antidiabetic agents and other drugs prescribed and assessed it's severity.

**Statistical analysis:** Using the Statistical Package for Social Service (SPSS) 19 version, the results were calculated and analyzed descriptively and thus reported.

## RESULTS

A total of 102 patients aged ≥30 years were enrolled. The study showed that the age group of 46-60 years had more prevalence of diabetes mellitus 39.21%. Male diabetic patients 52.94% were more when compared with female diabetic patients 47.06%.

Occurrence of diabetes mellitus was more among non-vegetarian diet than vegetarian diet pattern patients.

On comparing with the social history of smokers and alcoholics, Non-smokers and non-alcoholics were more prevalent for the diabetic condition. Moreover, patients with familial and genetic factors played a major role in the occurrence of disease.

Out of 102 type 2 diabetes mellitus patients, cardiovascular disease diagnosed comorbidities were more common, among which hypertension 41.2% was most commonly found.

On foresight for prescribing pattern for Type 2 Diabetic comorbidities and complications, Regular Human Insulin 34.46% was the commonly prescribed class of drugs as observed in the study.

Ramipril was the most commonly prescribed antihypertensive drug for type 2 diabetic hypertensive comorbid patients as mentioned in fig 2. Aspirin was the most frequently used antiplatelet drug for type 2 diabetic IHD patients as mentioned in table 6. Among diabetic hyperlipidemia patients, atorvastatin was the most commonly prescribed anti-hyperlipidemic drug as shown in table 7. Type 2 diabetic angina patients were more commonly treated with Nitroglycerin as antianginal agents as shown in table 8. Methylxanthines was the most commonly prescribed bronchodilators for Type 2 diabetic asthmatic patients as mentioned in fig 3. The prescription pattern of antibiotics given during the treatment of diabetic comorbid conditions and complications are listed in fig 4. Out of these, Cephalosporins was the most commonly prescribed class of drug.

Various combinations were given for anti-diabetic, anti-hypertensive, anti-asthmatic and antibiotics. These combinations increase the therapeutic effect and helps in enhancing the treatment in the patient resulting in better patient care. The most commonly prescribed fixed combinations that were used to treat diabetes mellitus was Glimepiride+Metformin 70.46% adjoined by Glibenclamide+Metformin 13.63%, Glipizide+Metformin 9.09% and other combinations included Gliclazide+Metformin, Pioglitazone+Glimepiride+Metformin and Pioglitazone+Glibenclamide + Metformin 6.82%.

The most common combinations used for hypertension was Ramipril+Hydrochlorothiazide 27.6% accompanied by Losartan+Hydrochlorothiazide 24.13%, Telmisartan+Hydrochlorothiazide 20.7% and Atenolol+Indapamide 10.34%. The least prescribed were Amlodipine+Metoprolol, Furosemide+Spironolactone and Amlodipine+Telmisartan 3.44%.

Among the anti-asthmatic combinations, Salbutamol+Ipratropium bromide 60% was commonly prescribed followed by Etophylline+Theophylline 40%.

The commonly prescribed antibiotic combinations were Ceftazidime+Tazobactum 48.57% adjoined by others that included Ofloxacin+Ornidazole, Ceftriaxone+Tazobactum, Amoxicillin+Clavulanic acid, Cefotaxime+Sulbactam and Ceftriaxone+Sulbactam 31.44%. The least prescribed drugs were Cefotaxime+Tazobactum 8.57%, Piperacillin+Tazobactum 5.72%, Sulfomethoxazole+Trimethoprim 2.85% and Cefoperazone+Sulbactum 2.85%.

The frequently used combinations for cardiovascular and hyperlipidemic patients were Aspirin+Atorvastatin 88.89% followed by Aspirin+Clopidogrel 11.11%.

The total number of anti diabetic drugs prescribed per patient was assessed. Most of the type 2 diabetic patients were prescribed with a single antidiabetic drug like Glimepiride+Metformin 37.3%, two anti-diabetic drugs like Insulin and Metformin 37.3%, three anti-diabetic drugs like Insulin, Metformin and Glimepiride 17.6% and a maximum of four antidiabetic drugs like Insulin, Metformin, etc 1% were used to control sugar level in a single patient.

Polypharmacy was very common among the type 2 DM with comorbidity. More number of patients received moderate type of polypharmacy 68.62% (8-16 drugs) followed by minor 26.48% (2-7 drugs) and severe category 4.9% (Above 16 drugs).

The drug interactions of 102 prescriptions where checked using Micromedex, the most commonly found interactions severity falls under moderate type 50.64% in which insulin+metformin was most commonly occurring which signified pharmacodynamic synergism followed by minor 48.39% where aspirin+insulin more frequently occurred and denoted pharmacodynamic synergism.

## DISCUSSION

The present study revealed cardiovascular disease diagnosed comorbidities were more common, among which hypertension was most commonly found. Other studies also showed that the majority of the patients had hypertension as the major comorbidity.[7]

The commonly prescribed antidiabetic, antihypertensive, antiplatelet, antihyperlipidemia, antianginal, antiasthmatic and

antibiotic drug for type 2 diabetic comorbid and complication patients were insulin, ramipril, aspirin, atorvastatin, nitroglycerin, methylxanthines and cephalosporins respectively. In contrast to our study, a study from Iran showed that the commonly prescribed anti diabetic drug were biguanides. Previous studies reported the same prescribing patterns for the other category of drugs.[8,9,10,11]

Polypharmacy was assessed among the type 2 DM patients and more number of patients received moderate type of polypharmacy followed by minor and severe category. The results of this study were similar to the studies conducted in Mangalore.[12]

The drug interactions of 102 prescriptions where analysed and the most commonly found interactions severity falls under moderate type followed by minor which was similar to the study conducted in Uttar Pradesh with potential drug interactions 82.4% for cardiovascular diseases followed by microvascular 67.2%, hyperlipidemic 62.6%, renal 58.4% and liver 1.6% complications.[13]

**Table 1: Distribution according to Diet**

| Diet | Frequency | Percentage |
|---|---|---|
| Veg | 41 | 40.2 |
| Non veg | 61 | 59.8 |
| Total | 102 | 100 |

**Table 2: Distribution according to Social history**

| | Age Group (Years) | | | | Total |
|---|---|---|---|---|---|
| Smoking | **30-45** | **46-60** | **61-75** | **>75** | |
| Non smoker | 04 | 30 | 25 | 13 | 72 |
| Smoker | 05 | 10 | 09 | 06 | 30 |
| Non alcoholic | 7 | 33 | 27 | 17 | 84 |
| Alcoholic | 02 | 07 | 07 | 02 | 18 |
| Both | 02 | 06 | 04 | 02 | 14 |

**Table 3: Distribution according to Family History**

| Family History | No. of Patients | Percentage (%) |
|---|---|---|
| Present | 63 | 61.8 |
| Absent | 39 | 38.2 |
| Total | 102 | 100 |

**Table 4: Diagnosis**

| Diagnosis | No of patients | Percentage |
|---|---|---|
| Diabetes Mellitus+Asthma | **11** | **10.8** |
| DM+Asthma+Diabetic nephropathy | **2** | **2.0** |
| DM+UTI | **19** | **18.6** |
| DM+CVD | **42** | **41.2** |
| DM+CVD+COPD | **15** | **14.7** |
| DM+CVD+Diabetic neuropathy | **13** | **12.7** |
| Total | **102** | **100** |

**Table 5: Occurrence of Type 2 Diabetes with Comorbidities and Complications**

| Category | No of prescriptions | Percentage |
|---|---|---|
| DM+Complications | 19 | 18.62 |
| DM+Comorbidities | 68 | 66.67 |
| DM+Comorbidities+Complications | 15 | 14.71 |
| Total | 102 | 100 |

**Table 6: Prescription pattern of Anti-Platelet drugs**

| Drugs | No. of prescription | Percentage |
|---|---|---|
| Aspirin | 21 | 58.34 |
| Clopidogrel | 11 | 30.56 |
| Aspirin+Clopidogrel | 4 | 11.11 |

**Table 7: Prescription pattern of Anti-Hyperlipidemic drugs**

| Drugs | No of prescriptions | Percentage |
|---|---|---|
| Atorvastatin | 26 | 96.3 |
| Rosuvastatin | 1 | 3.7 |

**Table 8: Prescription pattern of Anti-Anginal agents**

| Drugs | No of prescriptions | Percentage |
|---|---|---|
| Nitroglycerin | 8 | 80 |
| Isosorbide dinitrate | 2 | 20 |

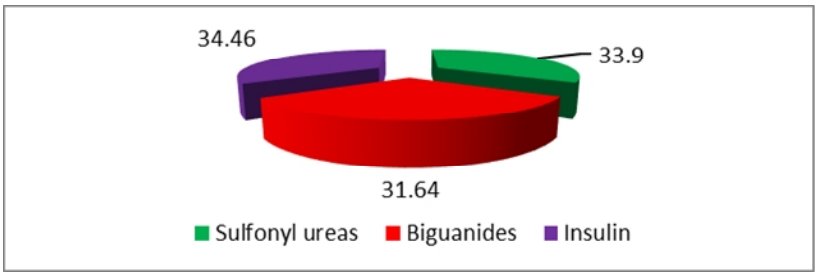



**Figure 1: Prescription pattern of Anti-Diabetic drugs**

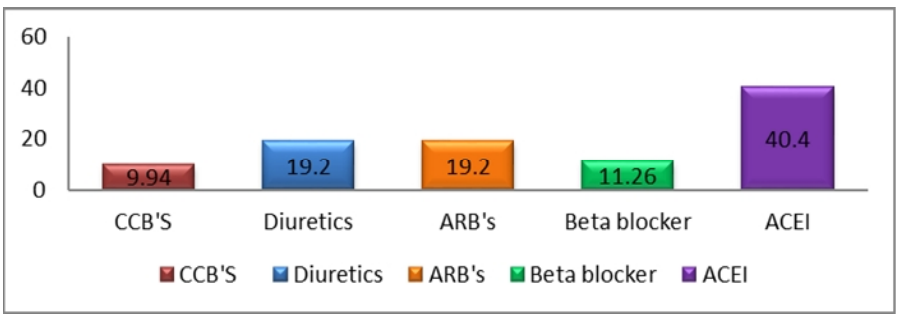



**Figure 2: Prescription pattern of Anti-Hypertensive drugs**

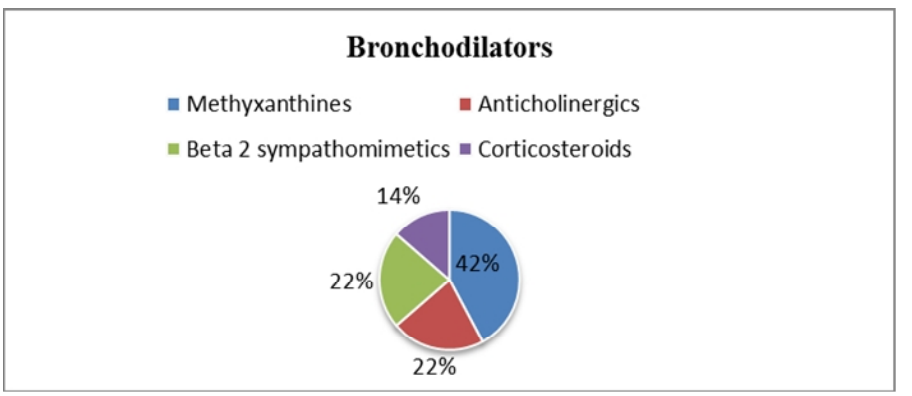



**Figure 3: Prescription pattern of Bronchodilators**

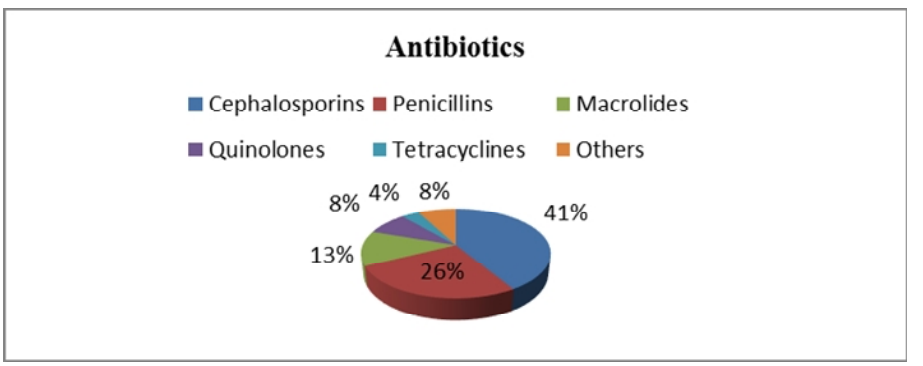



**Figure 4: Prescription pattern of Antibiotics**

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