Original Article

An Observational Study on Pharmacoeconomics and Prescription Pattern of Drugs Used in Diabetes Mellitus (Type II) in a Tertiary Care Hospital of Eastern India

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Background : Diabetic patients need to consume multiple Vmedications at a time due to presence of Hyperglycemia, its pathophysiology and complications.In this context the compliance of the patient depends on the cost of therapy, The conduction of this study was faced with limitations like the COVID-19 pandemic. In spite of that, we have decided to conduct this challenging task by analyzing the pattern of prescriptions and comparing the prices of Anti-diabetic Drugs in our Tertiary Care Teaching Hospital.

Objective : • To study the pattern of prescription writing in Type II Diabetes Mellitus and its association with the extent of control of the disease. • To analyze and compare the cost of different Anti-diabetic Drugs in Type II Diabetes Mellitus in a Tertiary Care Hospital.

Material and Methods : This is an observational study of descriptive type. It is prospective in nature. All the demographic characteristics of the patient, disease profile, drug profile and prescription profile were included in the case report form. A photocopy of the patient's Pharmacy Bill was collected from the indoor Pharmacy for analysis.

Result : The mean number of anti-diabetic medications prescribed in Generic name was 3.0(±2.12) while the mean number of drugs prescribed in Brand name was 4.02(±1.99). The average number of prescribed injectable drugs was 0.11 (±0.31) with p- value=0.012 and the mean number of prescribed Fixed Dose Combinations (FDCs) was 0.16 (±0.42) with p-value=0.005. The total number of prescribed Anti-diabetic medications was higher in presently Hyperglycemic patients under Anti-diabetic Therapy compared to presently Normoglycemic patients under Anti-diabetic Therapy. A weak positive correlation was found between family income per capita and total cost of treatment.

Conclusion: The total cost of treatment in presently Hyperglycemic patients under Anti-diabetic Therapy is relatively high due to prescription of more number of Anti-diabetic Medications. Metformin is the most common Anti-diabetic agent used in clinical practice and oral route of Drug Administration is mostly preferred in the OPD settings.

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Key words **: Diabetes Mellitus, Pharmacoeconomics, prescription pattern, Treatment.**

Diabetes Mellitus (DM) refers to a group of Metabolic Disorders, which is characterized by Hyperglycemia occurring due to a defect in the secretion of Insulin or in its function or a combination of the both[1]. According to American Diabetic Association Classification, a diagnosis of Diabetes Mellitus is characterized by at least any 1 of the following criteria– Fasting Plasma Glucose (FPG) ≥126 mg/dl (7.0 mmol/l), 2-hours post-load value in the Oral Glucose Tolerance Test (OGTT) ≥200 mg/dl (11.1 mmol/l), a random Plasma Glucose Level ≥200 mg/dl (11.1 mmol/l) with symptoms of diabetes and/or HbA1c levels 6.5%[1]. Chronic nature of Diabetes Mellitus requires life-long treatment in order to maintain the normal Glucose levels in blood and may lead to several complications. This may degrade the quality of life. In 381 million people had been diagnosed with Diabetes Worldwide as per report of International Diabetic Association (2013) After years of careful observation, it can be concluded that its swiftly growing incidence expected to double by 2030[2]. India is estimated to have 109 million individuals affected

Editor's Comment :

- The economic burden of treatment in hyperglycemic patients under anti-diabetic therapy is significantly high.
- Thus, rational prescription as well as physician knowledge of current drug prices is necessary to ensure patient compliance specially those belonging to lower socioeconomic classes.

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with Diabetes by 2035, as stated by the Indian Heart Association and has been labeled as the "Diabetes Capital of the World"[3]. This inflation may have its most probable cause in the rapid Urbanization in India that has made unhealthy lifestyle changes (like junk food consumption, sedentary habits) mainstream. This bears major Socio-economic implications, due to which the price of anti-diabetic medications is of utmost concern now. Thus, Diabetes Mellitus has now become a cause of huge Pharmacoeconomic burden Worldwide. In most cases, customized Pharmacotherapeutic approaches have been undertaken, to tackle the complexities presented by diabetes. There have been reports of variability from person to person in risk followed by subsequent development of diabetes, along with disparities in response to various oral Glucose lowering therapies that are currently available for diabetes Pharmacotherapy. This study has been planned in order to scruhtinized the patterns of prescriptions and collate the price of drugs used in DM (Type 2) in a Medical College. Prescription in a rational way specifies that "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period and at the lowest cost to them and their community"[5]. Drug utilization studies can be utilized to exhibit rational prescribing. WHO defines drug utilization as, "prescribing, dispensing, ingesting, marketing, distribution and use of drugs in society, with special emphasis on the resulting Medical, Social and Economic consequences". These data are important in order to properly examine the older drugs that are widely prescribed as well as the newer drugs in the market, analyze the wide discrepancy in the patterns of prescription and consumption of anti-diabetic medications, approach the issues of delayed adverse Drug Reactions (ADRs) and scrutinize the Inflation of drug/therapy costs[6]. A set of fundamental drug use indicators which will aid Health Workers to execute rational prescribing (like prescribing, patient care and health facility indicators) has been devised by the WHO[7]. Pharmacoeconomics is a relatively new discipline of Health Economics which helps in comparing two pharmaceutical drugs or products or therapies by estimating the expenditure and outcome in terms of effectiveness and standard of life[8]. These studies are a method to ensure the scientific and competent use of finite resources and the optimal functioning of wellness program in progressing nations[9]. The cost-effective therapy in Diabetes Mellitus serves not only the purpose of adhering to rational prescribing but also increasing the patient compliance with lesser chances of discontinue due to pecuniary problems. This will result in fewer problems and enhance the quality of life, therefore driving therapeutic effectiveness forward significantly. Hence keeping the above observations in mind, we did this survey in patients attending Medicine outdoor of our hospital with the main focus resting on analyse of cost. Our primary aim is to study the pattern of prescriptions. Then data which was collected in a validated case report form from patients diagnosed with Type II Diabetes Mellitus. This was done in a Outpatient Department (OPD) of General Medicine and the fundamental prescribing indicators was evaluated. Information related to the cost of the drugs was obtained from College Pharmacy. Following collection, it was scrutinized and variation of percentage in the price of Anti-diabetic Drugs was calculated.

Aims and Objectives

Primary objective is to study the prescription pattern of Type II Diabetes Mellitus and its association with the degree of control of the disease.

Secondary objective is to analyze and compare the prices of different Anti-diabetic Drugs in Type II Diabetes Mellitus in a Tertiary Care Hospital.

Materials and Methods

This is an observational, cross-sectional study of descriptive type. Data was collected from General Medicine Outpatient Department (OPD) of ESI-PGIMSR and ESIC Medical College, Joka. Parameters studied were history of the patient, cost of therapy, drugs prescribed duration of therapy and blood for FBG, PPBG and HBA1c. These data was analyzed in the Department of Pharmacology of same institution. Patients were selected following non-probability Convenient sampling - all the patients matching the inclusion criteria during the study period were included. Seeing the previous study and duration of data collection sample size assumed to be around 300. Patients of either sex and age between 18 and 80 years came to General Medicine outdoor with a diagnosis of 'Diabetes Mellitus' according to American Diabetic Association Classification characterized by any 1 of the following criteria at least –

(a) Fasting Plasma Glucose (FPG) $\geq$126 mg/dl (7.0 mmol/l), also referred to as Fasting Blood Glucose (FBG), two hours postload value in the Oral Glucose Tolerance Test (OGTT) $\geq$200mg/dl (11.1mmol/l), also referred to as Postprandial Blood Glucose (PPBG), Random Plasma Glucose Level $\geq$200 mg/dl (11.1 mmol/l) with symptoms of Diabetes,or HbA1c levels >6.5%.

(b) Patients excluded from the study were age less than 18 years and more than 80 years,Gestational Diabetes,Type 1 Diabetes Mellitus and patients with Major Medical Illness such as Malignancy, Autoimmune Disorder and Co-existent Neurological Disorder and Immune-compromised Disorder and Diabetic Kidney Disease.

Data was systematically entered in a Case Report Form (CRF) specifically designed for this purpose. The content validity of the questionnaire was checked by experts of qualitative research. The two- weeks test-retest reliability was checked in an initial group of 30 patients. Cronbach's alpha was used to check the reliability of the questionnaire during the initial validation. The value was found to be 0.83 and hence proved to be reliable and validated.

The case record form was designed in such a manner so as to include all demographic characteristics of the patient, disease profile, drug profile and prescription profiles. A copy of the patient's Pharmacy Bill was collected from the indoor Pharmacy for analysis. Further the drug formulation, its individual retail price, manufacturer details and the monthly cost borne by the patient will be noted down. The cost of a particular drug which is manufactured by different companies, in the same strength and dosage form were evaluated and the difference in maximum and minimum price was calculated. The Current Index of Medical Specialties and Indian Drug Review October-December, 2015 issues was used to find the Generic names, the combinations and their cost, in case the Generic names of the drugs are not written on prescription and their prices are not mentioned in the Bill.

Percentage variation in cost was calculated using this formula as follows:

Percentage cost variation

$$= \frac{\text{Cost of highest priced product} - \text{Cost of lowest priced product}}{\text{Cost of lowest priced product}} \text{ X } 100$$

Collection of data was done in a 2019 Excel file. It was summarized by routine descriptive statistics. Numerical variables would be compared between groups by Student's test, if normally distributed, or by Mann-Whitney U test, if skewed. All analyses would be 2-tailed.

Statistically significance would imply $p < 0.05$. Association between prescription pattern and cost was evaluated by Fischer Exact or Chi square test. The same formula was used to evaluate the association between prescription pattern and rate of control of disease. All statistical analysis was performed in R statistical software version 3.6.1(Language).

Observations and Results

The study was performed on 55 participants and it was conducted in a period of two months.

The mean age in years was found to be 55.8 (±10.7) years. Out of 55 participants, 31(56.4%) were females and 24(43.6%) were males. The average duration of Type II Diabetes Mellitus in the participants was found to be 5.69 (±3.68) years (Table 1)

The number of family members is 4.98(±2.13) on an average, while the mean per capita family income is 2662 (±1200). On the basis of BG Prasad scale, 2017, the participants were divided into classes according to their Socioeconomic status. Almost an equal number of participants from each of Lower Middle Class (18; 32.7%), Middle Class (19; 34.5%) and Upper Middle Class (18; 32.7%) were taken into consideration (Table 1).

A family history of Type II Diabetes Mellitus was present in 49.1% of the cases (27 out of 55). Adherence to anti-diabetic medication was observed in 47 participants (85.5%), while proper calorie restriction was followed by 37 participants (67.3%)(Table 2).

Table 1 — *Demographic Parameters of study population*

	Number (Percent) (N=55)
Age in Years Mean (SD)	55.8 (10.7)
Gender :	
Female	31 (56.4%)
Male	24 (43.6%)
Disease duration in Years Mean (SD)	5.69 (3.68)
Number of Family Members	4.98 (2.13)
Per capita family Income	2662 (1200)
Economic Status :	
Lower Middle Class	18 (32.7%)
Middle Class	19 (34.5%)
Upper Middle Class	18 (32.7%)

Table 2 — *History and Biochemical Parameters of study population*

	[ALL] N=55
Family history of DM :	27 (49.1%)
Adherence to medication :	47 (85.5%)
Proper calorie restriction :	37 (67.3%)
Fatigability :	33 (60.0%)
Increased thirst :	27 (49.1%)
Increased hunger :	8 (14.5%)
Frequent urination :	27 (49.1%)
Unexplained weight loss :	41 (74.5%)
Visual disturbances :	21 (38.2%)
Slow ulcer healing :	8 (14.5%)
Frequent infection :	4 (7.27%)
FBS - Mean (SD)	158 (74.5)
PPBS - Mean (SD)	241 (110)
Urea - Mean (SD)	21.4 (10.7)
Creatinine - Mean (SD)	1.01 (0.18)

33 out of the 55 participants (60%) had experienced fatigability, 27 (49.1%) felt increased thirst and only 8(14.5%) were experiencing increased hunger, following the clinical diagnosis of Diabetes Mellitus. 27 out the 55 participants (49.1%) were experiencing frequent urination, while unexplained weight loss had been observed in 41 cases (74.5%). 21 participants (38.2%) complained of visual disturbances. Slow ulcer healing was observed in 8 cases (14.5%), while 4 participants (7.27%) had suffered from frequent infection (Table 2).

Recent laboratory investigation reports were recorded and the mean Fasting Blood Sugar (FBS) was found to be 158 (±74.5) mg/dl, while the mean Postprandial Blood Sugar (PPBS) was 241 (±110) mg/dl. The average urea level was 21.4 (±10.7) mg/dl and the average Creatinine level was 1.01 (±0.18) mg/dl (Table 2).

Out of the 55 participants undergoing Anti-diabetic Therapy, 19 (34.54%) were found to be Normoglycemic, while the rest 36 (65.45%) were Hyperglycemic (Table 3). The total number of prescribed Anti-diabetic Medications on an average was 6.98 (±2.41), with a p-value of 0.045 (p-value ≤0.05, proving the data is significant). In Normoglycemic patients currently on Anti-diabetic Therapy, the mean of total number of drugs is 6.16(±1.92), while in Hyperglycemic patients currently on Anti-diabetic Therapy, it is 7.42 (±2.55) (Table 3). The mean number of drugs prescribed in Generic name was found to be 3.0(±2.12) with p-value=0.688, while the mean number of drugs prescribed in Brand name was 4.02(±1.99) with p-value=0.031. The average number of prescribed injectable drugs was 0.11 (±0.31) with p- value=0.012 and the mean number of prescribed Fixed Dose Combinations (FDCs) was 0.16 (±0.42) with p-value=0.005. (Table 3).

On an average, the number of prescribed anti-diabetic Drugs was found to be 2.55(±1.07) with a p-value of 0.003 (p-value ≤0.05, proving the data is significant). In Normoglycemic patients currently on Anti-diabetic Therapy, the mean number of Anti-diabetic Drugs is 2.0(±0/.88), while in Hyperglycemic patients currently on Anti-diabetic Therapy, it is 2.83 (±1.06). The mean number of Anti-diabetic Drugs used in clinical practice for comorbid conditions is 4.29(2.28).

Out of 55 participants, Injectable Insulin was prescribed in the form of Inj. Human Mixtard (30/70) in 3 cases (5.45%), as Inj Insulin Aspart + Insulin Aspart Protamine(30/70) in 1 case (1.82%) and as Inj. Insulin Degludec in 2 cases (3.64%); p- value=0.373 (Table 4).

Sulphonylureas were prescribed in the form of Glimepiride in 29 cases (52.7%) and Gliclazide in 1 case (1.82%); p-value=0.031(p-value ≤0.05, proving the data is significant). Biguanide like Metformin was prescribed in 53 cases (96.4%); p-value=1.0. DPP-4 inhibitors were prescribed as Sitagliptin in 11 cases (20.0%) and as Vildagliptin in 25 cases (45.5%); p-value=0.432. SGLT-2 inhibitor like Dapagliflozin was prescribed in only 1 case (3.64%) with p- value=1.0, while Thiazolidinedione like Pioglitazone was prescribed in 4 cases (7.27%), with p-value=1.0. Alpha-Glucosidase inhibitor like Voglibose was prescribed in 9 cases (16.4%); p-value=0.141 (Table 4).

It was found that the total number of drugs prescribed was higher in presently Hyperglycemic patients under anti-diabetic Therapy compared to presently Normoglycemic patients under Anti-diabetic Therapy (Fig 1).

The total cost of treatment was 13182 (± 9094) on an average and was subsequently found to be higher in presently Hyperglycemic patients under Anti-diabetic Therapy (14547±9144) than in presently Normoglycemic patients under Anti-diabetic therapy (10595 ±8646); p-value=0.122 (Fig 2).

A weak positive correlation was found between family income per capita and total cost of treatment with Pearson's correlation coefficient, r=0.145; p-value=0.287 (Fig 3).

Discussion

Diabetes Mellitus (DM) is a disease which results in severe complications in long-standing cases and is currently deemed as a Global epidemic by WHO. It requires Multiple Drug Therapy and may be associated with various other comorbidities, especially in the elderly age group. This may lead to adverse drug reactions and drug-drug interactions and in turn increases the risk of Social, Clinical as well as Financial burden. The patient compliance depends

Table 3 — *Pattern of drug prescription in presently Normoglycemic and Hyperglycemic individuals. Unpaired t-test was used to calculate p- values. Significance level was 0.05*

	[ALL] Mean (SD) N=55	Normoglycemic Mean (SD) N=19	Hyperglycemic Mean (SD) N=36	p- value
Total Number of Drugs	6.98 (2.41)	6.16 (1.92)	7.42 (2.55)	0.045
Drugs prescribed in Generic name	3.00 (2.12)	2.84 (2.06)	3.08 (2.17)	0.688
Drugs prescribed in Brand name	4.02 (1.99)	3.32 (1.42)	4.39 (2.16)	0.031
Injectable drug prescribed	0.11 (0.31)	0.00 (0.00)	0.17 (0.38)	0.012
Fixed Dose Combination prescribed	0.16 (0.42)	0.00 (0.00)	0.25 (0.50)	0.005
Anti-diabetic Drugs Prescribed	2.55 (1.07)	2.00 (0.88)	2.83 (1.06)	0.003
Drugs Prescribed for comorbid condition	4.29 (2.28)	4.00 (1.63)	4.44 (2.57)	0.438

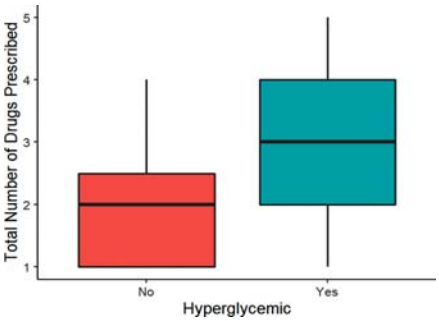

Fig 1 — Number of Drugs prescribed is higher in presently hyperglycemic patients

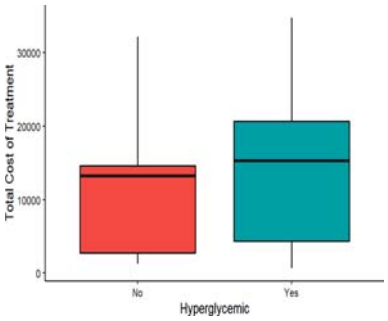

Fig 2 — Cost of treatment is higher in presently hyperglycemic patients

Table 4 — *Drug Utilization Pattern in presently Normoglycemic and Hyperglycemic individuals. Chi-squared Test with Yates' correction was used to calculate p-values. Significance level was 0.05*

	[ALL] N=55	Normoglycemic N=19	Hyperglycemic N=36	P overall
Insulin : Not Prescribed	49 (89.1%)	19 (100%)	30 (83.3%)	0.373
Inj. Human Mixtard	(30/70)	3 (5.45%)	0 (0.00%)	3 (8.33%)
Inj. Insulin Aspart + Insulin Aspart Protamine	(30/70)	1 (1.82%)	0 (0.00%)	1 (2.78%)
Inj. Insulin Degludec	2 (3.64%)	0 (0.00%)	2 (5.56%)	0.031
Sulphonylurea : Not Prescribed	25 (45.5%)	12 (33.3%)	13 (68.4%)	
Gliclazide	1 (1.82%)	0 (0.00%)	1 (2.78%)	
Glimepiride	29 (52.7%)	6 (31.6%)	23 (63.9%)	1.000
Biguanides: Not Prescribed	2 (3.64%)	1 (5.26%)	1 (2.78%)	
Metformin	53 (96.4%)	18 (94.7%)	35 (97.2%)	
DPP4 Inhibitor : Not Prescribed	19 (34.5%)	8 (42.1%)	11 (30.6%)	0.432
Sitagliptin	11 (20.0%)	2 (10.5%)	9 (25.0%)	
Vildagliptin	25 (45.5%)	9 (47.4%)	16 (44.4%)	
SGLT2.Inhibitor : Not Prescribed	53 (96.4%)	18 (94.7%)	35 (97.2%)	1.000
Dapagliflozin	2 (3.64%)	1 (5.26%)	1 (2.78%)	
Thiazolidinediones: Not Prescribed	51 (92.7%)	18 (94.7%)	33 (91.7%)	1.000
Pioglitazone	4 (7.27%)	1 (5.26%)	3 (8.33%)	
AG Inhibitor : Not Prescribe	46 (83.6%)	18 (94.7%)	28 (77.8%)	0.141
Voglibose	9 (16.4%)	1 (5.26%)	8 (22.2%)	

largely on the expenditure component in Anti-diabetic Therapy and it is important that clinicians ponder wisely while choosing the Anti-diabetic Drugs (be it in brand names or Generic names) in order to alleviate the Pharmacoeconomic burden and improve the health status of the patient[10]. As a result, we have conducted this study to know the prescription patterns of drugs commonly used for the treatment of Type II Diabetes Mellitus and subsequently analyze the total cost burden on diabetic patients. The Hyperglycemia observed in diabetes may be followed by chronic complications like dysfunction and ultimately failure of different organs, especially Kidneys, Blood Vessels, Heart, Eyes and Nerves. In fact, the development of Diabetes Mellitus involves numerous pathophysiological events[11]. Diabetes Mellitus (DM) is a common and serious disease in America but one third of those affected are unaware they have it[12]. A systematic review was projected to give an outline of the pecuniary evaluations of preventive measuress in Type 2 DM. Different Databases were searched for drawing conclusion from the result obtained, The important one states that, stringent control of Blood Pressure is considerably more cost-effective than less strict control. This was described in 6 studies[13]. In another systematic review, clinical effectiveness and cost-effectiveness of two drugs rosiglitazone and pioglitazone in the treatment of DM (Type II) was compared[14], whereas in another study, safety, effectiveness and cost of DPP-4 inhibitors were compared with intermediate acting Insulin for DM (Type II)[15]. The prescriptions of 55 Diabetic Patients were collected and scrutinized. Demographic analysis shows that the mean age of the participants was 55.8 years with a range between 34 and 72 years, which is congruous with the demographic findings of the study by Acharya *et al*[16]. This indicates a preponderance of Type II Diabetes Mellitus in middle-aged individuals, which may have a significant negative influence on quality of life. A higher percentage of females (56.4%) as compared to males (43.6%) was observed in our study

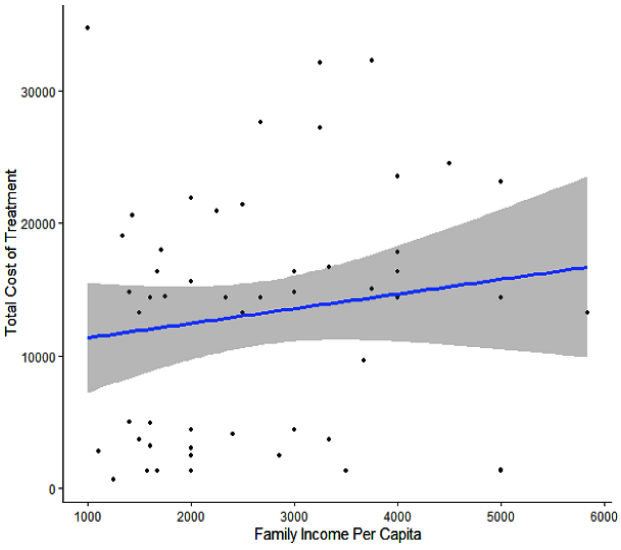

Fig 3 — Family income per capita has weak positive correlation with total cost of treatment (Pearson's r = 0.145, p-value = 0.287)

as opposed to the study by Abdi *et al*[17]. The average duration of Type II Diabetes Mellitus in the participants was found to be 5.69 (±3.68) years which is much less compared to the findings in the study by de Pablo-Velasco *et al*[18]. These disparities may be due to the limited sample size and shorter duration of the study. 49.1% of the participants (27 out of 55) presented with a family history of Type II Diabetes Mellitus, meaning either one or both of their parents suffered from the same. This in contrast to the findings of Kannan *et al,* where the majority of Diabetic Patients showed Genetic preponderance[19]. However, it is in consistency with the low prevalence of Genetic Preponderance as found by Assefa *et al*[20]. Recent laboratory investigations showed that 65.45% (36 out of 55) participants were hyperglycemic, with the mean FBS levels being 158 (±74.5) mg/dl. This is in accordance with the findings of Assefa *et al*[20]. In our study, the total number of medications used in clinical practice on an average was found to be 6.98 (±2.41), while the number of prescribed Anti-diabetic Drugs was 2.55(±1.07). This is a relatively high number, which indicates the trend of polypharmacy in treatment of Type II Diabetes Mellitus. Furthermore it was found that a relatively higher frequency of drugs were being prescribed as brand names (mean of 4.02), as compared to prescription of drugs in Generic names (mean of 3.0). This indicates a tendency of Pharmaceutical Companies to influence prescription patterns of Anti-diabetic Drugs. On the other hand, this may also be an effort on the part of the Physician to maintain standard quality of drug composition, to prevent Pharmacies from selling only specific brands which provide higher profit margins.The preferred route of Drug Administration was found to be oral in 49 cases (89.09%) with injectable insulin prescribed in only 6 participants(10.9%) which is in agreement with the study by Abidi *et al*[10]. This is assumably due to the fact that the study was performed in OPD conditions and injectable Insulin was prescribed only when the Blood Glucose parameters were not well controlled by oral anti-diabetic drugs. Biguanide, that is, Metformin was the most frequent Anti-diabetic Drug to be used in clinical practice (53 participants, 96.4%), followed by DPP-4 inhibitors like Sitagliptin and Vildagliptin in 36 cases (65.45%) and Sulphonylureas like Glimepiride and Gliclazide in 30 cases (54.54%). This conforms to the findings of Acharya *et al*[16]. However it is in complete contrast to the study by Abdi *et al* which is conducted during hospital stay of the patients[17]. The total cost of treatment was significantly higher in presently hyperglycemic patients under Anti-diabetic Therapy compared to their Normoglycemic counterparts. This is in par with the finding in our study that the total number of medications advised in presently Hyperglycemic patients exceeds the number prescribed in presently Normoglycemic patients. This may also be due to the requirement of additional drugs for associated comorbidities or complications, which may manifest earlier in case of poorly controlled Type II Diabetes Mellitus. Furthermore in our study, the total cost of treatment and per capita family income are found to be positively correlated, but the Pearson's correlation coefficient was relatively low (r=0.145). This suggests that the total cost of treatment remains limited to a specific range (13182 ± 9094) irrespective of the Socioeconomic status of the patient. This may indicate increased Economic burden on the patients from lower and lower middle Socioeconomic classes. It may be presumed that better prescription practices by prescribing drugs with the knowledge of market drug prices would significantly eliminate this problem. A study by Frazier *et al* shows that patients' drug expenditure can be reduced by providing a manual of comparative drug prices annotated with prescribing advice to Physicians[21].

Conclusions

In our study, the number of Hyperglycemic patients far exceeded the number of Normoglycemic patients, despite both groups being under anti-diabetic therapy. As a result, the average tally of Anti-diabetic Medications prescribed in Hyperglycemic patients is higher as compared to their Normoglycemic counterparts. The most common Anti-diabetic Drug used in clinical practice is Metformin, followed by DPP-4 inhibitors and Sulphonylureas and the most preferable route of drug administration is oral route in the prescriptions analyzed in our study. The total cost of treatment in presently Hyperglycemic patients under Anti-diabetic Therapy was significantly high, though the average total cost was limited to a specific high range for all included Socioeconomic classes. In most of the patients, the monthly expenses due to Anti-diabetic Therapy is significantly high, which increases the Economic burden of those belonging to lower Socioeconomic classes. Thus, a need for rational prescribing as well as Physician knowledge of current drug prices is felt, to ensure patient compliance. The conduction of this study was faced with multiple limitations like the COVID-19 pandemic which delayed the study process and also decreased OPD Department influx in the hospital (converted to a COVID-19 center during the pandemic) where the study was

carried out. As a result, the sample size is relatively small, which may increase errors. This study could be improved by increasing the sample size and also conducting the study over a longer duration of time.

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