

## A PROSPECTIVE STUDY ON DRUG UTILIZATION AND COST EFFECTIVENESS OF TREATMENTS IN DIABETES MELLITUS PATIENTS (INPATIENTS SETTING) IN TEACHING HOSPITAL OF MMIMSR

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### ABSTRACT

To study current treatment practice given by a group of physician according to demographic details and the patient's knowledge of correct/safe administration of the anti-diabetic drugs was determined under the consideration of percentage cost variation of the treatment. A Prospective observational study. A data Collection form was used to collect data of the patients' demographic details like sex, duration of diabetes, age, Co morbidity, prescribing pattern for anti-diabetic drugs and other drugs. The demographic characteristic of the study sample of (N=55) diabetic patients indicated that the male population were found to be predominantly having diabetes (52.7%) (n=29). When compared to female population which is only (47.3%) (n=26. Study revealed that out of (n=55) patients, (n=37) patients were on Mono therapy (67.3%) followed by (n=11) patients were on double therapy (20%), (n=4) patients were on triple therapy (7.3%). The focus of this study was to evaluate physician prescribing pattern and patient utilization patterns associated with pharmacological management of diabetic patients with the help of studying prescriptions and interviewing the patients. This study was carried out with the objectives of computing the costs and percentage price variation among oral hypoglycemic agents across the different brands available in the Indian market. It is observed from our results that there is a wide (up to 836.20%) variation in prices of drugs manufactured by different pharmaceuticals.

## INTRODUCTION

The development of drug utilization research was sparked by initiatives taken in Northern Europe and the United Kingdom in the mid- 1960<sup>[1]</sup>. The pioneers of this research understood that a correct interpretation of data on drug utilization requires investigations at the patient level. Diabetes mellitus (madhumeha) has been known since ages and the sweetness of diabetic urine has been mentioned in Ayurveda by Sushruta. Since DM is metabolic disorder characterized by hyperglycemia, glycosuria, hyperlipemia, negative nitrogen balance and sometimes ketonemia

### MAJOR RISK FACTORS IN TYPE 2 DM:

1. Age > 45 years,
2. Race/ethnicity (as south Asian, Asian American, Hispanics etc.),
3. Obesity (i.e., >20 % of one's desired body weight),
4. Family history of DM (i.e., parents or siblings with DM),
5. Sedentary life styles,
6. H/o GDM or delivery of baby weighing > 4.5kg,
7. Polycystic ovarian syndrome.

### PHARMACOLOGICAL TREATMENT:

The treatment of patients with type 1 DM (approximately 10 % of all patients with DM) is exogenous insulin to achieve glycemic control, reduce the risk of diabetic ketoacidosis (DKA), and sustain life. The Diabetes Control and Complications Trial (DCCT) has shown that tight control of fasting blood glucose levels (i.e., 100–120 mg/dl) in type 1 DM clearly decreases the incidence of micro- and macro vascular complications. Unfortunately, tight control (FPG < 120 mg/dl) also increases the frequency of hypoglycemic episodes in type 1 DM.

Following oral Antidiabetic agents are used for the treatment of patients with type 2 DM.

### INSULIN THERAPY:

Patients with type I diabetes mellitus depend on external insulin (most commonly injected subcutaneously) for their survival because the hormone is no longer produced internally. Patients with type II diabetes mellitus are insulin resistant, have relatively low insulin production, or both; certain patients with Type II diabetes may eventually require insulin if other medications fail to control blood glucose levels adequately.

- Rapid-acting insulin, which starts working within a few minutes and lasts for a couple of hours.
- Regular- or short-acting insulin, which takes about 30 minutes to work and lasts for 3 to 6 hours.
- Intermediate-acting insulin, which takes 2 to 4 hours to work and its effects can last for up to 18 hours.
- Long-acting insulin, which takes 6 to 10 hours to reach the blood stream, but it can keep working for an entire day.

Insulin for diabetes can be injected under the skin (subcutaneously) or into the vein (intravenously) <sup>[2]</sup>.

- a. Stimulators of insulin release by  $\beta$  cells, e. g., sulfonylureas, meglitinides.
- b. Inhibitors of hepatic gluconeogenesis e.g., biguanides.
- c. Inhibitors of intestinal  $\alpha$  glucosidases e.g. acarbose and meglitol and
- d. Drugs which reduces insulin resistance e. g. glitazones <sup>[3]</sup>.

Further these patients are treated with insulin injection as and when indicated. Diet and exercise also play an important role in the treatment of DM. Very mild cases of type 2 DM may be controlled with diet and exercise only.

Medicines are part of our everyday lives. But how many drugs do people take and what sort, how much do they cost, and who influences the way they are prescribed and the way they are actually taken? The surprising answer is that we still do not know as much as we should. Further a serious problem confronting the medical profession today is the lack of updating their knowledge about existing and new drugs and their effects on patients and there is a need of initiative step in this direction. Various prescription errors are result of in effective use of these inputs and are very common in clinical practice.

However the continuous monitoring of prescription and drug utilization studies may help to identify the problems involved in therapeutic decision and promotes the rational prescribing. Hence the assessment of the drug utilization is important for clinical, educational and Pharmacoeconomic purposes. Monitoring of prescription and study of drug utilization could identify the associated problems and provide feedback to the prescriber so as to create awareness for the rational use of drugs.

A survey depicts that 4 % of adults in India suffer from DM in the year 2000 and it is expected to increase to 6 % by the year

2025. With a reported burden of 32 -35 million diabetics in India, a methodical drug utilization study is necessary. Hence work of this type provides a powerful exploratory tool to documents the role of drugs in society and thereby to create a sound socio-medical and health economic basis for regulatory and other policy decision. So the primary purpose of Drug Utilization Review is to evaluate drug prescription on the basis of what we know about drug.

## RESEARCH METHODOLOGY

### Study design:

The present study is a prospective observational study which was attempted to find out the frequently prescribed drugs by the physician in diabetic patient.

### Place of study:

Maharishi Markandeshwar Institute of Medical Science and Research hospital (MMIMSR)

MMIMSR is a multi-specialty teaching hospital Mullana, (Ambala). It is an 850-bedded hospital.

### Study population:

In the present study, all type of patients from both genders aging from 1 to 70 years with type 1 and type 2 diabetes (with or without co-morbid condition) were studied.

### Study period:

Study period was 6 months (Commencing from September 2015 to March 2016).

### Sample size:

In the present Study, Sample size was (N=50) of DM TYPE 1 & DM TYPE 2 inpatients respectively, that were observed in the hospital.

### Inclusion criteria:

The patients should be:

- Proven diabetic.
- Patients of both gender
- Patients who were admitted to the MMIMSR Hospital.

### Exclusion criteria:

Patients with the following were excluded from the study:

- All psychiatrically ill patients or unable to communicate verbally.
- Gestational diabetic patients.
- Patients having DM Type1 and DM Type2 More than 5 years.
- Patients not ready to give informed consent.

## RESULTS

The demographic characteristic of the study sample of (N=55) diabetic patients indicated that the male population were found to be predominantly having diabetes (52.7%) (n=29). When compared to female population which is only (47.3%) (n=26).

Out of this Type1 DM and Type2 DM patients found 89.1% (n=89) and 11% (n=6) respectively. The result showed that more number of patients were between 40 –60 years, followed by number of patients under 69.1% (n=38). The most predominant age group was found to be 51-60 yrs. (20%) (n=11). The duration of diabetes were found to be 4-5yrs (n=16) 29.1%.

- On the basis of data collection in prospective study following result were made family history is considered as one of the genetic factors in development of DM. Data collected regarding presence of family history of DM revealed that 61.8% (n=34) of the patients had positive family history.
- The result showed that smoking habit and alcohol habit 34.5% (n=19) and 36.8% (n=20) respectively.
- We found that the majority of patients who were illiterate or literate 36.3% (n=20) and 63.6% (n=35).
- The findings show that out of 55 patients 63.6 % (n=35) had sufficient knowledge on importance of doing exercises while 14.5% (n=8) did not have sufficient knowledge on the importance of doing exercises for diabetic patients.
- The result showed that 38.2% (n=24) maintain their food habit and 56.4%

(n=31) not maintain food habit. The awareness about site of insulin injection administration and storage conditions of insulin were also assessed and results reveals 83.6% (n=46) knew about insulin injection site and 56.4% (n=31) knew about storage conditions.

- This study showed that 9.1% (n=5) of diabetic patients had good individual knowledge of their anti- diabetic medication. It was also observed that 63.6% (n=35) and 27.3% (n=15) of the participants had average and poor individual knowledge respectively.

As for diabetic related approximately 45.2% and 18.2% of patients knew none of the early and late complications of diabetes. One of the early complications of diabetes is hyperglycemia and 94.5 % (n=52) of patients knew about it. 89.1% (n=49) patients does not know cardiovascular complications as a late complication. The co-morbidities were found to be hypertension, COPD, neuropathy, UTI, asthma, ALD, CKD, hepatitis, tuberculosis, arthritis, anemia, neuropathy, retinopathy, and CAD 40%, 7.3%, 14.5%, 7.3%, 1.8%, 7.3%, 16.4%, 3.6%, 7.3%, 5.4%, 3.6%, 7.3%, 1.8%, and 3.6% respectively. (n=50).

The most prescribed drug was insulin alone or in combination with metformin and insulin with metformin with glimepiride 65.4% (n=36) and 13.4% (n=9) respectively. Study revealed that out of (n=55) patients, (n=37) patients were on Mono therapy (67.3%) followed by (n=11) patients were on double therapy (20%), (n=4) patients were on triple therapy (7.3%).

### Single drug therapy

In single drug therapy, Table shows the price variation between sulfonylurea groups of drugs. In this group, Glimepiride (2 mg) shows maximum price variation of 836.2%, while Glipizide (10mg) shows variation of 38.88%. The price variation in Biguanides (Metformin) & Thiazolidinedione's (Pioglitazones) groups of drugs. In these groups, Metformin (500 mg) & Pioglitazone (15 mg) show maximum price variation of 308.33% & 542% respectively and price variation between  $\alpha$ -glucosidases inhibitor group of drugs. In this group, Miglitol shows maximum price variation of 135.50%. Table 32 shows the price variation between Meglitinides group of drugs. In this group, Rapaglinide (0.5 mg) shows maximum price variation of 90.95%.

### Combination therapy

In Combination therapy, total seven combination therapies were analyzed. Out of

which Glipizide & Metformin combination shows the maximum variation up to 399.04%.

### Relationship between %age price variation & no. of manufacturing companies

When we draw a graph showing relationship between manufacturing companies and % price variation, it was noted that there is a linear relationship in between these two variables. As the no. of manufacturing companies increases, the percent price variation also increases.

## DISCUSSION AND CONCLUSION

A Drug utilization study is considered to be one of the most effective methods to assess and evaluate the prescribing attitude of physician and help to promote rational use of drugs. The prescription ratio of Insulin injection and oral hypoglycemic agents was rational. The findings of the study suggest the need to increase the awareness of generic prescribing and prescribe from National list of Essential Medicines (NLEM).

This study showed that slightly half 67.3% (n=37) of diabetic patients had good individual knowledge of their anti-diabetic medication. It was also observed that 50.9%

(n=28) and 27.3% (n=15) of the participants had average and poor individual knowledge respectively (Table 3). Patients' knowledge of anti-diabetic medication in this study comprised of five components that is being able to provide the drug name, drug administration and purpose of medication, storage of medication and dose of prescribed medication. Metformin and sulphonyl ureas have same glycemic control and lipid profile but metformin has an improved BMI when compared to them.

We found that 83.6% (n=46) out of the 55 sampled diabetic patient's did not store their anti-diabetic medication correctly, while in a study done in India (Ramesh et al, 2011), from the 300 sampled patient's in the study 21% did not know the storage conditions of insulin.

It was observed that 67.3% (n=37) of the patient's knew the correct administration of their anti-diabetic medication. In the current study administration of anti-diabetic medication comprised of knowledge of administration with regards to food for all the anti-diabetic medication and in addition knowledge of site of administration with regards to insulin, while the 62% of the patient's that were aware of the administration of their medicines. Knowledge deficit emphasizes the need for

diabetes education program which is essential in improving patient's knowledge of their anti-diabetic medication which is one of a key component of diabetes management and improvement of quality of life.

The focus of this study was to evaluate physician prescribing pattern and patient utilization patterns associated with pharmacological management of diabetic patients with the help of studying prescriptions and interviewing the patients. Unlike clinical trials that typically address issues related to safety and efficacy, this study attempted to provide data on utilization behavior associated with antidiabetic agents.

#### **Cost Assessment**

This study was carried out with the objectives of computing the costs and percentage price variation among oral hypoglycemic agents across the different brands available in the Indian market. Drug prices were captured from CIMS and IDR because these are regularly updated. Selection of cost effective brand will improve the compliance and the consequence of the treatment. It is observed from our results that there is a wide (up to 836.20%) variation in prices of drugs manufactured by different pharmaceutical



Companies.

The reasons for this price variation could be as follows:

1. The existing market structure of the pharmaceutical industry.
2. Industry costs.
3. Government regulations and pricing policies.

From our study it is also clear that, price variation was directly related to the number of companies manufacturing a particular drug. So it can be concluded that the price variation increases because of the increase in competition among the manufacturing companies. Pharmacists do not dispense the same brand as prescribed by the doctor and try to substitute it with other alternatives, quoting the reason of non-availability. This is often done with vested interest for economic gains as some brands have a higher profit margin.

It is felt that physicians could provide better services and reduce costs of drugs if information about drug prices was readily available. Studies have shown that providing a manual of comparative drug prices annotated with prescribing advice to physicians reduced their patients' drug expense. Due to the long term treatment duration, diabetes patients usually have higher than average monthly out-of-pocket

expenses and high out-of-pocket expenses can be a barrier to adherence to prescription drug regimens. Many chronically ill adults cut back on medications due to high prescription cost. Inadequate prescription coverage and out of pocket expenses is one of the strongest predictors of their medication adherence problems. In the absence of information on comparative drug prices and quality, it is difficult for doctors to prescribe the most economical prescription.

Most people cut their doses because the treatment is proven to be out of pocket expense for them. Physician has knowledge about that brand only they are prescribing. They don't have any information about other brands and this existence of wide variation in prices. Government should take some step in order to regulate and to bring uniformity in price. So that it can be affordable by a common man which will ultimately improve the compliance and reduce the economic burden.

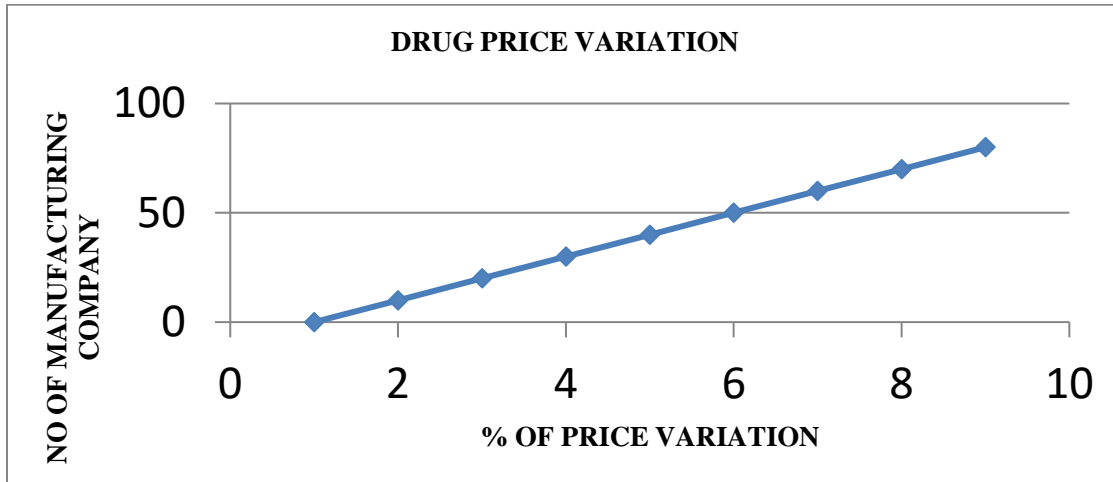
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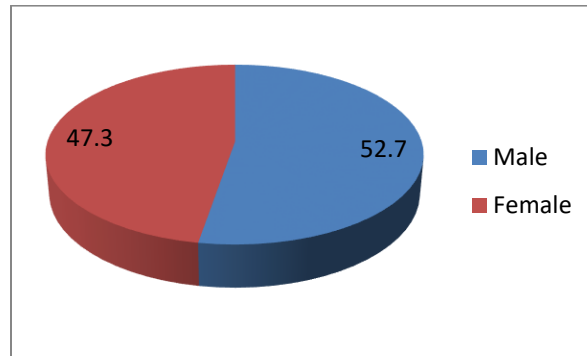
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**EXPERIMENTAL TABLES AND FIGURES**



**TABLE 1: DIABETES DISTRIBUTION PROFILE ON GENDER.**

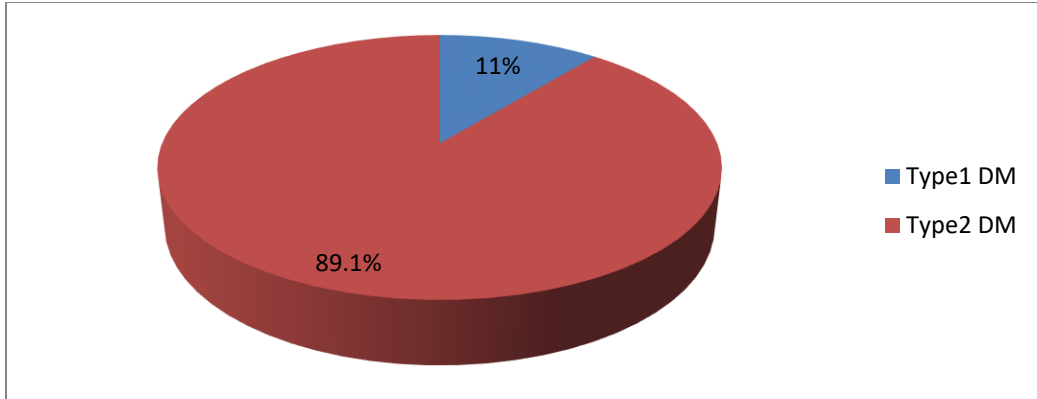
S. NO.	GENDER	NO. OF PATIENTS	PERCENTAGE
1.	Male	29	52.7%
2.	Female	26	47.3%
3.	Total	55	100%



**FIGURE1: DIABETES DISTRIBUTION PROFILE ON GENDER**

**TABLE 2: DISTRIBUTION OF DIABETIC PATIENT’S BASED ON TYPES OF DIABETIES.**

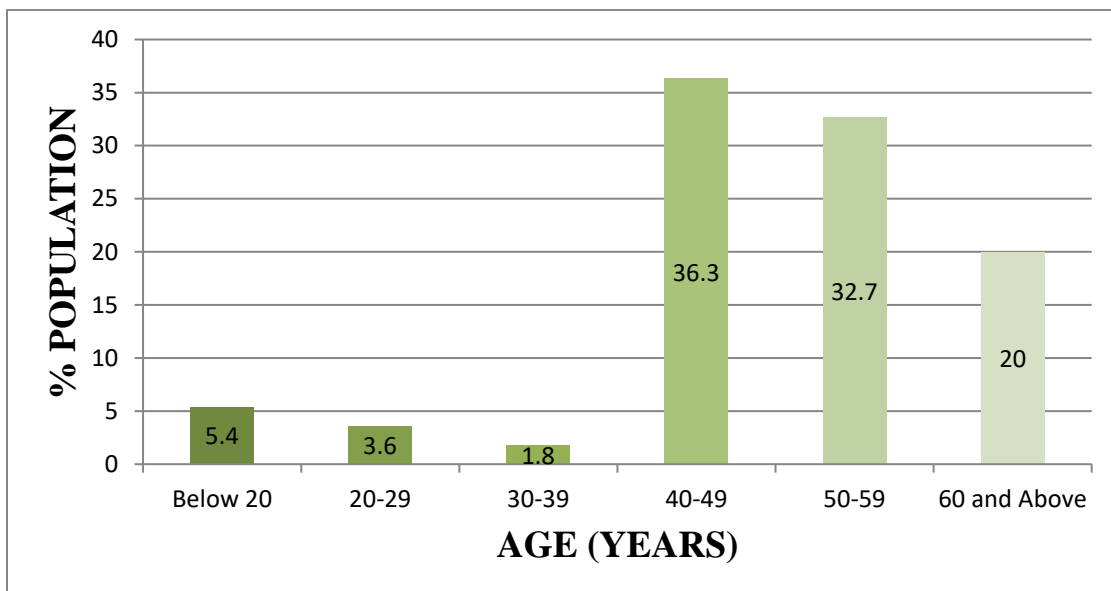
S.NO.	Types	Total	Percentage
1.	Type 1 DM	6	11%
2.	Type 2 DM	49	89.1%



**FIGURE 2: DISTRIBUTION OF DIABETIC PATIENTS BASED ON TYPES OF DIABETIES**

**TABLE 3: DIABETIC PATIENTS DISTRIBUTION PROFILE BASED ON AGE.**

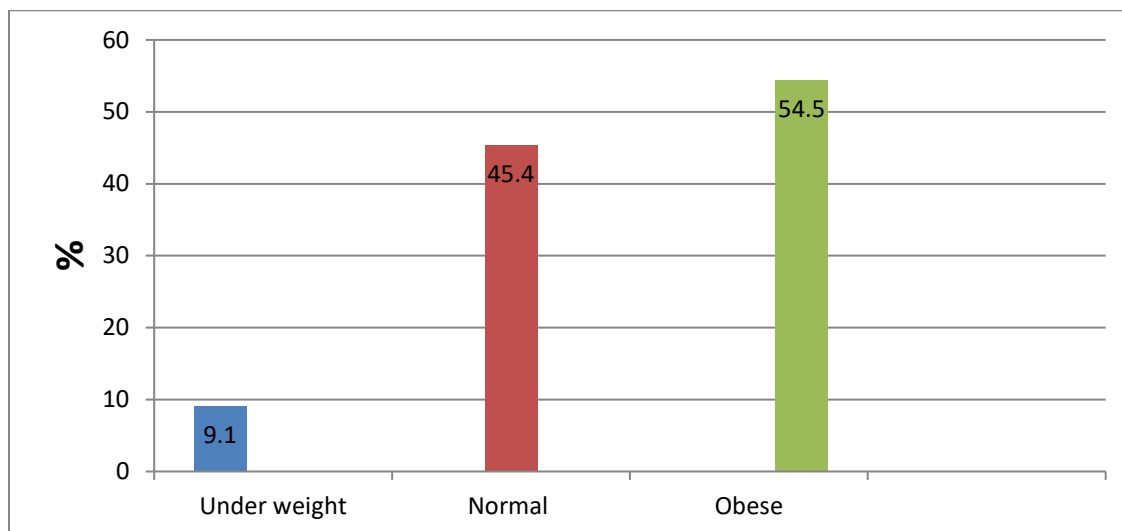
S.NO.	AGE	NO. OF PATIENTS	PERCENTAGE
1.	Below 20	3	5.4%
2.	20-29	2	3.6%
3.	30-39	1	1.8%
4.	40-49	20	36.3%
5.	50-59	18	32.7%
6.	60 and Above	11	20%



**FIGURE 3: DIABETIC PATIENTS DISTRIBUTION PROFILE ON AGE.**

**TABLE4: DISTRIBUTION OF DM PATIENTS BASED ON BODY WEIGHT.**

S. NO	BODY WEIGHT	NO. OF PATIENTS	PERCENTAGE
1.	Under weight	5	9.1%
2.	Normal	25	45.4%
3.	Obese	30	54.5%



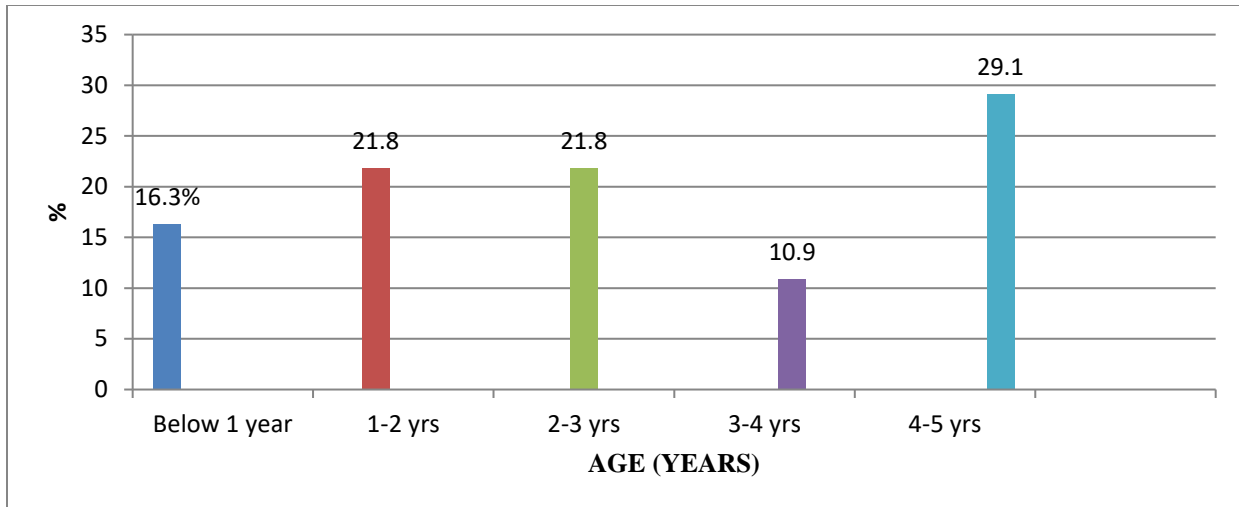
**FIGURE 4: DISTRIBUTION OF DM PATIENTS BASED ON BODY WEIGHT**

**TABLE 5: DURATION OF DIABETES PATIENTS.**

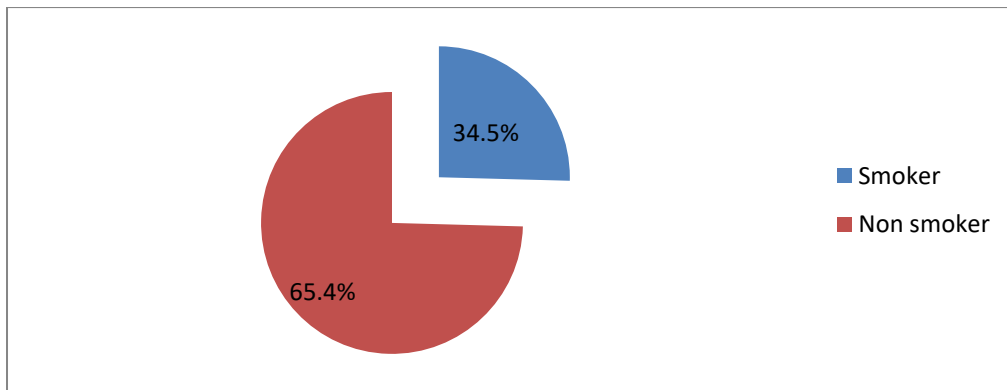
S. NO.	DURATION OF DIABETES	FREQUENCY	PERCENTAGE
1.	<1 yrs	9	16.4%
2.	1-2yrs	12	21.8%
3.	2-3 yrs	12	21.8%
4.	3-4 yrs	6	10.9%
5.	4-5 yrs	16	29.1%

**TABLE 6: DISTRIBUTION OF THE PATIENTS BASED ON SMOKING HABIT.**

S.NO.	TYPES	FREQUENCY	PERCENTAGE
1.	Smoker	19	34.5%
2.	Non-Smoker	36	65.4%



**FIGURE 5: DURATION OF DIABETES PATIENTS**



**FIGURE 6: DISTRIBUTION OF THE PATIENTS BASED ON SMOKING HABIT**

**TABLE 7: DISTRIBUTION OF THE PATIENTS BASED ON LITERACY.**

S. NO.	NO. OF PATIENTS	FREQUENCY	PERCENTAGE
1.	Literate	20	36.3%
2.	Illiterates	35	63.6%

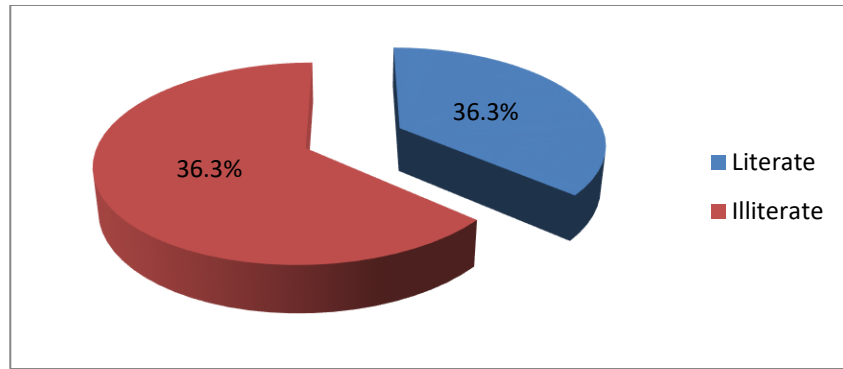


FIGURE 7: DISTRIBUTION OF THE PATIENTS BASED ON LITERACY

TABLE 8: DISTRIBUTION BASED ON DOING EXERCISE.

S.NO.	TYPES OF EXERCISE	FREQUENCY	PERCENTAGE
1.	Walking	35	63.6%
2.	Other Exercise	12	21.2%
3.	Exercise (Not Doing)	8	14.5%

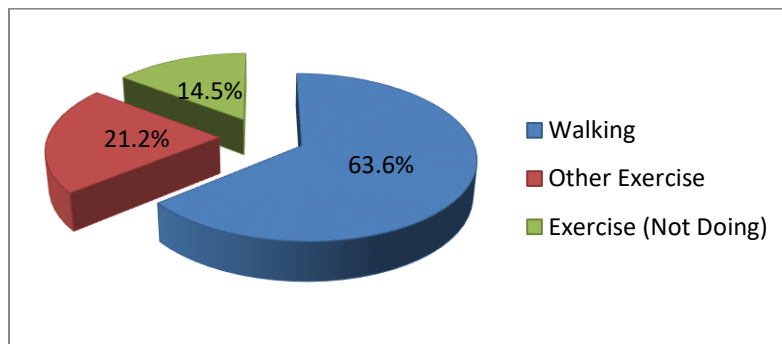


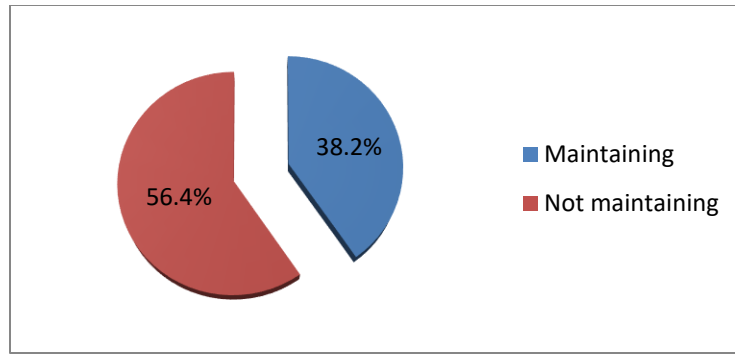
FIGURE 8: DISTRIBUTION BASED ON DOING EXERCISE.

TABLE 9: DISTRIBUTION OF DIABETIC PATIENTS BASED ON INSULIN INJECTION ADMINISTRATION AND STORAGE CONDITIONS OF INSULIN.

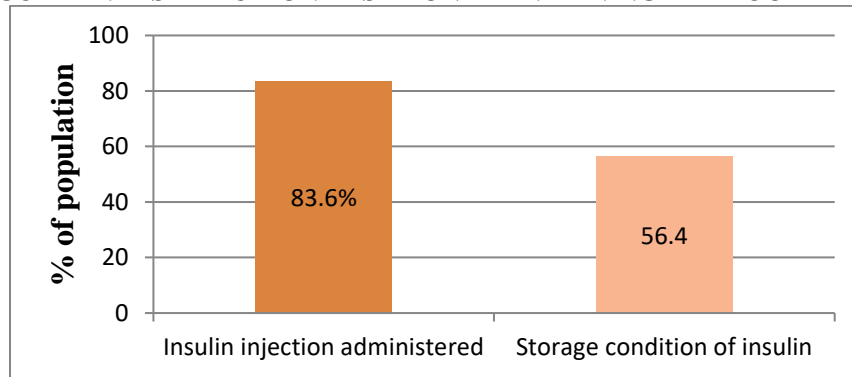
S. NO	NO. OF PATIENTS	FREQUENCY	PERCENTAGE
1.	Insulin inj. Administered	46	83.6%
2.	Storage condition of Insulin	31	56.4%

TABLE 10: DISTRIBUTION BASED ON MAINTAINING THE FOOD HABIT.

S.NO.	TYPES	FREQUENCY	PERCENTAGE
1.	Maintaining (Food habit)	24	38.2%
2.	Not maintaining (Food habit)	31	56.4%



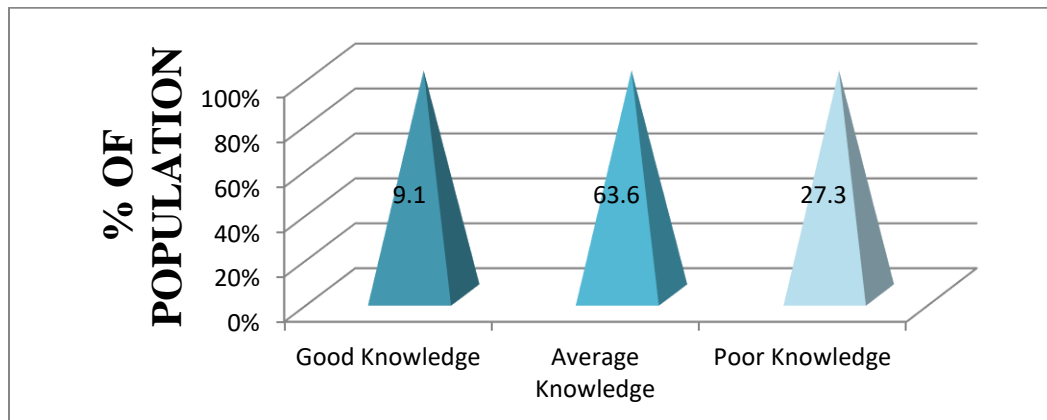
**FIGURE 11: DISTRIBUTION BASED ON MAINTAINING THE FOOD HABIT.**



**FIGURE 12: DISTRIBUTION OF DIABETIC PATIENTS BASED ON INSULIN INJECTION ADMINISTRATION AND STORAGE CONDITIONS OF INSULIN.**

**TABLE 11: PATIENTS INDIVIDUAL KNOWLEDGE OF ANTI-DIABETIC MEDICATION.**

S. NO	KNOWLEDGE OF DIABETES MEDICATION	FREQUENCY	PERCENTAGE
1.	Good knowledge	5	9.1%
2.	Average knowledge	35	63.6%
3.	Poor knowledge	15	27.3%

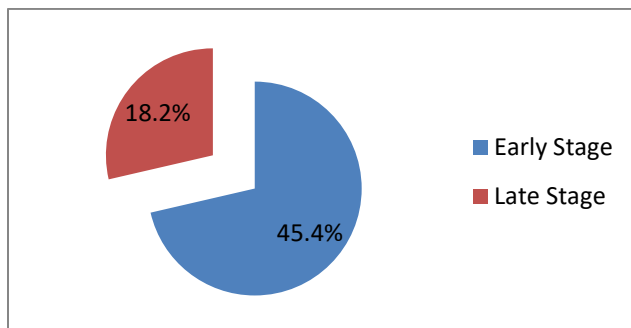


**FIGURE 13: PATIENTS INDIVIDUAL KNOWLEDGE OF ANTI-DIABETIC MEDICATION.**



**TABLE 12: DISTRIBUTION OF PATIENTS BASED ON COMPLICATION OF DM.**

S. NO.	DM COMPLICATION	NO. OF PATIENTS	PERCENTAGE
1	Early Stage	25	45.4%
2	Late Stage	10	18.2%



**FIGURE 14: DISTRIBUTION OF PATIENTS BASED ON COMPLICATION OF DM.**

**TABLE 13: DISTRIBUTION BASED ON CO-MORBID CONDITION WITH DM.**

S. NO	CO-MORBID CONDITION WITH DM	TOTAL NO. OF PATIENTS	PERCENTAGE
1.	Hypertension	22	40%
2.	COPD	4	7.3%
3.	Neuropathy	8	14.5%
4.	UTI	4	7.3%
5.	Asthma	1	1.8%
6.	ALD	4	7.3%
7.	CKD	9	16.4%
8.	Hepatitis	2	3.6%
9.	Tuberculosis	4	7.3%
10.	Arthritis	3	5.4%
11.	Anemia	2	3.6%
12.	Nephropathy	4	7.3%
13.	Retinopathy	1	1.8%
14.	CAD	2	3.6%

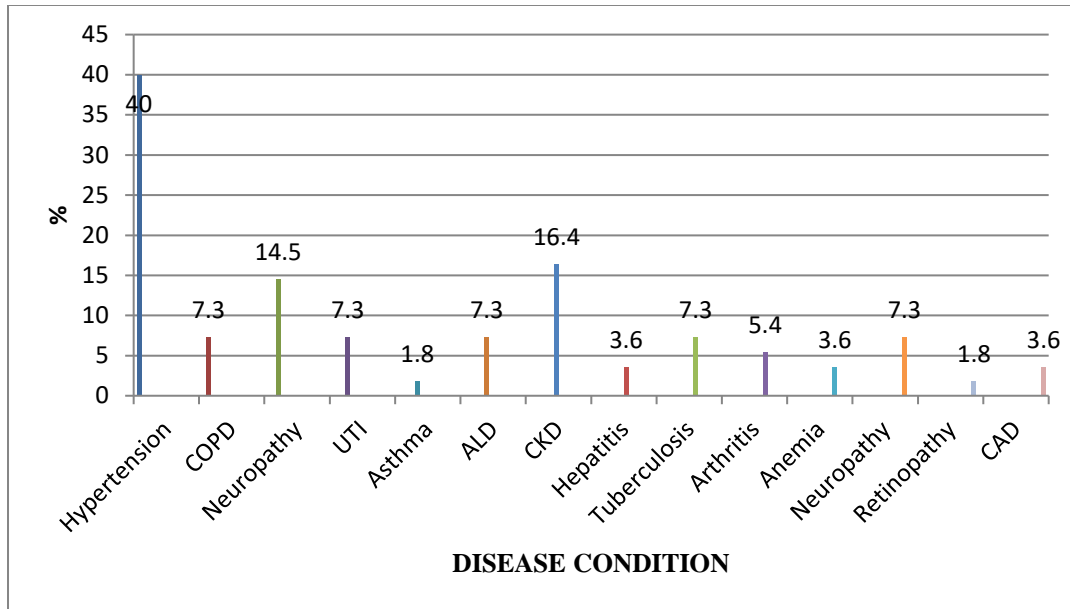


FIGURE 15: DISTRIBUTION BASED ON CO-MORBID CONDITION WITH DM

TABLE 14: VARIOUS ANTIDIABETIC AGENTS USED IN PROSPECTIVE DATA ANALYSIS.

S.NO.	NAME OF DRUG	FREQUENCY	PERCENTAGE
1.	Insulin	36	65.4%
2.	Metformin	1	1.8%
3.	Glimepiride	4	7.3%
4.	Insulin+ Metformin	9	13.4%
5.	Insulin+ Metformin+ Glimepiride	4	7.3%

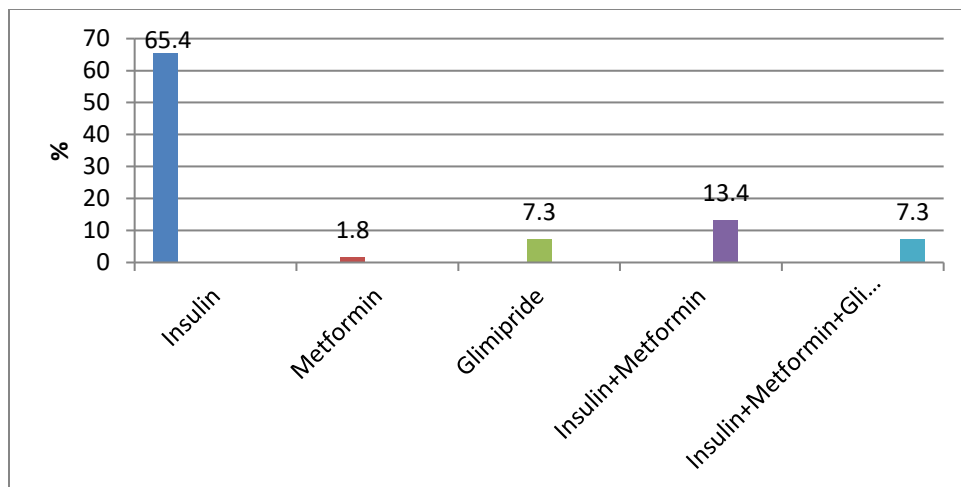
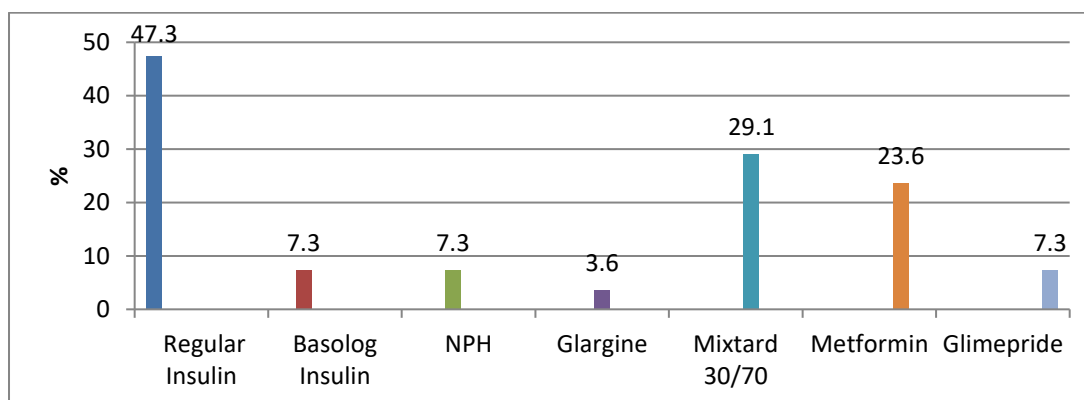


FIGURE 16: VARIOUS ANTIDIABETIC AGENTS USED IN PROSPECTIVE DATA ANALYSIS

**TABLE 15: MOSTLY PRESCRIBED DRUGS AMONG DIABETIC PATIENTS.**

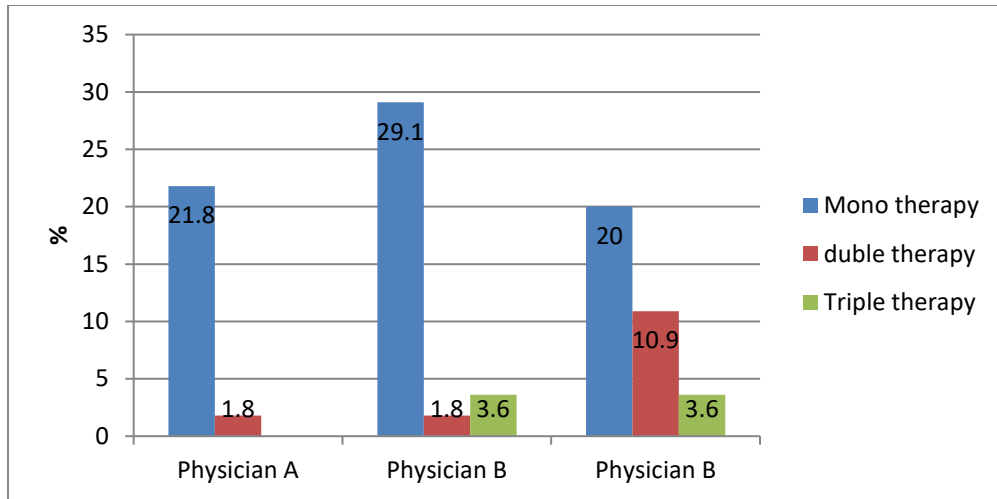
S. NO.	DRUGS	NO. OF PATIENTS	PERCENTAGE
1.	Short Acting Insulin	27	47.3%
	Regular Insulin		
2.	Rapid Acting Insulin	4	7.3%
	Basolog (Lispro Insulin)		
3.	Intermediate Acting Insulin	4	7.3%
	Nph		
4.	Long Acting Insulin	2	3.6%
	Glargine		
	Mixtard(30/70)	16	29.1%
5.	Bigunide	13	23.6%
	Metformin		
6.	Sufonulurea	4	7.3%
	Glimepride		



**FIGURE 17: MOSTLY PRESCRIBED DRUGS AMONG DIABETIC PATIENTS**

**TABLE 16: DISTRIBUTION OF THERAPY BASED ON DIFFERENT PHYSICIAN.**

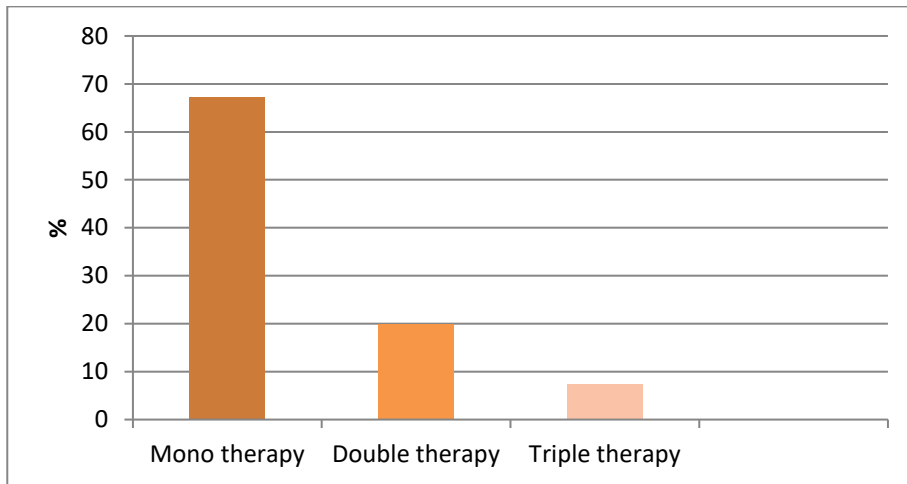
PHYSICIAN	DRUG THERAPY	TOTAL NO. OF PATIENTS	PERCENTAGE
A	Mono therapy	12	21.8%
	Double therapy	1	1.8%
	Triple therapy		
B	Mono therapy	16	29.1%
	Double therapy	1	1.8%
	Triple therapy	2	3.6%
C	Mono therapy	11	20%
	Double therapy	6	10.9%
	Triple therapy	2	3.6%



**FIGURE 18: DISTRIBUTION OF THERAPY BASED ON DIFFERENT PHYSICIAN.**

**TABLE 17: ANALYSIS OF TREATMENT THERAPY OF DIABETES.**

S. NO.	DRUG THERAPY	NO. OF PATIENT	PERCENTAGE
1.	Mono therapy	37	67.3%
2.	Double therapy	11	20%
3.	Triple therapy	4	7.3%



**FIGURE 19: ANALYSIS OF TREATMENT THERAPY OF DIABETES**

**REFERENCE STANDARD OF COST ANALYSIS FOR COMMONLY USED:  
TABLE 18: REFERENCE STANDARD OF COST ANALYSIS FOR INSULIN COMMONLY USED**

<b>BRAND NAME</b>	<b>COST/ UNIT RS.</b>
<b>Regular Insulin</b>	
Human Actrapid	0.49
Insuman rapid	0.41
Human fastact	0.49
Humanmonotard	0.49
Wosulin R	0.32
<b>Biphasic Insulin</b>	
Human mixtard	0.49
Huminsulin 30:70	0.36
Huminsulin 50:50	0.36
Human Rapimix	0.47
Insuman 50:50	0.41
Lentisulin HP1 (Pork insulin)	0.27
<b>Insulin Analogues</b>	
Novomix 30	1.75
Novorapid	1.75
Humalog	1.02

**TABLE 19: REFERENCE STANDARD OF COST ANALYSIS FOR METFORMIN.**

<b>BRAND NAME</b>	<b>COST/ STRIP OF 10 TAB RS.</b>	
	<b>STRENGTH.</b>	<b>RS</b>
Glycomet	500mg	12.22
	850mg	16.44
	1gm	18.20
Glycephage	250mg	5.90
	500mg	17.94
	850mg	14.04
	1gm SR	29.95
Bigomet	250mg	4.50
	500mg	7.10
	850mg	10.73
	1gm	17.60
<b>Melmet SR</b>	<b>500mg</b>	<b>19.00</b>
	<b>1gm</b>	<b>61.50</b>
<b>Dibeta SR</b>	<b>500Mg</b>	<b>17.41</b>
	1gm	33.60
<b>Janumet M</b>	<b>1gm</b>	<b>23.91</b>
<b>Exermet</b>	<b>500mg</b>	<b>81.50</b>
	<b>1gm</b>	<b>37.50</b>

**TABLE 20: REFERENCE STANDARD OF COST ANALYSIS FOR FIXED DOSE COMBINATIONS OF METFORMIN.**

BRAND NAME	COST/ STRIP OF 10 TAB RS.	
	STRENGTH.	RS
<b>Diabetrol</b>	<b>GB 5mg + M 500mg</b>	<b>19.43</b>
<b>Glycomet GP SR Exermet GM Forte</b>	GL 1mg + M 500mg	24.00
	<b>GL 2mg + M 1000mg</b>	<b>84.50</b>
<b>Glucord forte</b>	<b>GB 5mg + M 500mg</b>	<b>15.25</b>
Glycheck M & forte	GC 40mg + M 400mg	28.34
	GC 80mg + M 500mg	45.78
Exermet GM	GL 1mg + M 500mg	81.50
Metaglez forte	GP5mg + M500mg	7.56

**TABLE 21: REFERENCE STANDARD OF COST ANALYSIS FOR SULFONYLUREAS.**

BRAND NAME	COST/ STRIP OF 10 TAB RS.	
	STRENGTH.	RS
<b>Glibenclamide</b>		
Glybovin	1.25 mg	2.22
	2.25mg	2.92
	5mg	4.92
Euglucon	2.25mg	6.05
	5mg	8.80
Daonil	2.25mg	3.82
	5mg	9.15
Semidaonil	2.5mg	5.25
<b>Glipizide</b>		
Gliclaz	80mg	19.50
Glizide	40mg	17.65
	80mg	30.00
Diamicron	80mg	60.41
Reclide	80mg	60.61
<b>Glimepiride</b>		
Amaryl	1mg	63.15
	2mg	117.40
	3mg	125.00
Glimiprex	1mg	31.00
	2mg	36.00
Euglim	1mg	14.20
	2mg	33.20
Euglim	1mg	20.50
	2mg	36.00
	3mg	41.00
	4mg	48.00
Glimer	1mg	59.50
	2mg	115.50

TABLE 22: REFERENCE STANDARD OF COST ANALYSIS FOR THIAZOLIDINEDIONES.

BRAND NAME	COST/ STRIP OF 10 TAB RS.	
	STRENGTH.	RS
<b>Pioglitazone</b>		
Pioglit	15mg	18.00
	30mg	64.50
Piozit	15mg	35.00
	30mg	55.00
Pioglar	15mg	64.20
	30mg	98.23
Piomed	15mg	10.00
	30mg	18.00
<b>Rosiglitazone</b>		
Enselin	2mg	35.50
	4mg	59.50
	8mg	100.00
Rosinorm	2mg	36.00
	4mg	62.00
Result	2mg	40.00
	4mg	66.00
	8mg	100.00
Roglin	2mg	28.00
	4mg	55.00

TABLE 23: REFERENCE STANDARD OF COST ANALYSIS FOR MEGLITINIDES.

BRAND NAME	COST/ STRIP OF 10 TAB RS.	
	STRENGTH.	RS
<b>Repaglinide</b>		
Eurepa	0.5mg	38.00
	1mg	62.00
	2mg	98.00
<b>Nateglinide</b>		
NDS	60mg	45.00
	120mg	70.00
Roglin	2mg	28.00
	4mg	55.00

TABLE 24: REFERENCE STANDARD OF COST ANALYSIS FOR ACARBOSE

Brand Name	Cost/ Strip of 10 tab Rs.	
	Strength.	Rs
Glucobay	25mg	42.00
	50mg	88.00
Glucose	50mg	67.0
Abacus	50mg	65.00



The percentage variation in price was calculated using the following formula:

Cost variation (%) =

**Price of most expensive brand - price of least expensive brand X100**

**Price of least expensive brand**

**TABLE25: THE PRICE VARIES BETWEEN A SULFONYLUREA GROUPS OF DRUGS.**

Drug	Formulations	Doses (mg)	Manufacturing Companies	Min. Price (rs)	Max. Price (rs)	% price Variation
Glibenclamide	2	2.5	8	2.6	6.05	132.69
		5	9	3.6	9.15	154.16
Gliclazide	4	30	12	19	64.9	241.57
		40	17	14	27.5	96.43
		60	10	35	99.6	184.57
		80	39	19.5	70.5	261.54
Glimepiride	4	1	53	8.36	63.15	655.38
		2	53	12.54	117.4	836.2
		3	12	45	125	177.7
		4	20	18.5	103.4	450
Glipizide	3	2.5	6	2.93	9.35	219.11
		5	14	4.74	13.3	174.89
		10	5	18	25	38.88

**TABLE 26: PRICE VARIATION IN BIGUANIDES & THIZOLIDINEDIONES GROUPS OF DRUGS.**

Drug	Formulations	Doses (mg)	Manufacturing Companies	Min. Price (rs)	Max. Price (rs)	% price Variation
Metformin	4	250	7	4.6	9	35.65
		500	48	6	24.50	308.33
		850	18	10	36	260
		1000	34	14	41.4	195.71
Pioglitazone	2	15	40	10	64.20	452
		30	40	18	98.20	445.55

**TABLE 27: PRICE VARIATION AMONG A-GLUCOSIDASES INHIBITOR GROUP OF DRUGS.**

Drug	Formulations	Doses (mg)	Manufacturing companies	Min. Price (Rs)	Max. Price (Rs)	% price variation
Acarbose	2	25	11	32	55	71.87
		50	9	62	89	43.55
Miglitol	2	25	8	50	65.82	31.64
		50	14	50.3	118.47	135.50
Voglibose	2	0.2	12	36	64	78.5
		0.3	9	54	84	56.74

**TABLE 28: PRICE VARIES BETWEEN MEGLITINIDES GROUP OF DRUGS**

Drug	Formulations	Doses (mg)	Manufacturing companies	Min. Price (Rs)	Max. Price (Rs)	% price variation
Nateglinide	2	60	4	30	45	50
		120	4	50	70	40
Repaglinide	3	0.5	6	19.90	38	90.95
		1	4	39	62	58.97
		2	4	75	98	30.66

**TABLE 29: PRICE VARIES AMONG COMBINATION THERAPY**

Drug	Formulations	Doses (mg)	Manufacturing companies	Min. Price (Rs)	Max. Price (Rs)	% price Variation
Glibenclamide + Metformin	3	2.5+400	8	8.5	19	133.33
		2.5+500	12	16	36	62.50
		5+500	19	12	29.9	149.16
Glicazide + Metformin	5	80+500	43	18.10	78.25	332.32
		60+500	5	39.25	68.50	74.52
		40+400	3	28.3	29	2.47
		40+500	3	35	60	71.43
		30+500	3	32	59	84.37
Glimepiride + Metformin	5	1+500	50	18	69	283.33
		2+500	53	26	120.4	362.07
		1+1000	2	38	41.75	9.86
		2+100	4	51.8	60	15.83
		2+850	2	65	73	12.3
Glipizide + Metformin	2	5+500	11	6.72	14	108.33
		2.5+400	3	5.36	26.25	399.04
Pioglitazone + Glimepiride	3	15+1	12	17.1	59.3	246.78
		15+2	15	41.959.3	70	67.06
		30+2	2	69	80	15.94
Pioglitazone + Metformin	2	15+500	34	19	70.6	271.57
		30+500	21	32.40	86	165.43
Pioglitazone + Metformin + Glimepiride	2	15+500+1	12	44	80	81.81