



Trends and management of comorbid conditions in diabetes mellitus type 2 patients in a tertiary care hospital

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ABSTRACT

Across the globe, India has second prevalent diabetic people. The effect of diabetes mellitus associated with various long term comorbid conditions. Chances of increases in blood pressure or hypertension affect 70% of diabetic patients. Dyslipidemia is often concomitant with diabetes and is correlated to an increased risk of CVD. The study aimed to evaluate the occurrence of comorbidities among type 2 diabetes patients and its pharmacotherapy. It was a cross-sectional observational study carried out on patients who were 18 years and above with a diagnosis of diabetes type 2 with comorbidity. The data was recorded, medication status of all patients was reviewed, organized, and expressed as counts and percentages. Out of 142 subjects 55.63 % (n = 79) were males, 44.36 % (n = 63) were females and mean age of the sample was 56.84 (\pm 11.24) years. Out of 142 patients, 88.02 % (125) were concomitant with severe complications like ischemic heart disease, hypertension, and hyperlipidemia remaining 13.6% (17) were associated with other complications. The most commonly prescribed drugs for hypertension were telmisartan (46 %), followed by telmisartan and amlodipine (22 %). In ischemic heart disease, the most common combination of aspirin and atorvastatin (76.92 %) was prescribed. In hyperlipidemia, atorvastatin (50 %) was prescribed most commonly. The present study results suggest the significance of various combinations of comorbidity could shed light on a probable common etiology, and then on probably protective measures.



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INTRODUCTION

Diabetes mellitus (DM) is the main public health issue worldwide. Globally, estimation of DM is 371 million individuals and nearly 80% live in middle and low-income countries. ([American Diabetes Association, 2013](#)) The expected count of individuals to have DM by 2030 is over 550 million. In India, the number of people with diabetes has inclined from 61 million in 2011 to 67 million in 2014. Across the globe, India has the second-largest diabetic population after China in the world. ([International Diabetes Federation, 2012](#); [Pati and Schellevis, 2017](#))

The effect of DM associated with various long term comorbid conditions like hypertension, hyperlipidemia, and other cardiovascular disorders (Druss *et al.*, 2001; Wolff *et al.*, 2002; Kerr *et al.*, 2007). Some studies have been shown that prescriptions of diabetic patients contain numerous antihypertensives, antihyperlipidemic, and antiplatelets along with antidiabetics. (Tinetti *et al.*, 2004; Piette and Kerr, 2006) In 70% of diabetic patients, the risk of developing hypertension is twofold as compared to normal individuals. A study conducted in California has been shown that 41.5% of diabetic patients co-prescribed with at least one antihypertensives agent. (Karter *et al.*, 2009)

Dyslipidemia is frequently concomitant with diabetes and is correlated to an increased risk of CVD. Hypolipidemics, mostly statins, are recommended to decrease the risk of CVD. A study conducted in 2013 in Gujarat, India, showed 15.41% were prescribed hypolipidemic drug atorvastatin. (Shah *et al.*, 2013) Observational studies in Germany and North Carolina highlighted 25.5% and 37.7% of the diabetic patients had prescribed at least one statin, respectively. (Berthold *et al.*, 2009; Pauff *et al.*, 2015) Platelets are involved in the process of development of thrombus and are thus engaged in blood clotting. Platelets thus play a key role in the development of atherogenesis (fat deposition of the artery walls), thereby causing blockage of the arteries and increasing the risk of ischemia. (Angiolillo, 2009) Thus, the inclusion of antiplatelet therapy in diabetic patient is essential to reduce the chances of ischemia. An observational study conducted in Gujarat, India, revealed 18.9% of the diabetic population was prescribed aspirin. (Shah *et al.*, 2013) The study aimed to evaluate the prevalence of comorbidities among type 2 diabetes patients and its pharmacotherapy.

MATERIALS AND METHODS

It was a cross-sectional observational study conducted at Santosh Medical College in collaboration with AIIMS Bhopal. The present study involved patients who were 18 years and above age with a diagnosis of diabetes type 2 with comorbidity. The patient selected was interviewed and the objectives of the study were discussed with them. Information was noted from a prescription that had been prescribed to the patients by a Doctor. This proforma included patient detail, the prescribed drug with its dose, frequency, and duration. The data was recorded, medication status of all patients was reviewed, organized, and expressed as counts and percentages. Patients who meet our study criteria were randomly selected for participation.

After receiving the informed consent, demographics details, past medication history, and current treatment charts were recorded in the data collection form.

RESULTS

During the study period, a total of two hundred and fifty-five patients were reviewed, among them, 142 patients were enrolled in the study.

Demographic Characteristics of Patients

Out of 142 subjects 55.63 % (n = 79) were males, 44.36 % (n = 63) were females and mean age of the sample was 56.84 (\pm 11.24) years. The study reveals a higher incidence of diabetes in the middle age group of 41 – 60 years (Table 1).

Out of 142 patients, 88.02 % (125) were concomitant with severe complications like ischemic heart disease, hypertension, and hyperlipidemia remaining 13.6 % (17) were associated with other complications like hypothyroidism, epilepsy, and benign prostatic hyperplasia, etc. Of all patients, 55.63 % had single comorbidity, 42.95 % had two comorbidities and 1.4 % was diagnosed with 3 or more comorbidities (Figure 1).

The most commonly prescribed drugs for treating hypertension were telmisartan (46 %), followed by telmisartan and amlodipine (22 %) (Table 2). In ischemic heart disease, the most common combination of aspirin and Atorvastatin (76.92 %) followed by aspirin (23.07 %) were prescribed.

Atorvastatin (50 %) was prescribed most commonly followed by simvastatin (25 %) and atorvastatin + fenofibrate (25%) in patients with hyperlipidemia as a comorbid condition (Table 3).

Telmisartan and aspirin + atorvastatin most commonly prescribed drugs for treating hypertension and ischemic heart disease as a comorbid condition. (Table 4)

In Table 5, in a condition such as Hypothyroidism, Levothyroxine was used. For epilepsy Divalproex used. Tamsulosin was prescribed for Benign prostatic hyperplasia and Methylcobalamin + pregabalin was prescribed for Neuropathic pain.

DISCUSSION

Out of 142 patients, 55.63 % (n = 79) were males, 44.36 % (n = 63) were females and the mean age of the study subjects was 56.84 (\pm 11.24) years. In contrast to this, a study conducted in Kolkata, India, revealed that 46 % were men and 54 % were women, and the mean age was 51.5 (\pm 0.78) slightly

Table 1: Demographic profile of patients

Age in years	Number of patients		Total (Percentage distribution)
	Male	Female	
18 - 40 years	2	9	11 (7.74 %)
41 - 60 years	36	37	73 (51.40 %)
61 – 80 years	41	17	58 (40.84 %)
Total (Percentage distribution)	79 (55.63%)	63 (44.356 %)	142 (100 %)

Table 2: Drugs used in the therapy of diabetes mellitus with hypertension patients

Drugs used	Percentage
Telmisartan	46 %
Telmisartan + amlodipine	22 %
Telmisartan + hydrochlorothiazide	16 %
Amlodipine	4 %
Enalapril	4 %
Ramipril	2 %
Telmisartan + hydrochlorothiazide, atorvastatin	2 %
Ramipril, atorvastatin	2 %

Table 3: Drugs used in the therapy of diabetes mellitus patients with hyperlipidemia patients

Drugs used	Percentage
Atorvastatin	50 %
Simvastatin	25 %
Atorvastatin + fenofibrate	25 %

Table 4: Drugs used in the therapy of diabetes mellitus patients with Hypertension and Ischemic heart disease

Drugs used	Percentage
Telmisartan, aspirin + atorvastatin	30.43 %
Telmisartan + amlodipin, aspirin + atorvastatin	21.73 %
Ramipril, aspirin + atorvastatin	19.56 %
Telmisartan + clorthalidone, aspirin + atorvastatin	17.39 %
Telmisartan + amlodipin + hydrochlorothiazid , aspirin + atorvastatin	6.52 %
Telmisartan + hydrochlorothiazide, aspirin + atorvastatin	4.34 %

Table 5: Drugs used in the therapy of diabetes mellitus patients with other comorbid conditions

Comorbid condition	Drug used
Hypothyroidism	Levothyroxine
Epilepsy	Divalproex
Benign prostatic hyperplasia	Tamsulosin
Neuropathic pain	Methylcobalamin + pregabalin

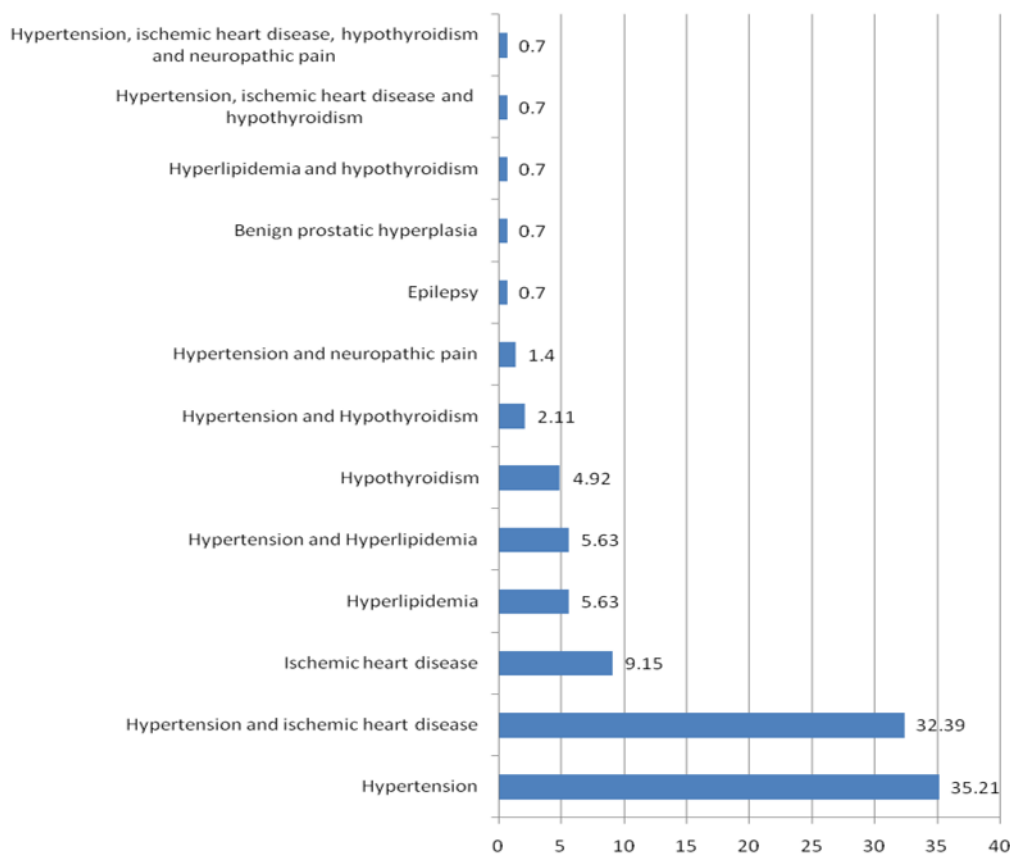


Figure 1: Percentage of comorbid conditions among type 2 diabetes patients (N=142)

greater than the present study. (Adhikari *et al.*, 2018) In the present study 73 (51.40 %) patients belonged to the age group of 41 – 60 years, whereas a study in Nepal revealed 37.91% of the patients belonged to the age group of 51 – 60 years. (Upadhyay *et al.*, 2007)

In the present study, 55.63 % of patients had single comorbidity, 42.95 % of patients had two comorbidities and 1.4 % of patients were diagnosed with 3 or more comorbidities. The present study contradicting Pati S and Schellevis *et al.*, in those study they had reported that 29% had single comorbidity, 25% had two comorbidities and 30% were diagnosed with 3 or more comorbidities. (Pati and Schellevis, 2017)

Diabetes complications are critical, which results in mortality and morbidity. Researches depicted that around 80% of diabetic patients die because of cardiovascular disorders. (Kumar *et al.*, 2018) It well-known fact, that hypertension is most commonly present in 50% of patients with DM. The increased risk for cardiovascular disease is 4 times higher with DM and HTN. In the present study, it was reported that hypertension (35.21 %) is the most common complication seen in patients. Likewise, a similar study also suggested that hypertension was accounted for 57.22% of the entire complications in

diabetes patients. (Singh *et al.*, 2017)

In the present study, the most commonly prescribed drugs for hypertension were telmisartan (46 %), followed by telmisartan and amlodipine (22 %). In ischemic heart disease, the most common combination of aspirin and Atorvastatin (76.92 %) were prescribed. In hyperlipidemia, atorvastatin (50 %) was prescribed most commonly. Whereas a study conducted in Karimnagar, Telangana revealed that ARB's and thiazides diuretics are prescribed in combination for treating HTN (46.68%) followed by ARB's (17.66%). Patients with increased cholesterol level were prescribed Atorvastatin. As in the case of elevated triglycerides, Fenofibrate was given to patients. Statins (72.72%), HMG CoA reductase inhibitors act on abnormal lipid levels and steady the atherosclerotic plaque. (Zhou and Liao, 2009) Patients with co-existing IHD, Aspirin (35.83%) an anti platelet drug prescribed.

According to the new American Diabetes Association (ADA 2020) recommendations, treatment for hypertension in diabetes patients should prescribe drug classes like angiotensin receptor blockers (ARBs), ACE inhibitors, thiazide-like diuretics, or dihydropyridine calcium channel blockers (CCBs). In patients with diabetes at more risk, with numerous atherosclerotic cardiovascular diseases

(ASCVD) risk aspects or aged 50–70 years, recommended use of high-intensity statin therapy. Aspirin therapy (75–162 mg/day) is recommended as the main inhibition approach in those with diabetes who are at the main risk of CVD. ([American Diabetes Association, 2020](#))

Uncontrolled diabetes mellitus type 2 influences triiodothyronine (T3) and thyroxine (T4) levels. ([Saunders et al., 1978](#)) The potential explanations hypothesized for a relationship between diabetes mellitus and hypothyroidism could be inherited, hormonal origin or biochemical. ([Wang, 2013](#)) In the present study, 4.92 % of patients had hypothyroidism as comorbidity, whereas a study on the occurrence of hypothyroidism with type 2 diabetes mellitus and hypertension in India concluded the prevalence of hypothyroidism with T2DM was 26.9%. ([Talwalkar et al., 2019](#)) Most of the patient with hypothyroid comorbidity treated with thyroxine, similarly more than 50% of the hypothyroid patients with T2DM alone, and T2DM + hypertension were given thyroxine. ([Talwalkar et al., 2019](#))

Diabetic neuropathy is a chronic complication, with changes in nervous functions due to their prolonged exposure to expanded glucose levels, which may incorporate neuropathic pain. Pathogenesis appears to be to include progressive sensory fiber axon degeneration, and additionally oxidative stress caused by increased free radicals formed as a function of high glucose levels. In the present study, 2.1 % of patients have neuropathic pain with other comorbidities, whereas Jose et al. study has shown neuropathic pain in 16.7% of diabetes mellitus type 2 patients. ([Cortez et al., 2014](#))

For the treatment of neuropathic pain, duloxetine and pregabalin have received regulatory approval by the FDA. According to ADA, pregabalin is the most studied drug for this purpose, and duloxetine has also shown efficacy. ([American Diabetes Association, 2020](#)) Whereas in the present study methylcobalamin + pregabalin used for the treatment of neuropathic pain. The present study represented a more prevalence of complications along with type 2 DM patients and consequently, numerous demands on the primary health care providers. Various complications managed independently by various health care professionals may result in a risk of disintegrated care among comorbidity patients. Our study underlines the significance for formulation need to be explored for primary health care guidelines for clinical care of diabetics which comprises not only diabetes care, but also care for the most common comorbid conditions. It also recommended the need

to discover the capability level of primary health care providers to notify these demands. The present study outcomes recommend the significance of further studies on the impact of multimorbidity on healthcare outcomes comprising healthcare utilization and quality of life.

CONCLUSION

This study shows diabetes mellitus associated comorbid conditions and the drug utilization pattern of co-morbidities. Among the various comorbidities, macrovascular comorbidities caused a major threat. In this study, males were more affected than females. It was observed that the maximum number of patients (51.40 %) was between the age group of 41- 60 years. Among the various comorbidities, hypertension (35.21 %) is the most common co-morbid condition seen in diabetes mellitus type 2 patients. In the present study, most commonly prescribed drugs for hypertension were telmisartan (46 %) followed by telmisartan and amlodipine (22 %). In ischemic heart disease, the most common combination of aspirin and atorvastatin (76.92 %) were prescribed. In hyperlipidemia, atorvastatin (50 %) was prescribed most commonly. Further analysis of different combinations of comorbidity could shed light on a possible common etiology, and then on possibly preventive measures.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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