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**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**Available online at: <http://www.iajps.com>**Research Article****ASSESSMENT OF DRUG-DRUG INTERACTIONS IN  
DIABETIC PATIENTS IN A SECONDARY CARE HOSPITAL****A. A. Mohamed Yasir Arafath\*<sup>1</sup>, Jamshed khan<sup>2</sup>, Jesslin joy<sup>2</sup>, Jithin. P. Jeenu<sup>2</sup>**

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**Abstract:**

*A retrospective study was done to analyse the diabetic cases in a secondary care hospital in Salem for a period of six months for evaluating drug-drug interactions. A total of 148 prescriptions were collected and analysed for drug-drug interactions. The obtained data were cross referenced to each other getting the maximum data. The 148 cases were classified according to gender wise and age wise and the maximum number of patients coming under the age group of 41-60. Then the cases were classified according to the number of drugs prescribed per prescriptions, in that cases in which 8-12 drugs are prescribed had found to have maximum number of drug interactions. Total number of drugs prescribed in 148 prescriptions is 204 in that 76 drugs are prescribed in generic names and 128 drugs are prescribed in brand names. From the total 148 prescriptions 69 prescriptions are showing drug-drug interactions in that 40 were male patients and 29 were female patients, in that Glipizide is interacting with 10 drugs, Insulin is interacting with 6 drugs, metformin is interacting with 3 drugs and Pioglitazone is interacting with 1 drug. It may be concluded that total number of drug interactions were found to be 46.62% in 148 prescriptions, in that the significant interactions are found to be 37%.*

**Keywords:** Diabetic, Drug-Drug Interaction, Secondary Care Hospital**Corresponding author:****A. A. Mohamed Yasir Arafath,**

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## INTRODUCTION

Type-2 diabetes is a disease marked by high levels of blood glucose due to the action of insulin and insufficient insulin production. Type-2 diabetes accounts for approximately 90% to 95% of all diagnosed cases of diabetes. Diabetes is a chronic disease affecting almost 6% of world population. It is associated with abnormal carbohydrate, protein and lipid metabolism. Diabetes if uncontrolled can lead to several acute and chronic complications. Chronic complications of diabetes make it needed to prescribe drugs for these patients lifelong.

India has the largest population of diabetes in the world. The international diabetes federation (IDF) estimates the number of people with diabetes in India will reach 80million by the year 2025. A survey depicts that 4% of adults in India suffered from diabetes in the year 2000 and is expected to increase to 6% by the year 2025. The world health organization (WHO) has projected that the global prevalence of type-2 diabetes mellitus will more than double from 5 million in 1995 to 300 million by 2025. Between 1995 and 2025, there will be a 35% increase in worldwide prevalence of diabetes mellitus, from 4 to 5.4% [1-6].

An interaction is said to occur when the effects of one drug are changed by the presence of another drug, herbal medicine, food, drink or by some environmental chemical agent. The outcome can be harmful if the interaction causes an increase in the toxicity of the drug. The more drugs a patient takes the greater the likelihood that an adverse reaction will occur the frequency of interactions uncritically compared the drugs that had been prescribed with lists of possible drug interactions, without appreciating that many interactions may be clinically trivial or simply theoretical. As a result, an unrealistically high incidence was suggested. Drug-drug interactions are a common problem during drug treatment and give rise to a large number of hospital admissions as a result of medically important, sometimes serious or even fatal adverse events. Drug-drug interactions can also cause partial or complete abolishment of treatment efficacy.

**Table 1: No of Cases Screened According To Gender Wise**

Sl. No	Gender	No. of patients	Percentage
1	Male	83	56
2	Female	65	44

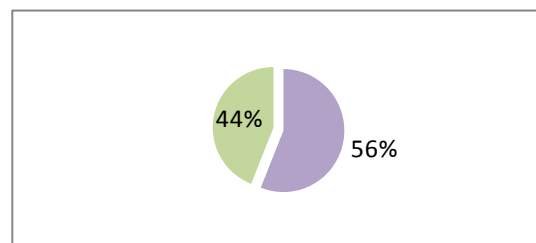
The overall prevalence of drug interactions is 50% to 60%. Those that affect pharmacodynamics or pharmacokinetics have a prevalence of approximately 5% to 9%. About 7% of hospitalizations are due to drug interactions. As the number of medications a patient takes increases, the potential for drug interactions increases. Other predictors for potential drug interactions include severity of the diseases being treated, age of the patient, and renal and hepatic dysfunction. Patients with HIV and those post transplantation are taking a larger number of medications and are at higher risk for drug interactions [7-10].

## MATERIALS AND METHODS

A retrospective study was carried out over a period of six months from VMKVMC&H secondary care hospital at Salem, Tamil Nadu. A suitable data collection form was designed to collect and document the data. Data collection form included the provision for collection of information related to demographic details of the patient, occupation, social status, past medical history, family history, duration of diabetes mellitus, category of the drug prescribed, most frequently prescribed anti diabetic drugs, drugs prescribed by generic and brand name, class of anti diabetic drugs prescribed and coexisting illness. All the necessary and relevant information were collected from prescription. Patients of both genders and all ages of inpatients were included in the study. Type 1 diabetes mellitus and Outpatients were excluded from the study.

## RESULTS

148 diabetic cases were collected in the duration of 6 months from VMKVMC&H Salem and categorized based on number of diabetic cases. The result of collection of data is given in the below tables and figures.



**Fig 1: Percentage of Male and Female Patients**

Table 2: No of Cases According to Age Wise

S.No	General	Age Group			
		0 - 19	20-40	41-60	Above 61
1	Male	Nil	8	52	23
2	Female	Nil	7	42	16

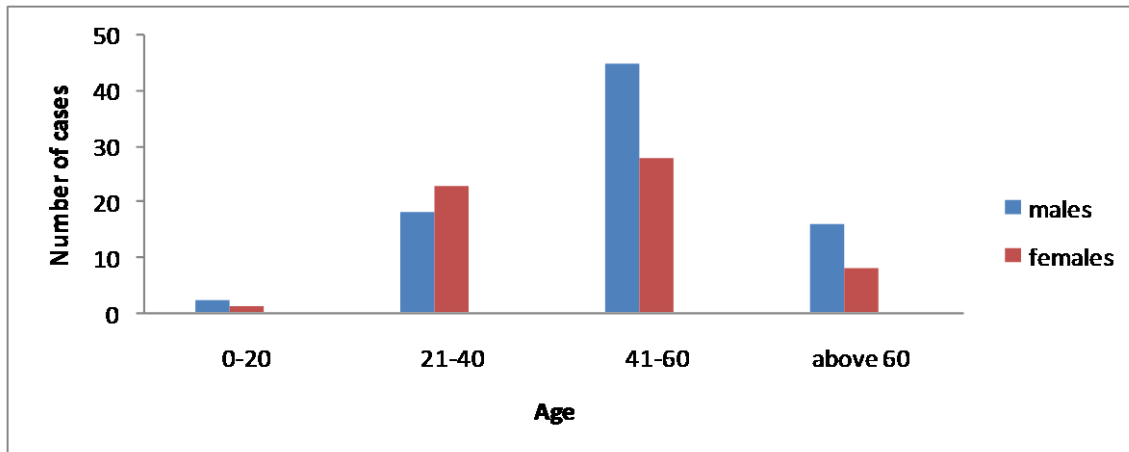


Fig 2: Percentages of Cases According to Age Wise

Table 3: Total no. of Cases Collected According To Month Wise

S.No	Month	Total No. of cases	No. of cases collected	Percentage
1	November	498	27	5.42%
2	December	412	25	6.06%
3	January	306	26	8.49%
4	February	368	38	10.32%
5	March	370	19	5.13%
6	April	603	13	2.15%

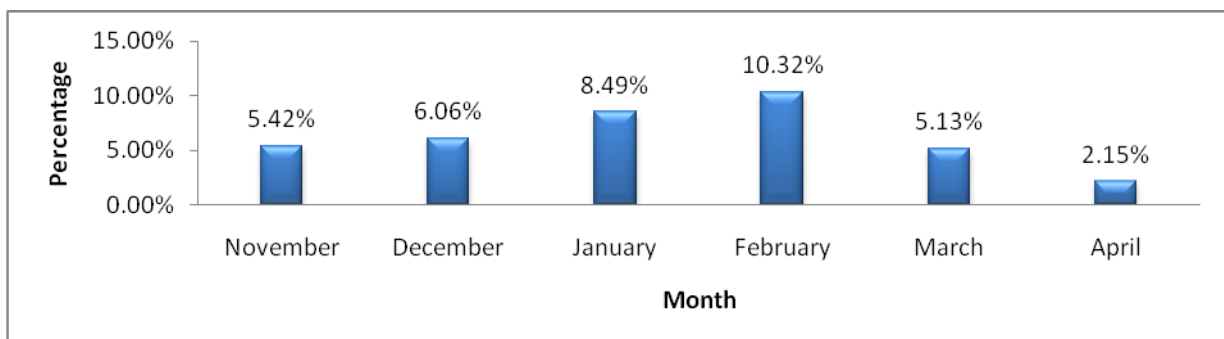
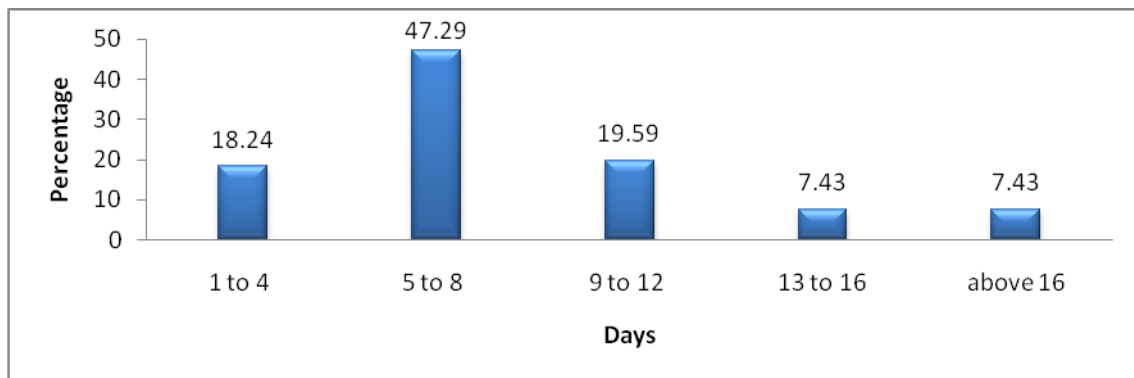


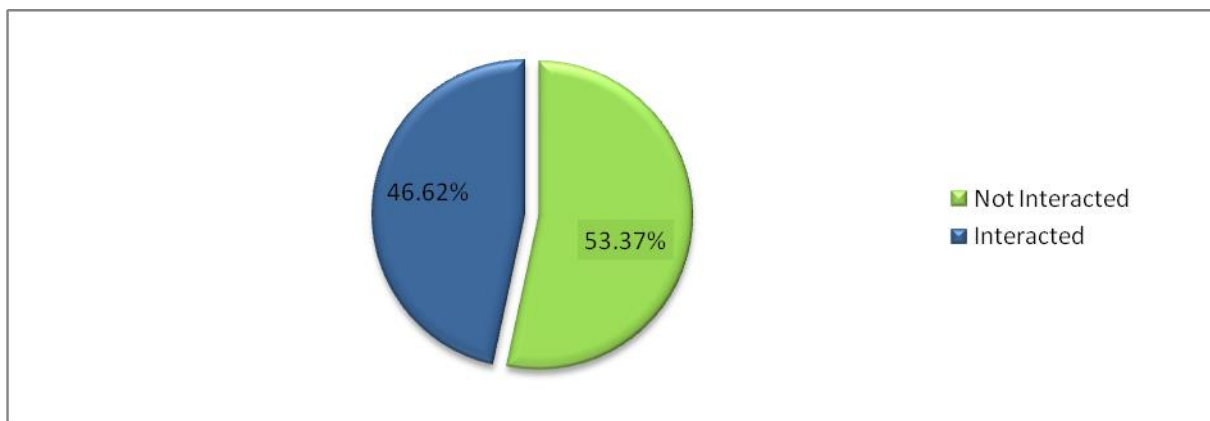
Fig 3: Percentage of Cases Collected According to Month Wise

**Table 4: No of Prescriptions Analyzed According To Days of Hospitalization**

S.No	No. of days	No. of prescriptions	Percentage
1	1 – 4	27	18.24%
2	5 – 8	70	47.29%
3	9 - 12	29	19.59%
4	13 - 16	11	7.43%
5	Above 16	11	7.43%

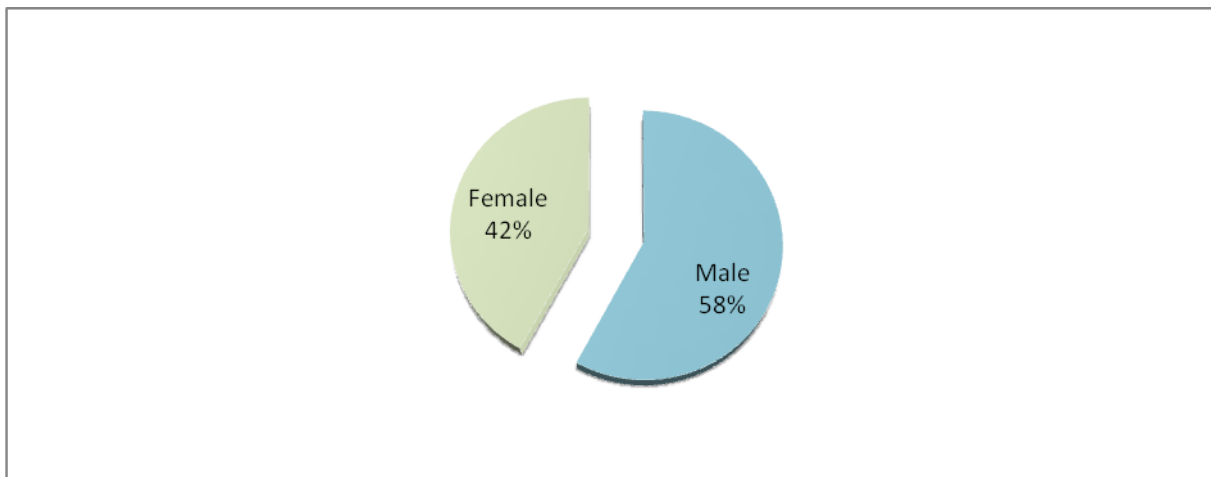
**Fig 4: Percentage of Prescriptions Analyzed According to Days of Hospitalization****Table 5: Presence or Absence of Drug Interaction**

Total prescription	Presence of drug interactions	Absence of drug interactions
148	69	79

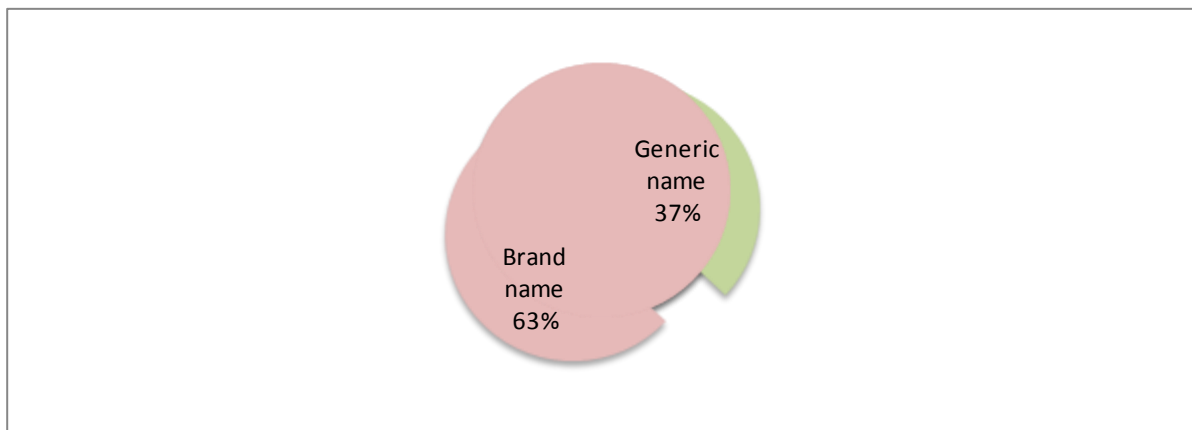
**Fig 5: Percentage of Presence or Absence of Drug Interactions**

**Table 6: No. of Drug Interactions Screened According to Gender Wise**

S.No	Gender	No. of patients	No. of drug interactions	Percentage
1	Male	83	40	57.97%
2	Female	65	29	42.02%

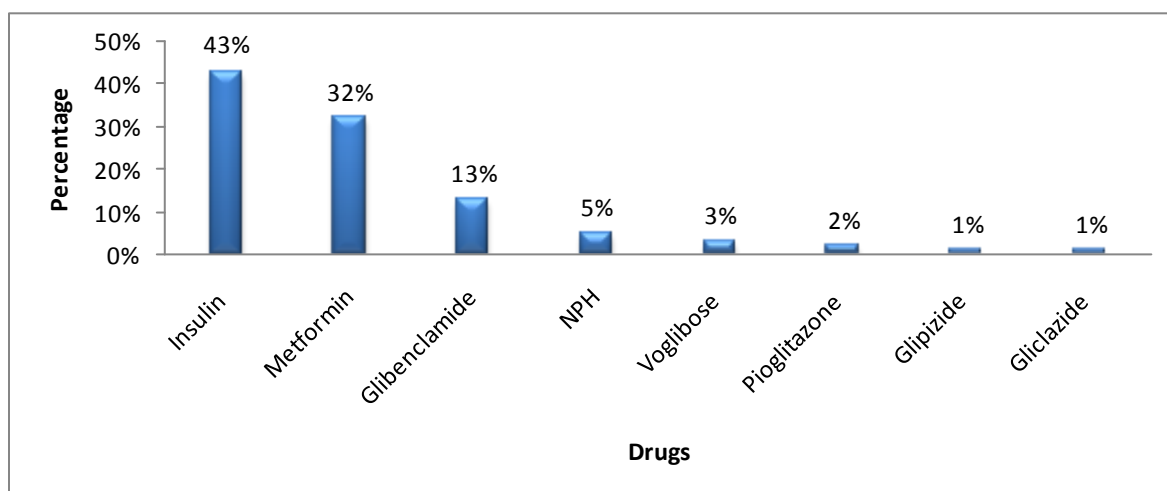
**Fig 6: Percentage of Drug Interactions Screened According to Gender Wise****Table 7: Distribution of Drugs in Generic and Brand Name**

Prescription Item	Number of Drugs	Percentage
Generic name	76	37%
Brand name	128	63%

**Fig 7: Percentage of Distribution of Drugs in Generic and Brand Name**

**Table 8: Most Commonly Prescribed Antidiabetic Drugs**

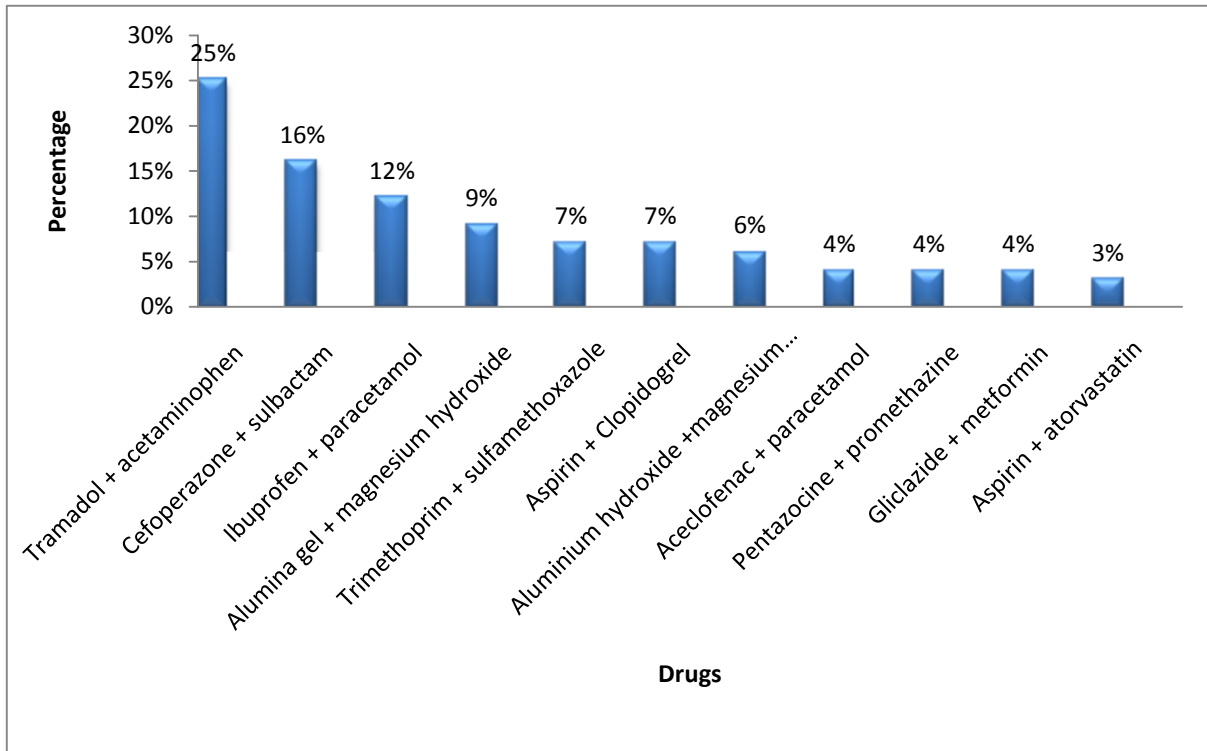
S.No	Drugs	No. of Prescription	Percentage
1	Insulin	118	43%
2	Metformin	88	32%
3	Glibenclamide	36	13%
4	NPH	14	5%
5	Voglibose	8	3%
6	Pioglitazone	6	2%
7	Glipizide	3	1%
8	Gliclazide	3	1%

**Fig 8: Percentage of Most Commonly Prescribed Antidiabetic Drugs**

Insulin and Metformin are the most common drugs that are prescribed for diabetes mellitus compare to other antidiabetic agents.

**Table 9: Most Commonly Prescribed Combination Drugs**

S.No	Combination Drugs	No. of Prescription	Percentage
1	Tramadol + acetaminophen	17	25%
2	Cefoperazone + sulbactam	11	16%
3	Ibuprofen + paracetamol	8	12%
4	Alumina gel + magnesium hydroxide	6	9%
5	Trimethoprim + sulfamethoxazole	5	7%
6	Aspirin + Clopidogrel	5	7%
7	Aluminium hydroxide +magnesium hydroxide	4	6%
8	Aceclofenac + paracetamol	3	4%
9	Pentazocine + promethazine	3	4%
10	Gliclazide + metformin	3	4%
11	Aspirin + atorvastatin	2	3%
12	Diazepam + imipramine	2	3%

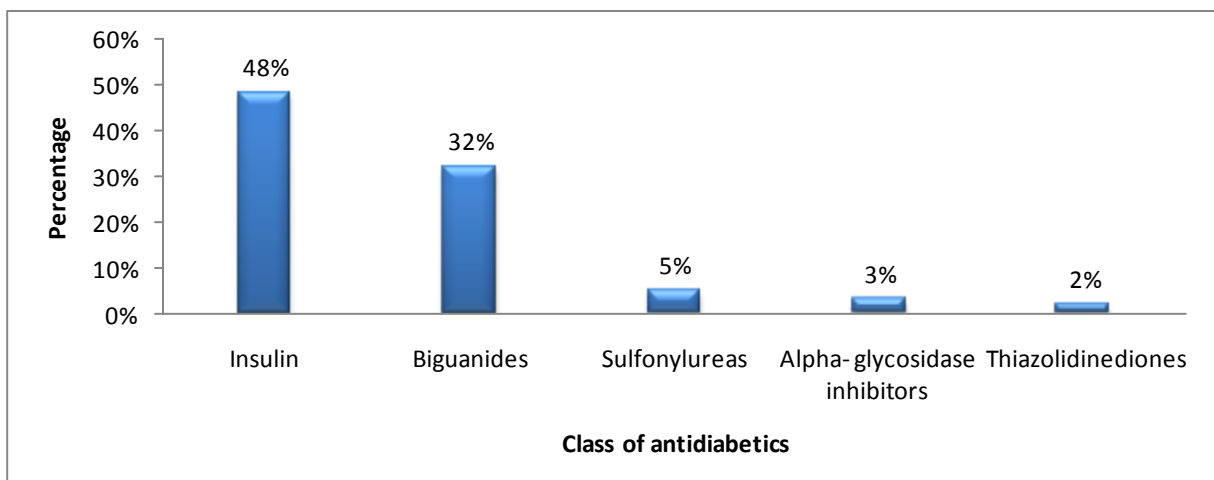


**Fig 9: Percentage of Commonly Prescribed Combination Drugs**

Tramadol + acetaminophen are the most frequently used combination drugs that present in the most of the prescriptions.

**Table 10: Most Frequently Prescribed Class of Antidiabetics**

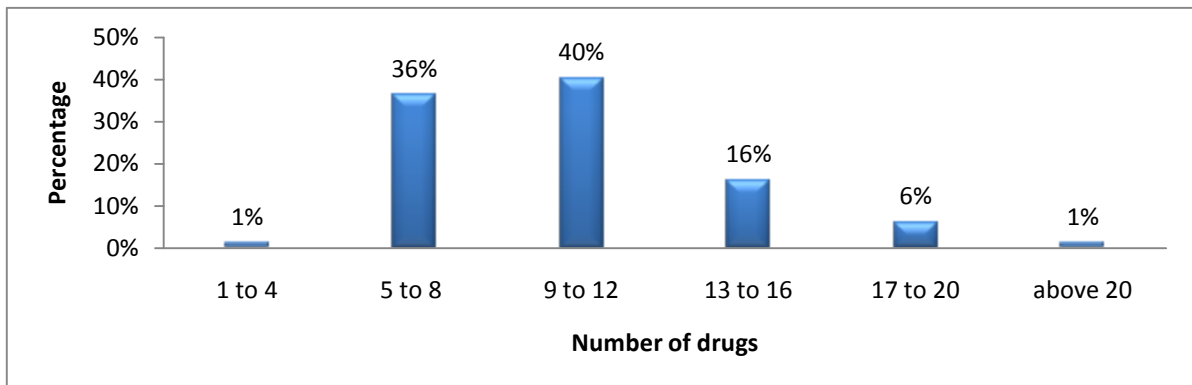
Sl. No	Class	No. of prescriptions	Percentage
1	Insulin	132	48%
2	Biguanides	88	32%
3	Sulfonylureas	42	5%
4	Alpha- glycosidase inhibitors	8	3%
5	Thiazolidinediones	6	2%



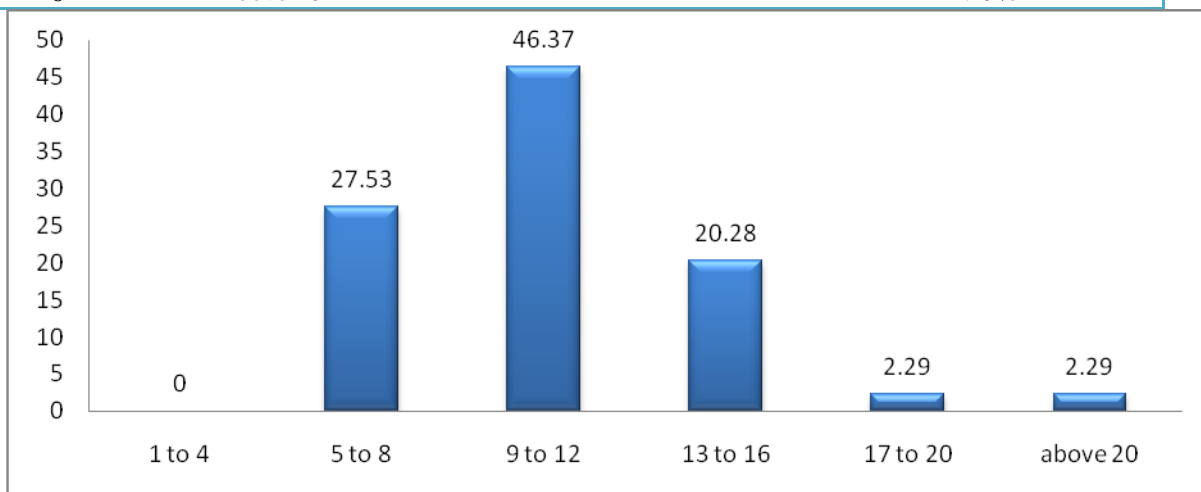
**Fig 10: Percentage of Most Frequently Prescribed Class of Antidiabetics**

**Table 11: No. of Drugs Prescribed Per Prescription**

S.No	No. of drugs	No. of prescriptions	Percentage
1	1 – 4	2	1%
2	5 – 8	53	36%
3	9 – 12	59	40%
4	13 – 16	24	16%
5	17 – 20	8	6%
6	Above 20	2	1%

**Fig 11: Percentage of Drugs Prescribed Per Prescription****Table 12: No. of Drugs in Prescriptions and Its Interactions**

S.No	No. of drugs	No. of Interactions	Percentage
1	1 – 4	Nil	0%
2	5 – 8	19	27.53%
3	9 – 12	32	46.37%
4	13 – 16	14	20.28%
5	17 – 20	2	2.29%
6	Above 20	2	2.29%

**Fig 12: Percentage of Drugs in Prescriptions and Its Interactions**

From the gathered data, the prescriptions containing 9-12 drugs had maximum no. of interactions (46.37%) and prescriptions containing 1-4 drugs had no interactions.



**Table 12: Drug -Drug Interaction and Its Effects**

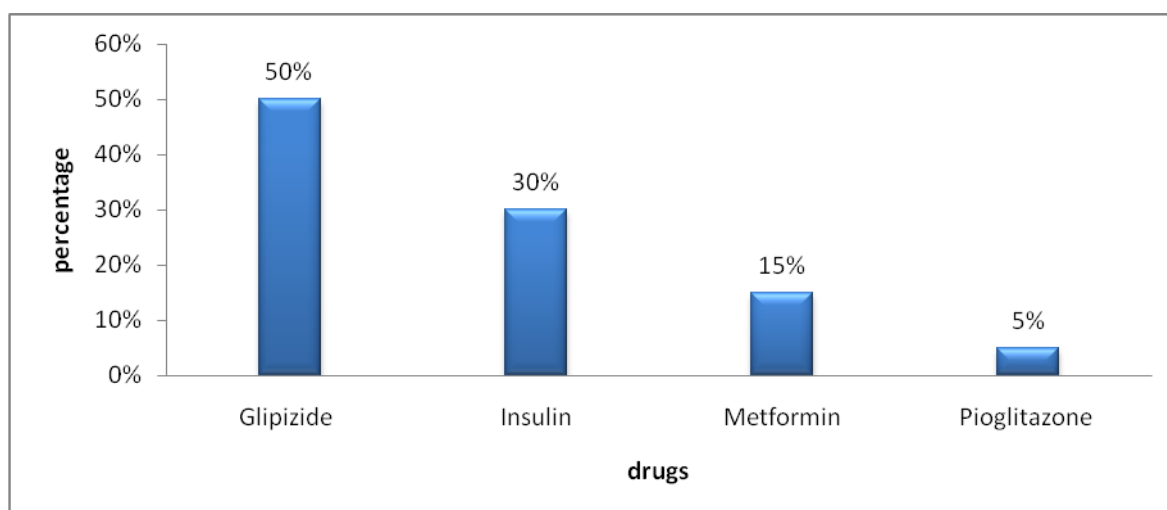
S.No	Interacting drug combinations	Effect	Type
1	Glipizide + Aspirin	Aspirin increase effect of glipizide	Unknown mechanism
2	Glipizide + Ibuprofen	Ibuprofen increase effect of glipizide	Pharmacodynamic Synergism
3	Glipizide + Enalapril	Enalapril increase effect of glipizide	Pharmacodynamic Synergism
4	Glipizide + Ciprofloxacin	Ciprofloxacin increase effect of glipizide	Pharmacodynamic synergism
5	Glipizide + Ranitidine	Ranitidine will increase the level if Glipizide by increasing gastric pH	Pharmacokinetic Antagonism
6	Glipizide + Linezolid	Linezolid increase the effect of Glipizide	Unknown mechanism
7	Glipizide + Levofloxacin	Levofloxacin increase the effect of Glipizide	Pharmacodynamic synergism
8	Glipizide + Famotidine	Famotidine will increase the level or effect of Glipizide by increasing the gastric pH	Pharmacokinetic Antagonism
9	Glipizide + Pantoprazole	Pan increase the level or effect of Glipizide by increasing the gastric pH	Pharmacokinetic Antagonism
10	Glipizide + Diclofenac	Diclofenac will increase the effect of Glipizide	Unknown mechanism
11	Insulin Regular Human + Ciprofloxacin	Ciprofloxacin increase effect of Insulin	Pharmacodynamic synergism
12	Insulin Regular Human + Pioglitazone	Insulin increases toxicity of Pioglitazone	Unknown mechanism
13	Insulin Regular Human + Levofloxacin	Levofloxacin increase the effect of Insulin	Pharmacodynamic synergism
14	Insulin Regular Human + Linezolid	Linezolid increase the effect of Insulin	Unknown mechanism
15	Insulin Regular Human + Ofloxacin	Ofloxacin increases effects of Insulin regular human	Pharmacodynamic synergism
16	Insulin Regular Human + Enalapril	Enalapril increases effects of Insulin	Pharmacodynamic synergism
17	Metformin + Levofloxacin	Levofloxacin increase the effect of Metformin	Pharmacodynamic synergism
18	Metformin + Nifedipine	Nifedipine may increase plasma concentrate of Metformin	Pharmacokinetic Antagonism
19	Metformin + Ciprofloxacin	Ciprofloxacin increase effect of Metformin	Pharmacodynamic synergism
20	Pioglitazone + Ciprofloxacin	Ciprofloxacin increases effects of Pioglitazone	Pharmacodynamic synergism

These Antidiabetic agents are having the interactions with Anti platelet drugs , Analgesics drugs, Antihypertensive drugs , H<sup>2</sup> receptor blockers, Quinolones, Protein pump inhibitors,

Antimicrobial drugs and its interaction effects where shown in the above table.

**Table 13: Number of Drugs Interacting With Each Antidiabetic Drug**

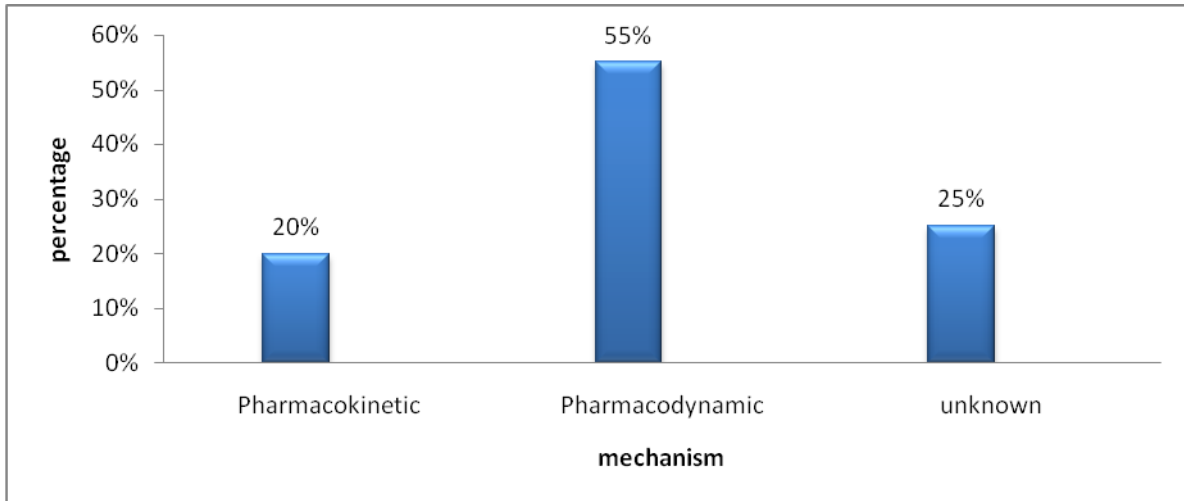
S.No	Drug	Class	Interacting drugs	No. of drugs	Percentage
1	Glipizide	Sulfonylurea	Aspirin Ibuprofen Enalapril Ciprofloxacin Ranitidine Linezolid Levofloxacin Famotidine Pantaprazole Diclofenac	10	50%
2	Insulin Regular Human	Short acting insulin	Enalapril Pioglitazone Levofloxacin Ofloxacin Ciprofloxacin Linezolid	6	30%
3	Metformin	Biguanides	Levofloxacin Nifedipine Ciprofloxacin	3	15%
4	Pioglitazone	Thiazolidinediones	Ciprofloxacin	1	5%



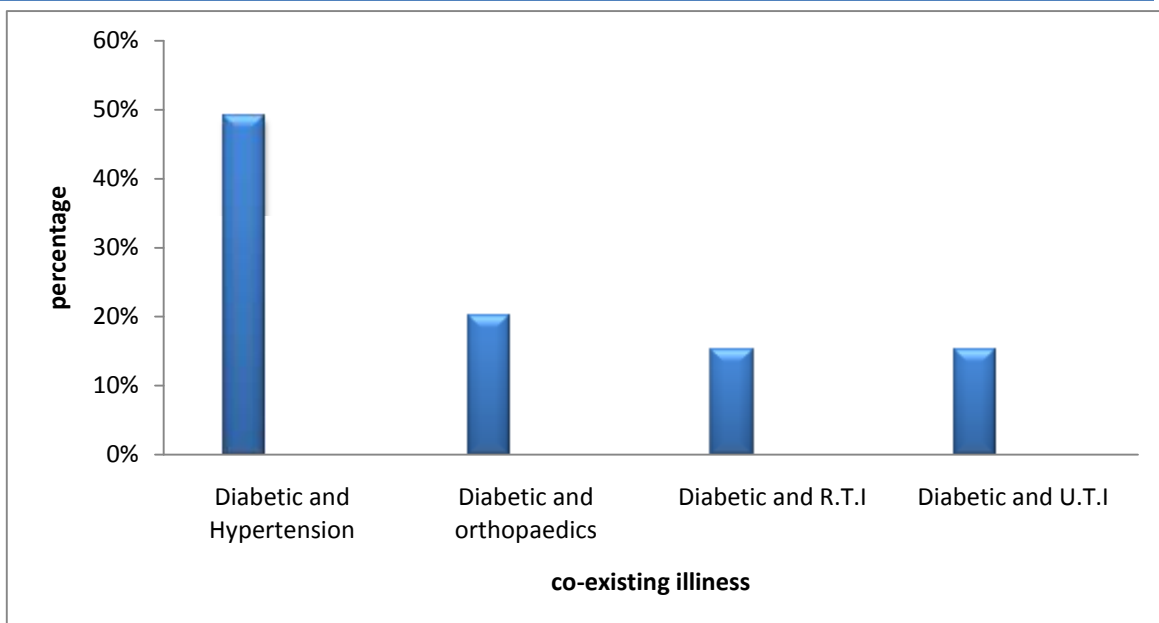
**Fig13: No. of Drugs Interacting with Each Antidiabetic Drug**

**Table 14: Mechanism of Potential Drug Interactions**

Mechanism	Number of drugs	Percentage
Pharmacokinetic	4	20%
Pharmacodynamic	11	55%
Unknown	5	25%

**Fig 14: Percentage of Potential Drug Interactions****Table 15: No. of Co-Existing Illness**

Sl. No	Disease	No. of cases
1	Hypertension	49
2	Orthopaedics	20
3	Respiratory tract infection	15
4	Urinary tract infection	15

**Fig 15: Percentage of Co-Existing Illness**

**CONCLUSION**

A total of 148 prescriptions were collected and analysed for drug-drug interactions. The obtained data were cross referenced to each other getting the maximum data. The 148 cases were classified according to gender wise and from these 83 male patients and 56 female patients were found. These 148 cases are then classified according to age wise and the maximum number of patients coming under the age group of 41-60. Then the cases were classified according to the number of drugs prescribed per prescriptions, in that the cases in which 8-12 drugs are prescribed had found to have maximum number of drug interactions.

Total number of drugs prescribed in 148 prescriptions is 204 in that 76 drugs are prescribed in generic names and 128 drugs are prescribed in brand names. The most commonly prescribed antidiabetic drugs in 148 prescriptions are metformin, insulin and glibenclamide. Commonly prescribed combinations of drugs in prescriptions are Tramadol+acetaminophen,

Cefoperazone+Salbactam, Ibuprofen+Paracetamol, From the total 148 prescriptions 69 prescriptions are showing drug-drug interactions in that 40 were male patients and 29 were female patients, in that Glipizide is interacting with 10 drugs, Insulin is interacting with 6 drugs, metformin is interacting with 3 drugs and Pioglitazone is interacting with 1 drug.

Those 69 drug interaction cases were individually again studied and found there were 20 different drug combinations causing interactions. These combinations were made by 20 individual drugs. Some drugs were interacting with more than one drug in the list, out of all antidiabetic agents glipizide is interacting with maximum number of drugs.

Among the above study it may be concluded that total number of drug interactions were found to be 46.62% in 148 prescriptions, in that the significant interactions are found to be 37%.

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