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Prescribing Pattern of Medication in Type 2 Diabetes Mellitus with Metabolic Syndrome

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Abstract

Introduction: Metabolic syndrome (MS) or X syndrome refers to simultaneous occurrence of cardiovascular risk factors such as abdominal obesity, high blood pressure and abnormal carbohydrate and lipid metabolism (hypertriglyceridemia, elevated blood glucose) and decrease in high density lipoprotein (HDL) level. Type 2 diabetes mellitus with metabolic syndrome is a multifaceted disease and needs multiple drug therapy. The present study was aimed to assess the prescribing pattern of medication among diabetic patients with metabolic syndrome and to find the associated socio-demographic factors.

Material and Methods: It was a hospital based observational study. The prescriptions of 102 patients of type 2 diabetes mellitus with metabolic syndrome were collected and analyzed to evaluate the sociodemographic data and prescribing pattern of medication.

Results: In antidiabetic therapy, 70.6% of patients were on combination therapy while 29.4%patients were on monotherapy. The most common prescribed anti-diabetic group, either as monotherapy or as combination therapy was biguanides(86.27%). In anti-hypertensive therapy 60.72% of patients were on combination therapy while 39.28% patients were on monotherapy. The most common prescribed antihypertensive group either as monotherapy or combination therapy was angiotensin receptor antagonists (69.04%). The most commonly prescribed hypolipidemic was statins (78.84%) while other drugs constituted only 21.15%.

Conclusion: there was increase in average number of drugs per prescription (8.62) but also very less number of drugs prescribed by generic names (22%). Multiple drug therapy was used to alleviate the pleiotropic effects of this metabolic disorder. Physician should prescribe more drugs by generic name and from essential drug list and more stress should be given on lifestyle modification than polypharmacy.

Keywords: Syndrome X, Anti-diabetic, Anti-hypertensive, Hypolipidemic.

Introduction

Modernization of life style and dietary habits has given birth to enemies of mankind such as obesity, metabolic syndrome, and type II Diabetes Mellitus (DM). Metabolic syndrome (MS) or X syndrome refers to simultaneous occurrence of cardiovascular risk factors such as abdominal obesity, high blood pressure and abnormal carbohydrate and lipid metabolism (hypertriglyceridemia, elevated blood glucose) and decrease in high density lipoprotein (HDL) level.[1] About 50% of patients with type 2 diabetes are suffering from metabolic syndrome and these people have more chances for stroke, retinopathy, neuropathy and microalbminuria.[1] Prevalence of metabolic syndrome is increasing in different region like Asia[2] and developing countries.[3] Prevalence of metabolic syndrome has been reported between 12.8% to 41.1% in different part of the world.[4]

Medications for DM need to be taken for the entire life and factors like efficacy, side effects, drug interactions and cost of therapy need to be taken into consideration. Prescribing patterns and indicators of prescription quality for DM patients show wide variability in different parts of the world.[5-9]

Drug utilization study is considered to be one of the most effective method to assess and to evaluate the prescribing attitude of a physician. It helps to promote the rational use of drugs and practice of evidence based medicine. As type 2 diabetes mellitus with metabolic syndrome is a multifaceted disease and needs multiple drug therapy, it further become very important to know about the prescribing pattern of medication in this disease.

The present study was aimed to assess the prescribing pattern of medication among diabetic patients with metabolic syndrome and to find the associated socio-demographic factors.

Material and methods

It was a hospital based observational study. The prescriptions of all patients with type 2 Diabetes mellitus with metabolic syndrome admitted in Mahatma Gandhi Medical College during the one year period from September 2016 to September 2017 were collected. Due approval was taken from Institutional Ethical Committee before undertaking this study.

According to Adult treatment panel (ATP) III criteria, all the prescriptions of patients aged >18 years with type 2 diabetes mellitus with any two of the following were included in the study.

- waist circumference greater than 102 cm in men and 88 cm in women
- Blood pressure: ≥ 130/85 mmHg
- Dyslipidemia: triglycerides (TG): ≥ 150mg/dl (1.69mmol/L) and high-density lipoprotein cholesterol (HDL-C) ≤ 40mg/dl (1.04mmol/L) in male, ≤ 50mg/dl (1.29 mmol/L) in female.

All the patients who do not meet the inclusion criteria; Pregnant and lactating women; Patients with secondary causes of obesity; Malignancy; Thyroid disorders and severe hepatic or renal disease patients were excluded from the study.

The prescriptions of 102 patients meeting the inclusion and exclusion criteria were collected after taking permission from medical record department officer from medicine. The prescription were analyzed to evaluate the sociodemographic data and prescribing pattern of medication in patients of diabetes mellitus with metabolic syndrome. Sociodemographic data such as age, gender and rural/urban collected in a predesigned and pretested case report form from prescriptions.

WHO prescribing indicators was estimated

A. Average number of drugs per encounter was calculated by dividing the total number of

different drug products prescribed by the number of encounters surveyed.

B. Percentage of drugs prescribed by generic name was determined by dividing the number of drugs prescribed by generic name by the total number of drugs prescribed, multiplied by 100.

C. Percentage of encounters with an antibiotic prescribed.

D. Percentage of encounters with an injection prescribed were calculated by dividing the number of patient encounters during which an antibiotic or an injection was prescribed by the total number of encounters surveyed, multiplied by 100.

E. Percentage of drugs prescribed from essential drug list was determined by dividing the number of products prescribed from essential drug list of the hospital by the total number of drugs prescribed, multiplied by 100.

Data was entered in Microsoft Office Excel Worksheet. Data was analysed and is interpreted in proportions and percentages.

Results

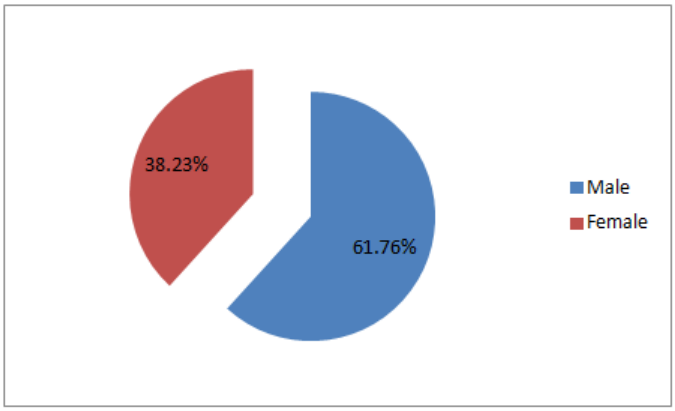
In this observational study, a total of 102 prescriptions of patients of diabetes mellitus with metabolic syndrome were analysed.

Table 1: Distribution according to Age group and average number of drugs prescribed per encounter

Age (years)	Average number of drugs prescribed per encounter				Total
	<5	5-8	8-10	> 10	
31-40	2	4	5	3	14
41-50	5	7	8	5	25
51-60	2	9	15	10	36
61-70	1	2	7	8	18
> 71	0	1	2	6	9

The maximum number of patients belong to the age group of 51-60 years (35.3%) followed by 41-50 years (24.5%), 61-70 years (17.6%), 31-40 years (13.7%) and >71 years (8.8%) (Table 1).

Figure 1: Pie chart showing distribution according to gender.



In the present study, 38.23% were males and 61.76% were females. (Figure 1). Distribution of respondents according to place of residence shows that out of 102 patients, 34.31% belongs to rural area and 65.68% belongs to urban area, indicating prevalence of it is more common in urban area compared to rural area. (Figure 2)

Fig 2: Distribution of respondents according to place of residence

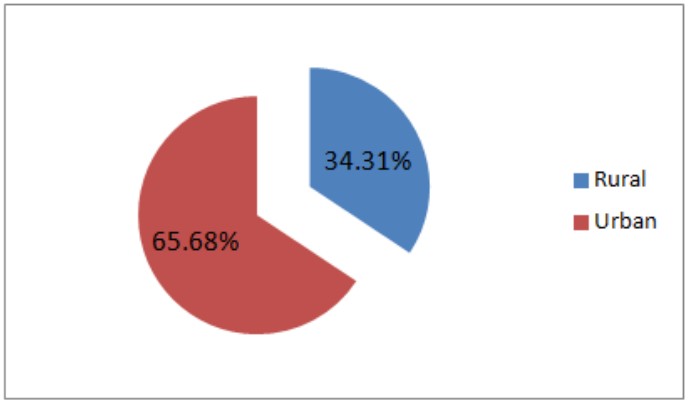
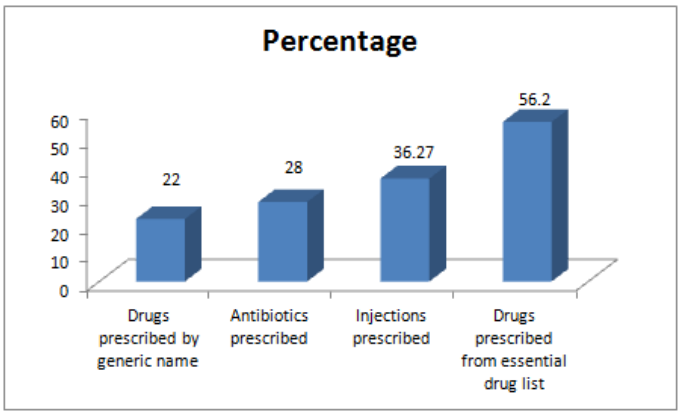
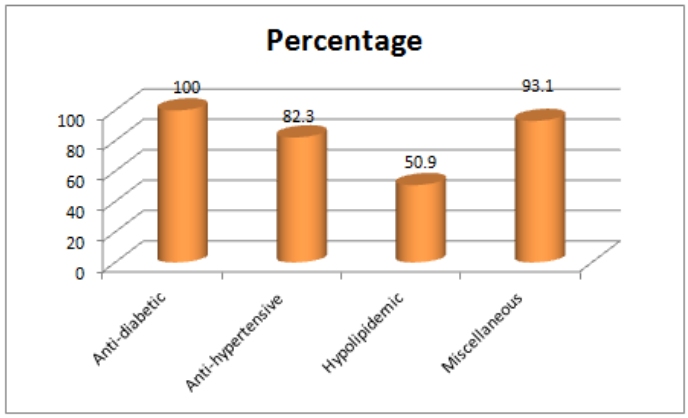


Fig 3: Distribution according to drugs prescribed by generic names, antibiotic, injections prescribed and drugs prescribed from essential drug list



In the present study, the average number of drugs per prescription was 8.62. Figure 3 showed the distribution according to drugs prescribed by generic names, antibiotic, injections prescribed and drugs prescribed from essential drug list . Percentage of drugs prescribed by generic name was 22% only; percentage of prescriptions with antibiotic was 28%; percentage of prescriptions with an injection was 36.27%; and percentage of drugs from essential drug list was 56.2%.

Figure 4: Bar diagram showing the percentage of medications prescribed

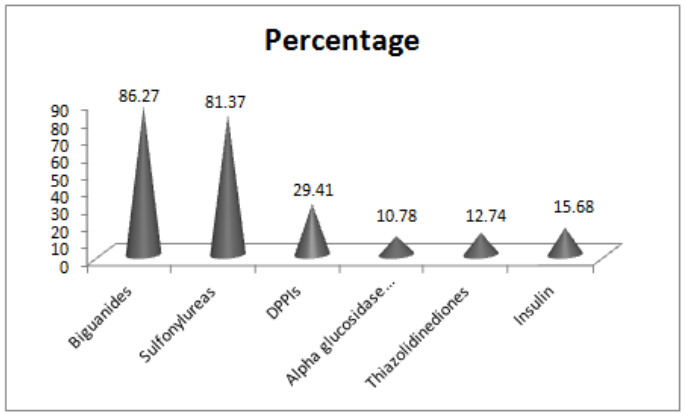


Analysis of the prescriptions revealed that the most common prescribed medication group was that of anti-diabetic drugs (100%) followed by antihypertensive drugs (82.3%) and hypolipidemic drugs(50.9%). Miscellaneous drugs (e.g. PPIs, antiplatelet drugs, multivitamins, analgesics, etc.) was prescribed in 93.1% of the patients (Figure 4).

Table 2: Distribution according to combination of anti-diabetic drugs prescribed (Total – 102)

	Antidiabetic drugs	Frequency	Percentage
Monotherapy	BI	8	7.84
	SU	6	5.88
	IN	13	12.74
	DPPIs	3	2.94
Two drug combinations	BI + SU	43	42.15
	BI + AG	3	2.94
	IN + DPPIs	2	1.96
	SU + DPPIs	2	1.96
	BI + TH	1	0.98
	IN + TH	1	0.98
Three drug combinations	BI + SU + DPPIs	19	18.62
	BI + SU + TH	5	4.90
	BI + SU + AG	1	0.98
	DPPIs + TH + AG	1	0.98
	IN + BI + AG	1	0.98
	SU + TH + AG	1	0.98
Four drug combinations	BI + SU + TH + AG	4	3.92
	BI + SU + DPPIs + TH	2	1.96
Five drug combinations	BI + SU + DPPIs + TH + AG	2	1.96

Figure 5: Distribution according to type of anti-diabetic medication prescribed

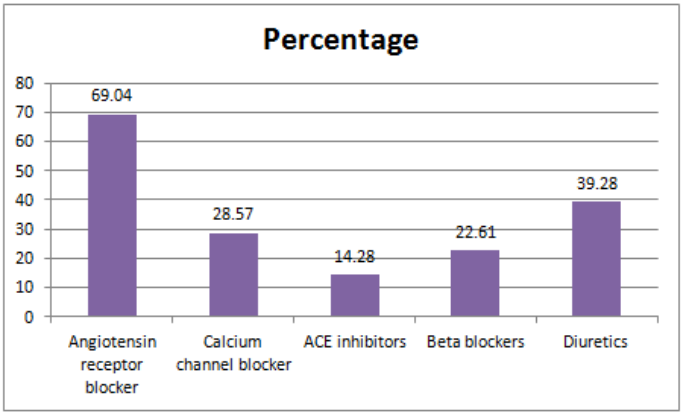


Upon further analysis of anti-diabetic therapy (Table 2, Figure 5), 70.6%of patients were on combination therapy while 29.4%patients were on monotherapy (Table 2). Overall,the most common prescribed anti-diabetic group,either as monotherapy or as combination therapy,was biguanides(86.27%) followed by sulphonylureas(81.37%), DPPIs (29.41%), α-Glucosidase inhibitors(10.78%), thiazolidinediones (12.74%) and insulin (15.68%)(Table 4). While, the most common prescribed antidiabetic group as monotherapy was insulin (12.74%) followed by biguanides(7.84%), sulphonylureas (5.88%) and DPPIs (2.94%). The two- drug anti-diabetic combination was prescribed in 50.97% of patients. The most common prescribed two-drug anti-diabetic combination was that of biguanides + sulphonylureas (42.15%). The three- drug anti-diabetic combination was prescribed in 26.46% of patients. The most common prescribed three-drug anti-diabetic combination was that of biguanides + sulphonylureas + DPPIs (18.62%). The four- drug anti-diabetic combination was prescribed in 5.88% of patients. The most common prescribed four-drug anti-diabetic combination was that of biguanides + sulphonylureas + thiazolidinediones + α-Glucosidase inhibitors (3.92%). The five-drug antidiabetic combination consisting of biguanides+ sulphonylureas + DPPIs+ thiazolidinediones + α-Glucosidase inhibitors was prescribed in only 1.96% of patients.

Table 3: Distribution according to combination of Antihypertensive drugs prescribed (Total – 84)

	Antidiabetic drugs	Frequency	Percentage
Monotherapy	ARB	22	26.19
	CCB	4	4.76
	ACEI	4	4.76
	BB	2	2.38
	DI	1	1.19
Two drug combinations	ARB + DI	18	21.42
	BB + CCB	4	4.76
	ACEI + DI	2	2.38
	ARB + BB	2	2.38
	ARB + CCB	4	4.76
	CCB + ACEI	1	1.19
	BB + ACEI	1	1.19
	BB + DI	1	1.19
Three drug combinations	BB + ACEI + DI	3	3.57
	ARB + BB + CCB	4	4.76
	ARB + BB + DI	2	2.38
	ARB + CCB + DI	3	3.57
	BB + CCB + ACEI	1	1.19
Four drug combinations	ARB + BB + CCB + DI	3	3.57
Others		2	2.38

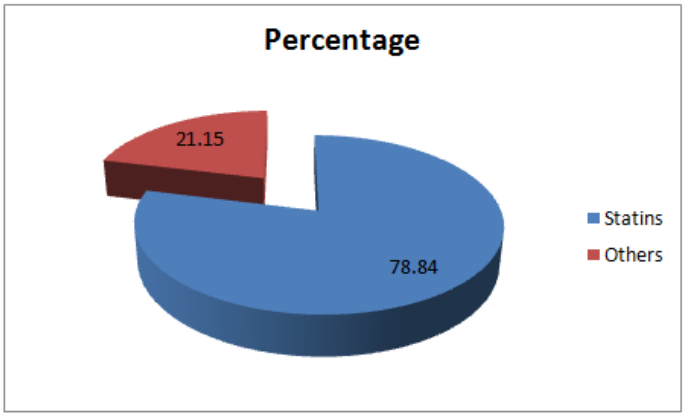
Figure 6: Distribution according to type of anti-hypertensive medication prescribed



As far as anti-hypertensive therapy is concerned, 60.72% of patients were on combination therapy while 39.28% patients were on monotherapy (Table 3, Figure 6). Overall, the most common prescribed antihypertensive group either as monotherapy or combination therapy was angiotensin receptor antagonists (69.04%) followed by diuretics (39.28%), CCBs (28.57%), beta-blockers (22.61%), and ACEinhibitors (14.28%).

The most common prescribed anti- hypertensive group as monotherapy was angiotensin receptor blockers (26.19%) followed by CCBs (4.76%), ACE inhibitors (4.76%), beta-blockers (2.38%) and diuretics (1.19%). The patients on two-drug combination therapy were 39.27% while patients on three-drug and four-drug combination therapy were 16.47% and 4.95% respectively. The most common prescribed two drug anti-hypertensive combination was that of ARBs+ diuretics (21.42%). The most common prescribed three drug anti-hypertensive combination was that of ARBs+ beta-blockers+ CCBs (4.76%). The commonly prescribed four-drug anti-hypertensive combination was that of ARBs+ beta-blockers + CCBs+ diuretics (3.57%) and other combinations contribute to 2.38% cases.

Figure 7 : Pie chart showing type of Hypolipidemic drugs prescribed (Total – 52).



The most commonly prescribed hypolipidemic drug was statins (78.84%) while other drugs constituted only 21.15% (Figure 7).

There were many other drug groups which were prescribed in the patients of diabetes mellitus with metabolic syndrome. Among these, the most common drug group was multivitamins (56%), followed by antiulcer drugs(60%), anti-platelet drugs (40%), minerals (36%), analgesics (30%), anxiolytics (20%) and antibiotics (20%) and others (10%).

Discussion

In the present study, the maximum number of patients belong to the age group of 51-60 years (35.3%) followed by 41-50 years (24.5%), 61-70 years (17.6%), 31-40 years (13.7%) and >71 years (8.8%). Mean age of presentation of patients was 57.5 years. Similar to the Prashant S et al [(1)], Roohafza H et al [(10)] and Tziallas D et al [(11)] reported the mean of patients of metabolic syndrome to be 58.2, 56.5 and 58.4 years respectively.

Out of a total of 102 patients, 39 (38.23%) were female and 51 (61.76%) were male patients, indicating a male preponderance of the disease. A similar study conducted by Adla N et al [(2)] showed similar results. A study by Prashant S et al [(1)], Roohafza H et al [(10)], Mangat C et al [(3)] reported higher number of female patients (57%, 67.9% and 59.6% respectively) than male patients (43%, 32.1% and 40.4% respectively).

Distribution of respondents according to place of residence shows that out of 102 patients, 34.31% belongs to rural area and 65.68% belongs to urban area, indicating prevalence of it is more common in urban area compared to rural area. Studies by Adla N et al [2] and Patel NR et al [4] also showed higher prevalence in urban area compared to rural areas.

In the present study, average number of drugs per prescription was 8.62; percentage of drugs prescribed by generic name was 22% only; percentage of prescriptions with antibiotic was 28%; percentage of prescriptions with an injection was 36.27%; and percentage of drugs from essential drug list was 56.2%

Similar studies conducted by Prashant S et al [1] and Adla N et al [2] reported that average number of drugs per prescription was 5.64 and 4.38 respectively; percentage of drugs prescribed by generic name was 3.19% and 90.73% respectively; percentage of prescriptions with antibiotic was 3% and 0.11% respectively; percentage of prescriptions with an injection was 8% and 0% respectively and percentage of drugs from essential drug list was 52.62% and 95.4% respectively.

In the present study, 100% of patients were on antidiabetic therapy out of which 70.6% of patients were on combination therapy while 29.4%patients were on monotherapy. A similar study done by Shamna M et al [5] reported that 47.5% of type 2 diabetes mellitus patients were on monotherapy while 52.5% were treated with a combination of anti-diabetic drugs. Rani J et al [6] found in their study that the frequency of use of anti-diabetic drugs in type 2 diabetes mellitus as monotherapy is 74.5% and as combination therapy is 24.5%.

Overall, the most common prescribed anti-diabetic group, either as monotherapy or as combination therapy was biguanides (86.27%) followed by sulphonylureas (81.37%), DPPIs (29.41%), α-Glucosidase inhibitors (10.78%), thiazolidinediones (12.74%) and insulin (15.68%). Sharma S et al [9] in their study found biguanides (85.6%) the most commonly prescribed anti-diabetic drug followed by sulfonylureas (59.8%), thiazolidinediones (26.6%), DPP-inhibitors (26%) and alpha- glucosidases inhibitor (12.2%). Patel B et al [10] found that metformin (87.7%) is the most utilized anti-diabetic drug for type 2 diabetes followed by sulphonylureas (68.4%), insulin (22.8%), α-Glucosidase inhibitors (21.1%) and thiazolidinediones (10.5%).

As far as anti-hypertensive therapy is concerned, 60.72% of patients were on combination therapy while 39.28% patients were on monotherapy. Panda BB et al [9] reported that among diabetic hypertensives, 31% of patients were treated with single anti-hypertensive drug and 69% of patients were treated with combinations.

Overall, the most common prescribed antihypertensive group either as monotherapy or combination therapy was angiotensin receptor antagonists (69.04%) followed by diuretics (39.28%), CCBs (28.57%), beta-blockers (22.61%), and ACEinhibitors (14.28%).

A study by Prashant Shukla et al [1] showed that The most common prescribed anti- hypertensive group as monotherapy was angiotensin receptor blockers (12%) followed by CCBs (7%), ACE inhibitors (2%), beta-blockers (2%) and diuretics (1%). Dhanaraj E et al [12] reported that among diabetic hypertensives, ACE inhibitors (47%) was the most commonly anti-hypertensive agent used as monotherapy followed by angiotensin receptor blockers (36%), CCBs (12%), beta-blockers (5%) and diuretics (0.2%).20 Panda BB et al [9] reported that among diabetic hypertensives, angiotensin receptor blockers (22.8%) was the most commonly employed anti-hypertensive agent as monotherapy followed by CCBs (16.1%) and beta-blockers (12.7%).

The present study showed that most commonly prescribed hypolipidemic was statins 78.84%) while other drugs constituted only 21.15%. A similar study by Prashant

Shukla et al [1] showed 60% patients were prescribed was statins while 3% were prescribed other drugs. Patel B et al [8] found that use of hypolipidemic drugs was seen in 56% of the patients. Statins were prescribed in all patients on hypolipidemic drugs. Raja S et al [13] reported Atorvastatin to be the most common hypolipidaemic drug prescribed as monotherapy (53.4%) in diabetic hypertensive patients.

Conclusion

Diabetes mellitus with metabolic syndrome is multifaceted disease associated with multiple disorders. Not only antidiabetics but several other drugs are used to manage the concomitant factors attributing to morbidity. Which results in polypharmacy that gives rise to non compliance, increase cost of treatment, drug interactions and lot of drug related adverse effects.

The results of this study revealed that maximum number of patients of diabetes mellitus and metabolic syndrome belongs to age group 51-60 yrs (35.3%) and more commonly in males 61.76%. They were more from urban area. Lifestyle changes and increase in stress factors leading to increase in prevalence of obesity may be the cause. Not only there was increase in average number of drugs per prescription (8.62) but also very less number of drugs prescribed by generic names 22% which further increasing the economic burden on the patients. Large number of antibiotics was prescribed (28%). Drugs given in injectable form was also high (36.27%). As they are highly prone for infections due to their metabolic disorder. Mainly drugs was prescribed from essential drug list (56.2%)

In present study mostly patients were on combination therapy (70.6%) than on monotherapy (29.4%). Overall, the most common prescribed anti-diabetic group, either as monotherapy or as combination therapy was biguanides(Metformin)(86.27%) followed by sulphonylureas (Glimepiride)(81.37%) and then comes DPPIs (Sitagliptin)(29.41%). Insulin was given in 15.68% as monotherapy and in combination with other antidiabetic drugs. Newer insulin analogues were used more commonly 12.5%.

Overall, the most common prescribed antihypertensive group either as monotherapy or combination therapy was angiotensin receptor antagonists (69.04%) followed by diuretics (39.28%)) and hypolipidimic drug was statins (78.84%). Telmisartan (58%) in antihypertensive and Atorvastatin (62%) in statins is most commonly prescribed.

Among other drugs prescribed, the most common drug group was multivitamins (56%), followed by antiulcer drugs(60%).

The choice of drugs was based on their efficacy and least adverse effects. Multiple drug therapy was used to alleviate the pleiotropic effects of this metabolic disorder which has greatly increased the socioeconomic burden on the patients. Therefore more stress should be given on their lifestyle modification then polypharmacy by physician and they should prescribe more drugs by generic name and from essential drug list.

There is a need of more such studies on metabolic syndrome as it is a major risk factor of cardiovascular disease in diabetics and associated with greater health care costs and increased risk of adverse drug events (ADEs), drug –interactions, medication non-adherence, reduced functional capacity and poor quality of life. This type of studies are one of the most effective methods to assess and evaluate the prescribing attitude of physician and help to promote rational use of drugs.

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