

## PHARMACOECONOMIC STUDY OF HYPERTENSIVE DIABETIC PATIENTS IN THE RURAL AREAS OF AMARAVATHI

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### Abstract:

**Background:** Pharmacoeconomics is recent emerging discipline to identify cost of medicines used for various ailments. This cost determination helps in identifying of cost burden for patients. This kind of study is very helpful in chronic ailments, rare disease conditions, and operational methods. It is very helpful for governments to monitor treatment procedures, protocol making for any kind of ailment particularly health insurance aspects. Diabetes is a metabolic disorder occurred in all kind of population and cases are increasing drastically now a days. It also had several comorbid conditions. The most common comorbid conditions exhibited in diabetic patients are sore ulcers, infections, gastritis, hypertension and obesity.

**Aim and objective:** The present aim of this study is to identify the cost expenditure on the combination and single prescribed drugs of hypertensive diabetic patients along with miscellaneous drugs and also the usage ratio of generic and branded drugs used among the population.

**Results:**The results show that of voglibose, Glimepiride and metformin is the mostly used combination of drugs in the patients having irregular glucose levels. The second most commonly prescribed drug combination is Metformin and glipizide combination. Drugs like SGLT2 inhibitors and dipeptidyl peptidase 4 inhibitor containing prescriptions are having highest cost expenditure. The mostly used combination was telmisartan, amlodipine and hydrochlorothiazide. antihyperlipidemic drugs are mostly prescribed then second are multivitamins in the category of miscellaneous drugs.

**Introduction:** Pharmacoeconomics is emerging branch plays a major role in the determination of burden of cost on the population having various disorders.<sup>1</sup> This branch is extensively developing and very helpful in the cost reduction with high efficacy. By the application of pharmacoeconomics

the patient’s morbidity index was evaluated whether they are getting satisfactory outcome or not.<sup>2</sup> There are various evaluator methods in pharmacoeconomics applied on the prescribing regimens to get the desired outcome like minimization of cost, beneficiary analysis, utility of drugs and effective analysis of drugs taken for the ailment.<sup>3</sup>As the diabetes was the chronic disorder it had so many numbers of multiple prescribed drugs along with number of co morbid conditions. This branch also deals with cost of treatment and the methods used to reduce the cost burden of population. This plays a major role in total cost determination, prescribing drug cost and its related issues. <sup>4</sup>The diabetes is increasing among the Indian population which is ranging from 5.5 % to 7.7 % during 2016. According to National NCD Monitoring Survey (NNMS) the diabetes in india will reach to 9.3% in 2018.<sup>5</sup>

**Inclusion Criteria:** The selected population having the both diabetic and hypertension condition ranging of age from 18 to 50 years.

**Exclusion criteria:** The population excluded from the study are those who are pregnant women, having other co morbid conditions other than hypertension like thyroid, obesity etc.

**Methodology:** The study was done on hypertensive diabetic patients around the rural areas of amaravathi. About 1263 population data was collected from various rural regions and their usage of drugs for diabetic and hypertension.<sup>5,6</sup> Among the population 493 females and 770 males are having the condition. About 150 prescriptions are taken into considerations which are mostly prescribed combinations as well as individual composition drugs. The cost range per tablet is determined along with kind of tablet i.e. generic or brand type.<sup>7,8</sup> Along with the drugs used for the ailment the other miscellaneous drugs are taken into consideration like Proton pump inhibitors, atorvastatin, etc.<sup>9</sup> Based on the prescriptions mostly prescribed drugs cost is analysed from lowest to highest categorised into anti diabetic, anti hypertensive and other drugs in hypertensive diabetic patients.<sup>10</sup>The QALY was obtained for the 25 number of subjects based on the scored among the study with same age. The QALY and the cost effectiveness was calculated between the physically active group and diet maintained group vs inactive group at same age. The outcome and cost was assessed by using incremental cost-effectiveness ratio (ICER) with each group. The using incremental cost-effectiveness ratio (ICER) was calculated by using the following formula.

$$ICER = \frac{\text{Cost expenditure in active subjects} - \text{Cost expenditure in inactive subjects}}{\text{Out come in active subjects} - \text{Outcome in inactive subjects}}$$

S.No	Number of Drugs used	Total Number
1	Total Number of Drugs used among hypertensive diabetic population	717
2	Total Number of drugs used for diabetes	195

3	Total Number of drugs used for hypertension	207
4	Total number of miscellaneous drugs	315

**Table1: Total number of drugs used among the hypertensive diabetic population**

S.NO	Drugs used	Percentage prescribed combination of antidiabetic drugs	Cost Range (Lowest to Highest)
1	Pioglitazone(15mg) + Metformin (1000mg) + Glimiperide (1mg)	4.61	5.39 – 12.73 INR per tablet
2	Metformin Hcl (500mg)+ Glipizide (5 mg)	15.89	1.51 – 2.01 INR per tablet
3	Voglibose(0.3mg) + Glimiperide (2mg)+ Metformin (500mg)	9.23	5.51 – 13.33 INR per tablet
4	Metformin(500mg) + Glimepiride(1mg)	25.1	6.80 – 12.15 INR per tablet
5	Sitagliptin(100mg) + Metformin (1000mg)	12.30	13.3 – 16.9 INR per tablet
6	Tenigliptin(20mg)+ Metformin (1000mg)	4.61	3.14 – 15.4 INR per tablet
7	Metformin (500mg)+ Voglibose (0.2mg)	1.53	2.41 -14.44 INR per tablet
8	Metformin SR (500mg)	18.97	1.17 – 2.26 INR per tablet
9	Teneligliptin (20mg)	4.61	2.11 – 11.8 INR per tablet
10	Canaglifozin (100mg)	3.07	54.2 – 60.6 INR per tablet

**Table 2:Percentage and cost range of anti diabetic Drugs prescribed in hypertensive diabetic patients**

S.NO	Drugs used	Percentage prescribed anti hypertensive drugs	Cost Range (Lowest to Highest)
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1	Metoprolol Succinate(23.75mg)	20.2	3.71 – 4.62 INR per tablet
2	Nicorandil(5mg)	8.69	15.7 – 16.4 INR per tablet
3	Ramipril (5mg)	13.04	4.33 – 8.83 INR per tablet
4	Carvedilol(6.25mg)	2.89	4.33 – 8.83 INR per tablet
5	Furosimide(40mg)+ Amiloride(5mg)	7.24	0.93 – 1.17 INR per tablet
6	Olmesartan(20mg)+ Hydrochlorthiazide(12.5mg)	13.04	6.25 –14.44INR per tablet
7	Olmesartan medoximil(40mg)	10.14	5.06–21.06 INR per tablet
8	Temisartan(40mg) Amlodipine(5mg) Hydrochlorthiazide(12.5mg)	2.89	8.7 – 16.83 INR per tablet
9	Telmisartan (20mg&40)	21.73	0.96 – 4.05 INR per tablet

**Table 3 :Percentage and cost range of Anti hypertensive Drug prescribed in hypertensive diabetic patients**

S.NO	Drugs	Percentage prescribedmiscellaneous drugs	Cost Range
1	Anti Histaminics	3.80	1.45– 1.96 INR per tablet
2	Haematinics	2.85	5.3 – 16.5 INR per tablet
3	Anti ulcer drugs	28.57	4.27 – 18.93 INR per tablet
4	Multivitamins /Calcium	30.47	3.5– 14.05 INR per tablet
5	Anti hyperlipidemic	34.28	16.7–37.07 INR per tablet

**Table 4: Percentage and cost range of miscellaneous Drugs prescribed in hypertensive diabetic patients**

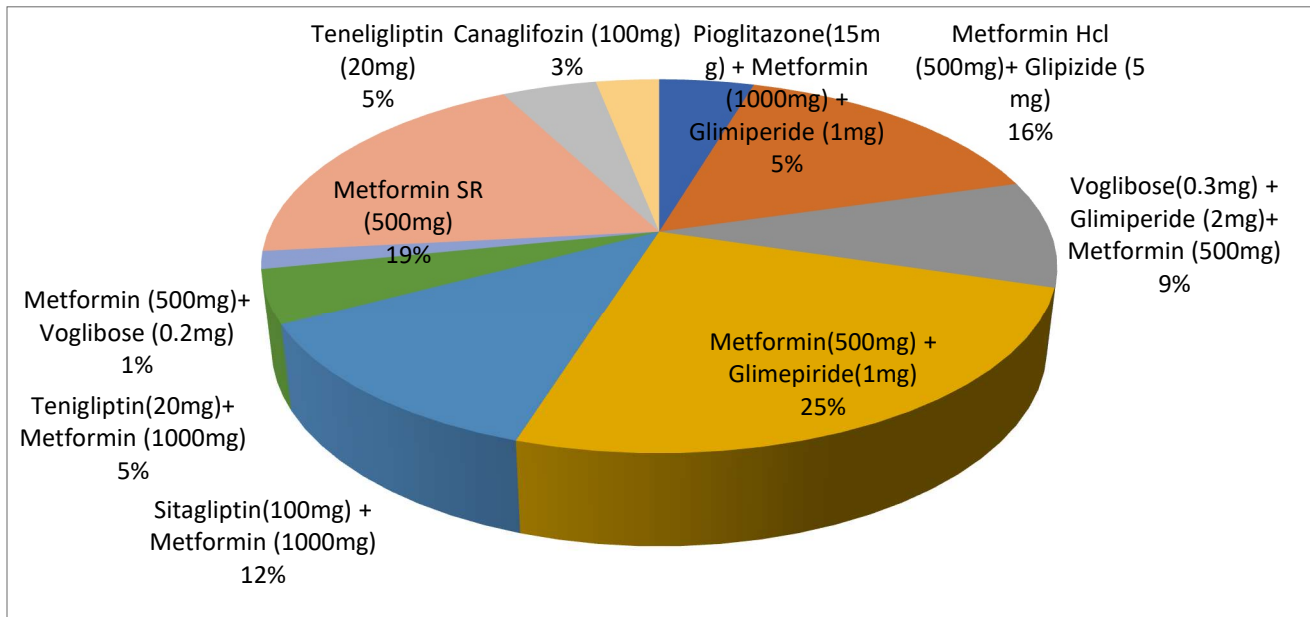
S.No	Cost Range	Number
1	3001-4000	6
2	2001-3000	21

3	1001-2000	54
4	501-1000	48
5	100-500	21
6	0-100	0

**Table 5: Overall Cost range of hypertensive diabetic patients**

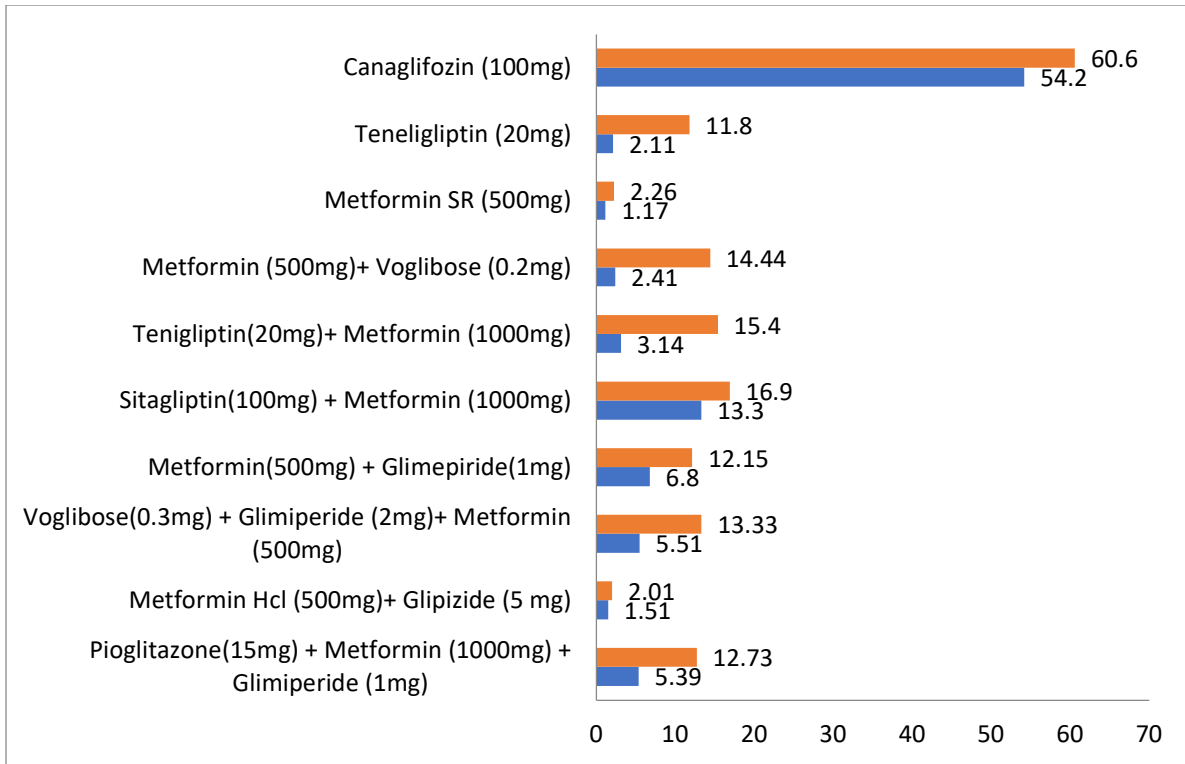
S.No	Type of Drug prescribed	Percentage prescribed
1	Generic	32.9
2	Branded	67.0

**Table 6: Percentage of type of prescribing drugs in market**



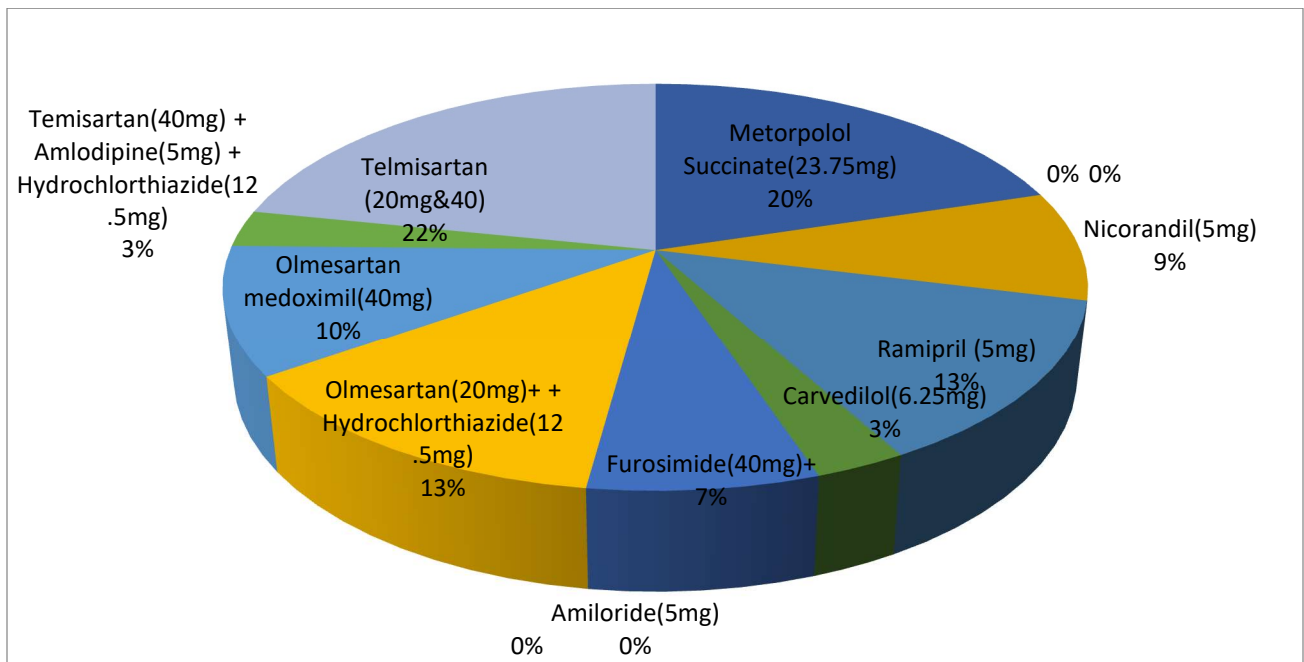
**Figure 1: Percentage of diabetic drugs prescribed in hypertensive diabetic population**

Percentage of diabetic drugs prescribed in hypertensive diabetic population represents as per the prescribed ratio. As per the above figure it was concluded that highest prescribing combination is metformin and glimepiride. The least prescribing drugs are Canaglifozin and tenigliptin which are used in the multiple therapy



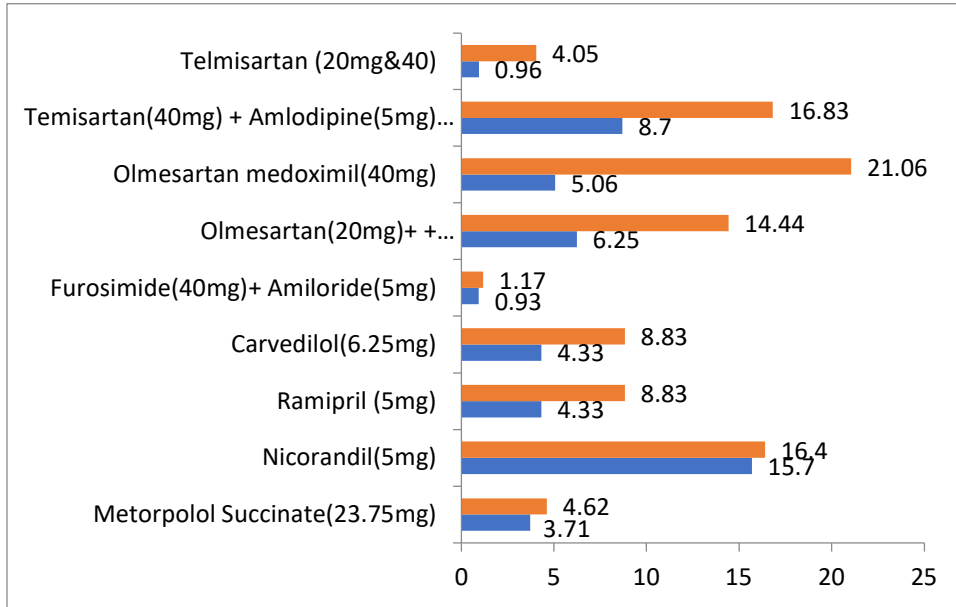
**Figure 2: Cost Range of diabetic drugs prescribed in hypertensive diabetic patients**

Cost Range of diabetic drugs prescribed in hypertensive diabetic patients represents that SGLT 2 type are having highest cost ranging from 54.02 – 60.6 INR where as merformin and combined drugs are very low ranging of 1.51 – 2.01 INR. The drugs includes other than sulphonyl ureas and biguanides the cost of drugs is increasing.



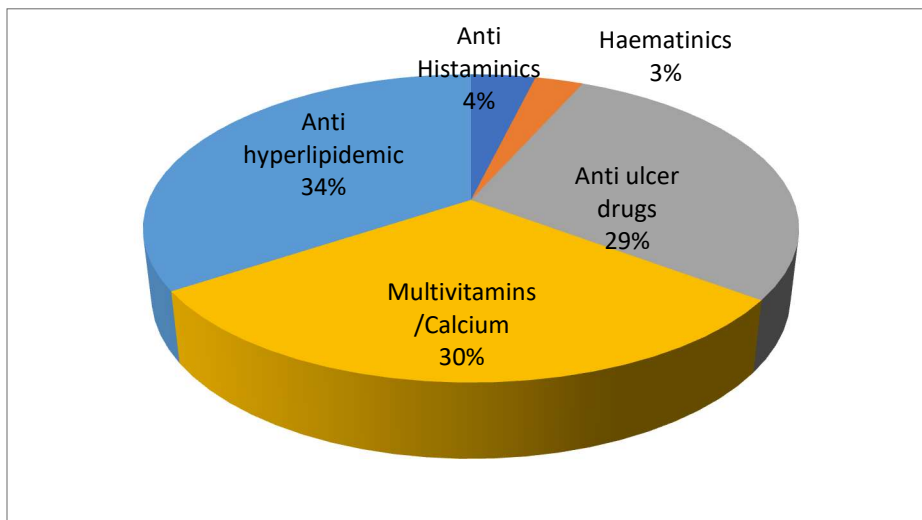
**The figure 3 :the combinations as well as the individual drugs**

The combinations as well as the individual drugs for the hypertensive diabetic population to control the blood pressure. Mostly prescribed drug is Telmisartan followed by metorpolol which are also represented as safe drugs as per the hypertensive management guidelines



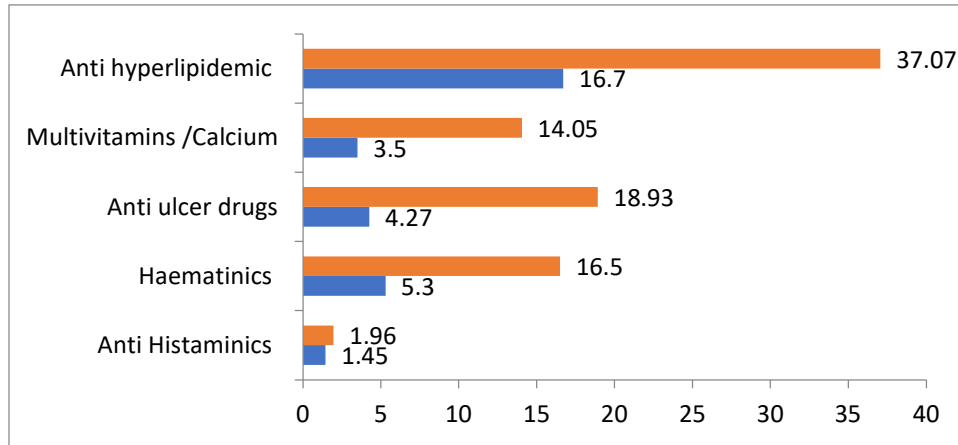
**Figure 4: that cost Range of antihypertensive drugs**

This figure represents that cost Range of antihypertensive drugs prescribed in hypertensive diabetic patients which shows that the top prescribed drugs are low in cost with a range of 4.05 and 4.62 INR. The highest cost of 21.06 INR was taken by the olmesartan medoximil which is mostly used in the hypertension patients above 50 years condition.



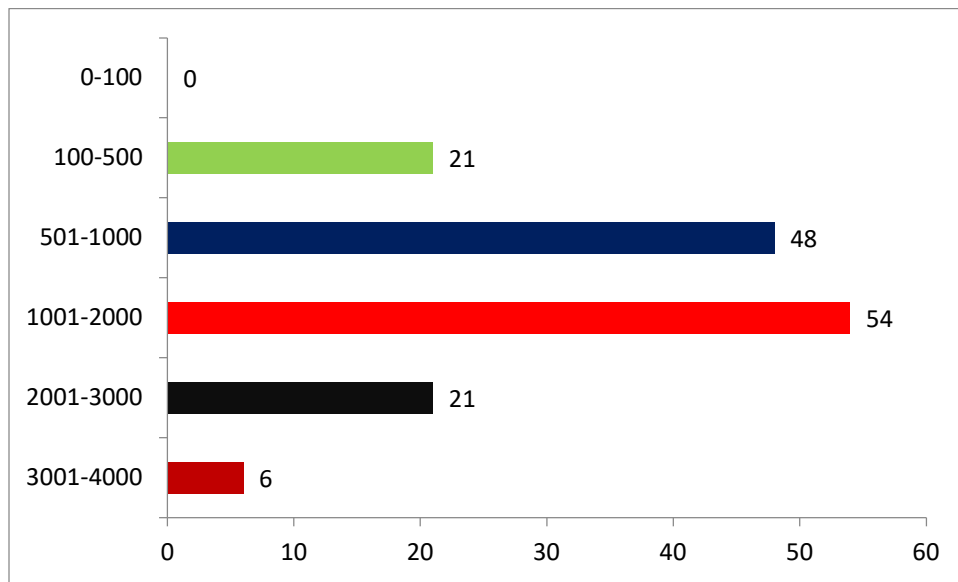
**Figure 5: Drugs used in the hypertensive diabetic population**

These shows that other drugs used in the hypertensive diabetic population are mostly multivitamins and antiulcer drugs like proton pump inhibitors, antihistamines and sucralfate suspension. Haematinics and H1 anti histamines are very few in number.



**Figure 6: Miscellaneous Prescribing Drugs**

Among the miscellaneous prescribing drugs highest cost was taken by anti hyperlipidemia drugs followed by anti ulcer which shows about cost of 37.0 INR and 18.93 INR. The suspension forms are high in cost when compared with the tablet forms.



**Figure 7: Hypertensive diabetic subjects are spending average expenditure**

This shows that the hypertensive diabetic subjects are spending average expenditure of 500-2000 INR on the drugs per month.

**Discussion:** The table 1 shows that the total numbers of drugs used by the subjects are 717. Among them the total numbers of drugs used for diabetes are 195, for hypertension 207 and the other



miscellaneous drugs are 315. prescribed drugs for diabetic condition used in the hypertensive diabetic patients. As per the results the combination of voglibose, glimiperide and metformin is the mostly used combination of drugs in the patients having irregular glucose levels. The second most commonly prescribed drug combination is Metformin and glipizide combination. As per the single administration of drugs metformin sustained release formulations are mostly prescribed drug. Depending up on the glucose levels analysed the combination of drugs are increasing as well as the dosage which increases the cost of diabetic drugs showed in table 2. The drugs like SGLT2 inhibitors and dipeptidyl peptidase 4 inhibitor containing prescriptions are having highest cost expenditure. The cost expenditure for treating the hypertension is represented in the table 3 and showed in graph 4. The results shows that metoprolol succinate is the highest prescribing drug. The combinations are very rarely used unless the blood pressure comes under stage 2 and 3. The mostly used combination was telmisartan, amlodipine and hydrochlorothiazide. In the table 3 the miscellaneous drugs used in the hypertensive diabetic are represented. As per the results showed in table 4 antihyperlipidemic drugs are mostly prescribed then second are multivitamins. Mostly the antihyperlipidemic drugs are mainly used for the prophylaxis purpose. The third and fourth mostly prescribed medicines are anti ulcer drugs which contains PPI's , sucralfate and H<sub>2</sub> antihistaminic drugs. The table 5 represents the monthly cost expenditure of hypertensive diabetic patients. The table 6 represents type of branded and generic drugs prescribed in subjects.

**Conclusion:** The study reveals the cost increases along with the disease progression. Apart from the ailment drugs the prescriptions also had miscellaneous drugs which will be burden for the subjects. More research has to be needed that comparing of the subjects having significant values versus abnormal values of blood glucose and hypertension. Most of the cases the drug cost were significantly affected by the diagnosed values range. Even though there are abnormal values in diagnostic values the cost also can be reduced by using generic drugs. Along with the drug therapy non pharmacological therapy had a major role in disease progression since it indirectly act on the levels of blood glucose and hypertension. The correlation between the non pharmacological therapy, diagnosed values and drug cost should be monitored.

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