

Original Study

Assessment of Chronic Complication and Treatment Outcome Among Indoor Patients of Diabetes Mellitus. An Observational Prospective StudyDr Joginder Singh Pathania¹, Dr Kiran Mokta², Dr Ramesh Gulepa³, Mr Arnav Mokta⁴, Dr Jatinder Kumar Mokta^{5*}*Junior Resident, Department of Internal Medicine, Indira Gandhi Medical College Shimla, Himachal Pradesh, India**Associate Professor, Department of Microbiology, Indira Gandhi Medical College Shimla, Himachal Pradesh, India**Assistant Professor, Department of Pharmacology, Indira Gandhi Medical College Shimla, Himachal Pradesh, India**MBBS Student, Dr YS Parmar Medical College, Nahan, Himachal Pradesh, India**Professor, Internal Medicine, Indira Gandhi Medical College Shimla, Himachal Pradesh, India***Corresponding Author:** Dr. Jatinder Kumar Mokta, E-mail: jkmokta@yahoo.co.in**ARTICLE INFO***Article history*

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Key words:Diabetes mellitus (DM),
Macrovascular,
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Retinopathy**ABSTRACT**

Background: Diabetes mellitus (DM) is often associated with a myriad of complications as the disease progresses. These cause significant morbidity and mortality among diabetic patients. There is a limited published data in this part of the country regarding the hospitalization patterns of diabetic patients, the reasons for admissions due to development of acute or chronic complications. **Objective:** To identify the type of diabetes related complications, their prevalence among indoor diabetic patients in a tertiary care hospital. **Method:** It was an observational - prospective study. **Results:** Out of Total 589 patients enrolled in the study, 366 (62.2%) patients were having microvascular complications, followed by macrovascular complications in 111(18.8%) patients and both microvascular and macrovascular complications in 60 (10.2%) patients. **Conclusion:** Most of the patients presented with microvascular complications, neuropathy being commonest. The patients of heart failure constituted a significant number followed by CAD. Most of the patients were having hypertension as an associated disease. The complications, duration of stay in the hospital and mortality was more in the patients having duration of stay more than 10 years.

INTRODUCTION

Diabetes mellitus (DM) is often associated with a myriad of complications as the disease progresses¹. It can be complicated by acute or/and chronic complications. These cause significant morbidity and mortality among diabetic patients. Individuals with diabetes have an increased risk for tuberculosis, severe gram-positive infections, hospital acquired post-operative infections, urinary tract infections (UTIs) and tropical diseases compared with people without diabetes². Studies have reported that diabetes and its complications were among the common reasons for inpatient admissions, accounting for about 4.4% of total admissions and 3.4% to 32.5% total deaths. Diabetes can be effectively managed well in the outdoor patient departments but due to various patient, physician and drug related factors most of the patients do not attain the optimum glycaemic control and land up in different complications and need hospitalization. Building

capacity of the primary health care system for early detection of diabetes, proper management and prevention would go a long way in preventing the complications due to diabetes³. Increasing amenities with sedentary life style and increasing prevalence of obesity suggest that diabetes will continue to remain a serious and growing health concern well into future also. Comprehensive clinical management of diabetes has significant impact on development of diabetic complications. Comparable data on trends in rates of diabetes complications, specifically from low- and middle-income countries, is lacking. There is a limited published data in this part of the country regarding the hospitalization patterns of diabetic patients, the reasons for admissions due to development of acute or chronic complications and timely use of insulin therapy. We aimed to identify the type of diabetes related complications, its prevalence among indoor diabetic patients in a tertiary care hospital, located in the capital city of a North Indian Himalayan state.

Aims and Objectives

1. To observe the prevalence of micro vascular and macro vascular complications in admitted patients of diabetes mellitus.
2. To analyze final outcome among diabetic and non-diabetic admitted patients
3. To observe various causes of death among admitted patients of diabetes.

MATERIAL METHODS

Study Design

It was an observational - prospective study conducted among hospitalized patients in the department of internal medicine of Indira Gandhi Medical College Shimla over a period of one year w.e.f. 1st June, 2018 to 31st May, 2019.

Study Population

A total of 9961 patients were admitted due to different illnesses, diabetic patients constituted 589 (5.9%) of all those admissions. Indoor diabetic patients who achieved 18 years of age were enrolled in the study after taking duly signed informed consent. Approval of institutional ethics committee was taken.

Data Collection

We collected information from all the diabetic patients admitted in male medical wards, female medical wards, medicine critical care unit (CCU), High density unit (HDU), Intensive care unit (ICU) and all diabetic patients admitted in medical and surgical special wards under the department of Internal medicine. Demographic profile was recorded as per the proforma. Detailed history about current treatment, reason for hospitalization and history of previous admission if any was taken. General physical examination and systemic examination were carried out. All patients had undergone thorough clinical examination with special attention to identify any diabetes related acute or chronic complications. Following Investigations were noted both at the time of admission and discharge from the hospital: Complete hemogram, RBG (FBG and PPBG), HBA1c, Urea/Creatinine, Sod/Pot/Chloride, Liver function tests : ALT / AST / Alkaline Phosphate, S. Bilirubin, Serum Proteins, Lipid Profile, Urine microalbuminuria/ 24Hr. urine Proteins, Fundus Exam, ECG, Echocardiography, Chest X-ray, USG Abdomen and other Investigations. Hospital records were accessed for collecting final information if required.

Statistical Analysis

Descriptive statistics and frequency percentages were determined for categorical variables. Means and standard deviations were calculated for quantitative variables. Qualitative variables were analyzed using Pearson's chi square test, ANOVA one way or paired-t test, whichever was applicable.

The statistical analysis was done using statistical software IBM SPSS statistics for Windows version 21.0.

RESULTS

Demographic Profile

In our study, among 589 patients enrolled, 270 (46.2 %) were males and 319 (53.8%) were females. Amongst all, 460 (78%) were from rural and 129 (22%) patients were from urban background. The mean age of the diabetic patients in this study was 57.22 ± 10.07 years. Out of 589 patients, 568 (96.4%) were Type -2 diabetic patients and 21 (3.6%) were having Type -1 diabetes.

Pattern of Chronic Complications in Diabetes

Out of Total 589 patients enrolled in the study, 366 (62.2%) patients were having microvascular complications, followed by macrovascular complications in 111(18.8%) patients and both microvascular and macrovascular complications in 60 (10.2%) patients. It was found that 52 (8.8%) patients were not having any micro or macrovascular complication at the time of admission (Fig.1). However, 43(82.7%) of them were amongst the newly diagnosed diabetics.

Thus 426 patients were reported with microvascular complications, which constitute 366 patients as micro vascular only and 60 patients having micro as well as macro vascular complications. Out of 426 patients with microvascular complications, 101 (23.8%) patients were having all 3 types of microvascular complications. However, 138 (32.2%) were having two microvascular complications and 187 (44%) patients were having single complication at the time of admission. The number of complications had linear relationship with duration of disease and HbA1c levels.

Pattern of Microvascular Complications

Among 426 patients who had one or more than one microvascular complications, neuropathy was the most common complication seen in 299 (70%) patients followed by retinopathy in 270 (63.4%) and nephropathy in 231 (54.4%) patients.

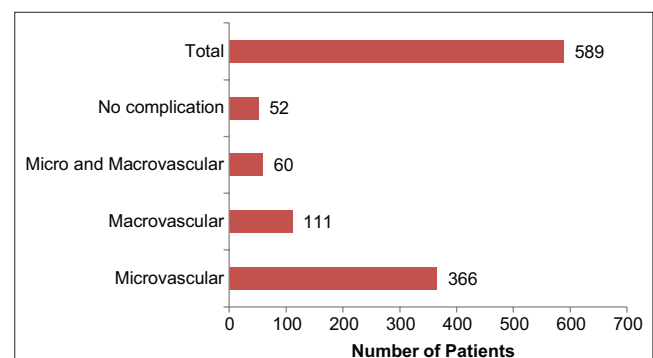


Figure 1. Pattern of chronic complications of diabetes

Pattern of Neuropathy

Among the 299 patients with neuropathy, symmetric sensory polyneuropathy was present in 193 (65%) of patients followed by motor sensory neuropathy in 99 (33%) patients and autonomic dysfunction in 7 (2%) patients. Sensory form of neuropathy was the most common and the autonomic dysfunction was the least common form of neuropathy (Fig. 2).

These findings were analyzed as per the duration of diabetes. Among the patients with duration of disease < 5 years, 46 (15%) patients were having symptoms of neuropathy and between 5-10 years duration, 96 (32%) patients having such symptoms. In patients with duration of diabetes more than 10 years, 157 (53%) were having these symptoms. The number of patients of neuropathy increase with duration of disease (Table 1).

Pattern of Retinopathy

Among the 270 patients having retinopathy, non proliferative diabetic retinopathy (NPDR) was present in 244 (91%) of patients while proliferative diabetic retinopathy (PDR) was present in 26 (9%) of patient. Moderate NPDR was the most common type seen in 145(60%) of patients having NPDR (Fig. 3).

Retinopathy

Among the patients with duration of disease < 5 years, 35 (12.5%) were having retinopathy. In patients with duration of diabetes between 5 years to 10 years, 94 (35.1%) had retinopathy, while among the patients with duration of diabetes more than 10

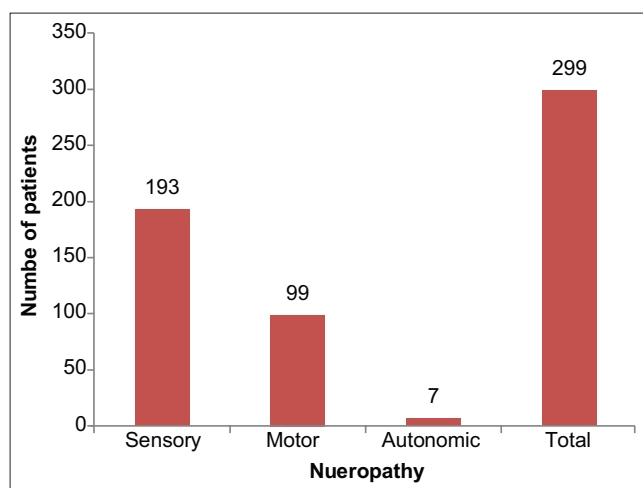


Figure 2. Distribution of patients according to type of Neuropathy

years, it was found that 141 (52.4%) were having retinopathy (Table 1). The increasing trend of retinopathy with the duration of diabetes was similar to trends seen in neuropathy cases.

Pattern of Nephropathy

Among the 231 patients having nephropathy, CKD was the most common presentation. It was seen in 32 (57.1%) patients followed by microalbuminuria 72 (31.1%) and macroalbuminuria in 27 (11.8%) patients (Fig. 4).

Among the patients with duration of disease < 5 years, 29 (12.5%) were having nephropathy. In patients with duration between 5 years to 10 years, 81 (35.1%) patients had retinopathy while among patients with duration of diabetes more than 10 years, 121 (52.4%) were having nephropathy (Table 1). Thus it was found that prevalence of nephropathy increases with duration of disease as similar to progression seen in neuropathy and retinopathy cases.

Pattern of Macrovascular Complications

A total of 111(18.8%) patients presented with macrovascular complications. Out of 111 patients, 70 (63.3%) had coronary artery disease (CAD) and 11 (9.7%) patients had peripheral vascular disease (PVD). However, 30 (27%) cerebrovascular accident (CVA) patients represented those who had suffered from CVA at any particular time as diabetics and those who are currently admitted because of CVA (Fig. 5).

Among the patients with duration of disease < 5 years, 15 (13.8%) were having macrovascular complications. In patients with duration between 5 years to 10 years, 28 (25.3%) patients and in those with duration of diabetes more than 10 years, 68 (60.9%) were suffering from the diabetes related macrovascular complications (Table 1). The number of patients with macrovascular complications increased with increasing duration of disease.

Combined (Macro and Microvascular) Complications

60 patients presented with combined macro and microvascular complications. Out of them, 42 (70%) presented with heart failure and 18 (30%) patients presents with diabetic foot. Each patient had one or more microvascular complications as well.

Pattern of Complications in Type 1 Diabetic Patients

Out of 21 (3.6%) Type 1 diabetics, microvascular complications were seen in 9 (43%) patients. It was retinopathy in 4

Table 1. Distribution of Microvascular and Macrovascular complications according to duration of diabetes

Duration	Total enrolled	Microvascular complications			Macrovascular complications
		Neuropathy	Retinopathy	Nephropathy	
< 5 Years	163 (27.7%)	46 (15%)	35 (12.5%)	29 (12.5%)	15 (13.8%)
5-10 years	193 (32.7%)	96 (32%)	94 (35.1%)	81 (35.1%)	28 (25.3%)
> 10 Years	233 (39.6%)	157 (53%)	141 (52.4%)	121 (52.4%)	68 (60.9%)
Total	589 (100%)	299 (100%)	270 (100%)	231 (100%)	111 (100%)

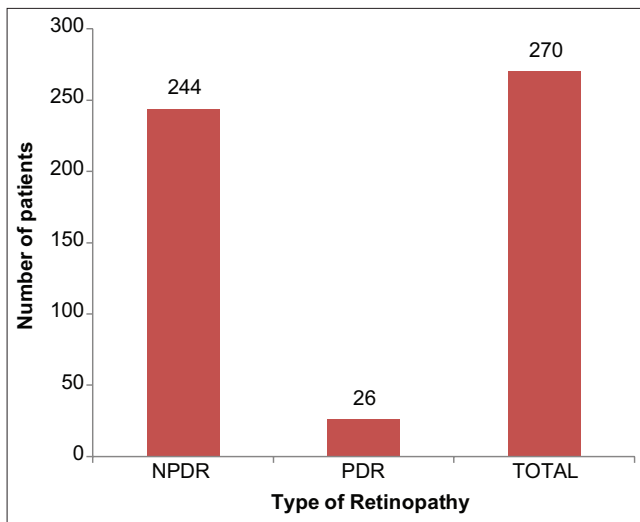


Figure 3. Distribution of patients according to type of Retinopathy

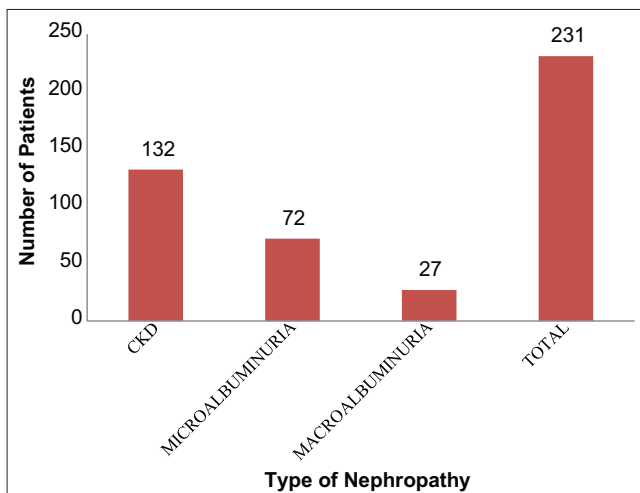


Figure 4. Distribution of patients according to type of Nephropathy

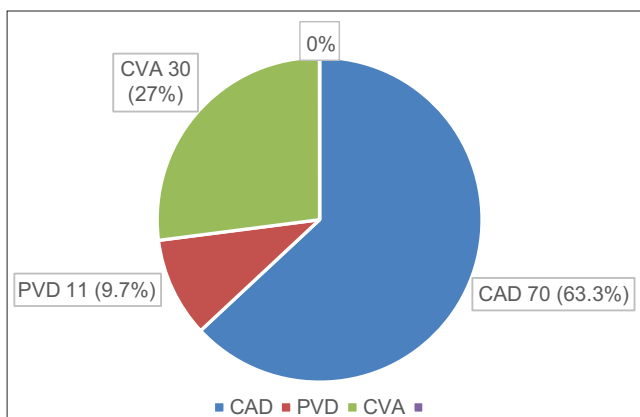


Figure 5. Distribution of patients according to type of Macrovascular complications

(18%) patients, nephropathy in 2 (10%) and neuropathy in 3 (15%) patients. Among 21 (3.6%) Type 1 diabetic, none had any macrovascular complications, while 12(57%) patients were not having any kind of complication (Table 2).

Table 2. Type 1 diabetic patients with complications

Complication	Number	Percentage (%)
Retinopathy	4	18
Neuropathy	3	15
Nephropathy	2	10
Macrovascular	0	0
No complication	12	57
Total	21	100

Co-morbidities in Admitted Diabetic Patients

Hypertension was the most common associated disease. It was seen in 45% patients. ADHF/CCF was seen in 16.1% patients. Hypothyroidism was noted in 3% patients, COPD in 7.5% patients and CLD was associated in 9 (1.5%) patients. While 26.9 % patients were not having any comorbidity (Fig. 6).

Outcome in Diabetic and Non-diabetic Patients

There were 759 (7.6%) total deaths (including death of diabetic patients) out of 9961 admissions in medicine wards during the study period of one year (Table 3).

It was observed that the death rate was 1.3% more in diabetic patients as compared to general admissions whereas, patients in LAMA and Referred category were more (0.4% and 0.8% respectively) amongst non diabetic patients).

Pattern of the Cause of Death

Cardiovascular disease was the most common cause of death accounting for 16 (30.5%) deaths followed by infections in 11 (22%) and CKD-ESRD in 11 (22%) deaths. Other causes of death were acute complications 8(15%) and Stroke in 6(10.5%) cases (Fig. 7).

DISCUSSION

In our study, percentage of female patients (53.8%) was higher than males (46.2 %). Most of the studies reported equal distribution of patients among both sexes. Our results were in concordance with the study done by Mehta et al (60% females)⁴. Majority of patients (78%) belonged to rural area, while 22% came from urban locality. High proportion of rural patients in our study may be because of rural predominant population of Himachal Pradesh. The mean age of population was 57.22 ± 10.07 years, 36% patients were above 60 years of age. It was not comparable to the findings reported from Multan, which reported that 21% patients had attained 60 years of age⁵. This regional difference might be because of the improved survival of diabetic patients in our region due to improved health care facility over a period of time. In our study, microvascular complications were present in 366 (62.2%) patients whereas, 111(18.8%) patients presented with macrovascular complications. We found that 60(10.2%) patients were having both microvascular and macrovascular complications whereas, 52 (8.8%) patients were not having

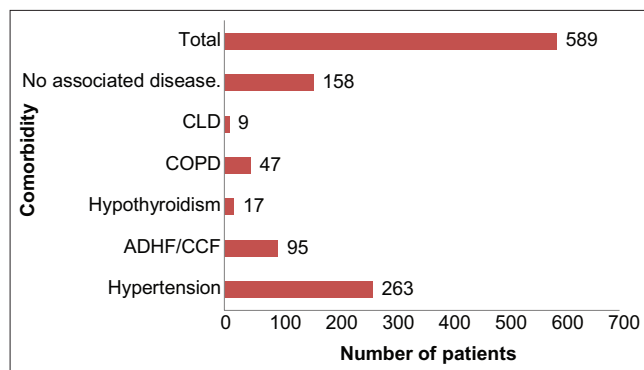


Figure 6. Distribution of patients according to comorbidities

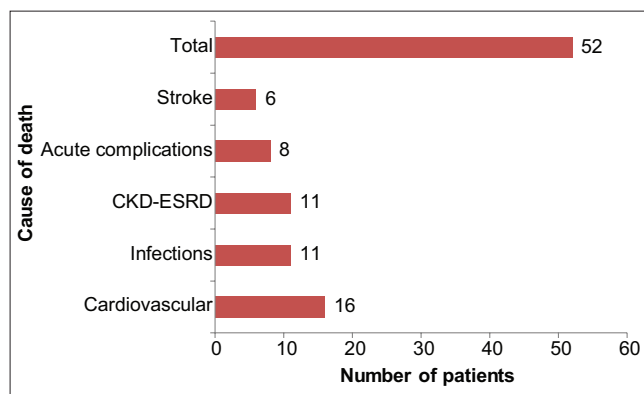


Figure 7. Cause of death among diabetic patients

Table 3. Outcome in diabetic and non-diabetic patients

Outcome	Diabetic patients (n= 589)		Non diabetic patients (n=9372)	
	Number (n)	%	Number (n)	%
Death	52	8.8	707	7.5
LAMA	15	2.5	309	3.3
Referred	10	1.7	189	2.1

any type of complications at the time of admission. Among the patients having microvascular complications neuropathy was the most common complication seen in 293 (70%) patients followed by retinopathy in 266 (63.4%) and nephropathy in 228 (54.4%), while 99 (23.8%) patients were having all three types of complications. We found that 135 (32.2%) were having two complications whereas 184 (44%) patients were having single complication at the time of presentation. The number of complications had linear relationship with duration of disease and HbA1c levels. In a study done by Rahman et al⁶, it was reported that 35% patients had all three complications, 33% had two complications, 17% had only one complication and 15% had no microvascular complication. In our study, the patients having single complication outnumbered that observed in Rahman et al study whereas, all other findings were comparable. Neuropathy was the most common microvascular complication seen in 293 (70%) patients. It was comparable to the study done by Rahman et al, reported 68.5% patients with neuropathy but quite higher than reported by Ramachandran et al⁷ and Agrawal et al⁸ who reported neuropathy in 27.5% and 30.1% patients re-

spectively. The different observations are due to the fact that the study done by Rahman et al was a hospital-based study whereas, that done by others was a population-based study. It clearly shows a higher incidence of neuropathy in the hospitalized patients. In a study done by Dyck et al⁹, distal symmetric polyneuropathy (DSPN), sensory neuropathy and autonomic neuropathy was observed in 45%, 29% and 5% respectively. In our study it was 65%, 33% and 2% respectively. Prevalence of polyneuropathy was higher in our study, which may be due to the regional variations in the neuropathy. Amongst patients with duration of disease < 5 years, 26.9% were having neuropathy and with duration of disease >10 years 66.5% patients were having neuropathy. This is due to the linear relationship of neuropathy with the duration of disease. Similar findings were observed in a study done in South India¹⁰. In our study, prevalence of retinopathy was seen in 266 (63.4%) of patients which was quite higher than that observed by Ramachandran¹¹, Rahman et al¹² and Shera et al¹³, who evidenced occurrence of retinopathy in 23.7%, 55% and 43% patients respectively. It was due to the fact that patients in our study were indoor patients whereas; patients in these studies also included the patients from general population also. Amongst patients with duration of disease < 5 years, 20% were having retinopathy and 60% patients with duration of disease >10 years were having retinopathy which is comparable to the study done by Rema et al¹⁴. It was observed that retinopathy had a linear relationship with duration of disease. Nephropathy was observed in 54.4% patients. It was comparable to study done by Rahman et al¹⁵ a hospital based study who witnessed 67% patients with nephropathy. This shows a higher prevalence of nephropathy in hospitalized patients. This was more than that observed by Agarwal et al⁸ and Shera et al¹³, who reported nephropathy in 32.5% and 20.2% patients respectively, both were population based studies. In our study, CKD-ESRD was observed in 57.1% patients which were more than that observed by Rachel J Middleton¹⁶ in a population-based study. This can well be explained by a difference of population and hospital-based study. Among the patients with duration of disease <5 years 12.5% patients were having nephropathy whereas, patients with duration of disease > 10 years 52.4% patients were having nephropathy. This linear relationship of nephropathy with duration of disease was comparable with that observed by John et al¹⁷ and Vijay et al¹⁸. In our study, 111(18.8%) patients were having diabetes related macrovascular complications. Coronary artery disease was the most common macrovascular complication 70 (63.3%), whereas PVD was the least common 11 (9.7%). The occurrence of PVD was higher than observed by Fatma et al¹⁹ who reported PVD in 14.4% cases. As all these studies were population based. This clearly indicates that prevalence of macrovascular complications is more in the hospitalized patients. 63.3% patients admitted due to CAD in our study were higher than that observed by Al Adsani et al²⁰ (27.3% patients) and Wetterhall et al²¹ (34% patients). This may be due to the regional differences in the prevalence of cardiovascular diseases. Diabetic patients are at increased risk of CAD and CVA as it is an independent risk factor for development of atherosclerosis and hence the

macrovascular complications. The most common associated disease in the admitted diabetic patients was hypertension (45%) followed by heart failure (16.1%). Hypertension is a major cardiovascular risk factor and prevalence of hypertension in diabetic patients is much higher as compared to general population. This was comparable with study done by Tarin et al⁵, where 36.4% diabetic patients were found to have hypertension as an associated disease with diabetes. In our study 26.9 % patients had no co-morbidities which were comparatively higher than that observed by Tarin et al⁵ who reported that 6.8% patients had no co-morbidity. This may be due to the improved health care status of our region with changing times.

In our study, the mortality observed was 8.8% in the diabetic patients and 7.5% in the general admissions (non-diabetics) in the medicine wards. The mortality rate in diabetic patients was slightly on the higher side (1.3%) due the immunocompromized status of the diabetics and severity of illness. In-hospital mortality in our study was on the lower side as compared to study reported by Tarin et al⁵ and Chuhwak et al²², who reported mortality as 16% and 8.9% respectively. The difference may be attributed to the difference in causes of admissions, severity of illness and the availability of health facilities in the hospitals where the study was carried out. In our study, the most common cause of death was cardiovascular disease accounting for 16 (30.5%) deaths followed by infections 11 (22%) and CKD-ESRD 11(22%). Other causes were acute complications 8(15%) and CVA 6(10.5%). In studies from different parts of the world, Roberto De Marco et al²³ from Italy and Morrish et al²⁴ in a multicentric study reported cardiovascular diseases as the most common cause of death in diabetic patients to the extent of 40.4% and 52% respectively. The higher prevalence of cardiovascular deaths in these studies may be due to higher prevalence of non communicable diseases in the western countries as compared to Asian region. The results of study done by A H Zargar et al²⁵ documented that infections were the most common cause of death in 40.9% cases, followed by CKD in 33.6% and CAD in 16.9% cases. In our study, infections and CKD shared the second common cause of deaths. Our study results for CKD as the cause of death (22%) were comparable to that observed by Tarin et al⁵ (23%) and A H Zargar et al²⁵ (33.6%).

CONCLUSION

Most of the patients presented with microvascular complications, neuropathy being commonest. The patients of heart failure constituted a significant number followed by CAD. Most of the patients were having hypertension as an associated disease. The complications, duration of stay in the hospital and mortality was more in the patients having duration of stay more than 10 years. Maximum mortality occurred in patients with longer duration of disease. The most common cause of death was related to cardiovascular disease followed by end stage renal disease.

SPONSORSHIP IF ANY

None

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ETHICAL ISSUES

Informed consent taken from all participants.

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