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Prevalence of microvascular complications of diabetes mellitus in tertiary care hospital

Raveendra babu K[*1], Deepika Reddy B[1], Bheemamma P[1], Vamshi Krishna E[1], Chinna Eswaraiah M[2]

[1]Department of Pharmacy Practice, Anurag Pharmacy College, Ananthgiri, Kodad -508206, Telangana, India

[2]Anurag Pharmacy College, Ananthgiri, Kodad, Suryapet-506208, Telangana, India

ABSTRACT

The major cause of mortality and morbidity in the present generation is diabetes mellitus. The high prevalence of microvascular complications in diabetes mellitus occurs due to the untreated long duration of hyperglycemia. The main aim of the study is assessing the prevalence of microvascular complications of patients who are diagnosed with diabetes mellitus in public tertiary care hospitals. A retro-prospective observational study was conducted in the outpatient department of medicine at a tertiary care hospital. We took the samples of a total of 300 consecutive patients who are diagnosed with diabetes mellitus with microvascular complications were included in the study. To diagnose microvascular complications of diabetes mellitus clinical parameters, patient past and present history and other related investigations were included. A total of 300 patients in this study, 160 are males and 140 are females. The age range was 30-80 years, with a mean age of 49.43 ± 13.45 years. 31% of patients are diagnosed with neuropathy, 35% of patients are diagnosed with retinopathy and 34% of patients are diagnosed with nephropathy. 68.6% of patients are affected with microalbuminuria, whereas 31.3% of patients are affected with macroalbuminuria. [HbA1C] levels are divided into two groups on the basis of glycated hemoglobin levels in subjects. The patients with HbA1C >7.5% are found to 61% and 39% are found to be in the range of HbA1C 6.5-7.5%. By comparing both patients with HbA1C>7.5% are more prone to microvascular complications than that of HbA1C 6.5-7.5%. The 23% subjects had normal BMI [$18.5-24.99 kg/m^2$, 55% subjects were over-weight [$25-29.99 kg/m^2$ and 21.3% subjects were obese [$>30 kg/m^2$]. To prevent or retard further progression of these complications, we should control blood sugar levels.

*Corresponding Author

Name: Raveendra babu K
Phone: 9959212028
Email: ravipharma36@gmail.com

INTRODUCTION

In endocrine disorders, the most common metabolic disorder is diabetes mellitus. Due to decreased insulin secretion with or without insulin resistance causes a serious condition called hyperglycemia. More than 2.6 million people in the UK have DM, and by the year 2025, this number is estimated to rise to 4 million. 8.2% is the annual prevalence of T2DM (Guariguata *et al.*, 2014). In the year 2015, 415 million people are globally suffering from DM as per the International Diabetes Federation (IDF,

2015). In the 21st century, the DM is worldwide a globally pandemic disorder. Diabetes mellitus is categorized into two major types, which include type-1 and type-2 DM. In this, the metabolic and vascular complications are more common in type-2 DM (Basit *et al.*, 2004). The prevalence of microvascular complications in DM subjects was diagnosed by the long duration of hyperglycemia (Harris *et al.*, 1992). Diabetes complications are differentiated into two various types, like microvascular and macrovascular complications. These Diabetes complications may cause mortality, morbidity and disability may impair the quality of life of diabetic subjects. Macrovascular complications include coronary artery disease, peripheral arterial disease and cerebrovascular disease. Microvascular complications are the long term complications, which include nephropathy, retinopathy and neuropathy. Nephropathy occurs due to the damage to the kidney or renal failure. Retinopathy occurs due to the impaired vision and blindness and retinopathy are of two types proliferative and nonproliferative. Non- Proliferative retinopathy is also called as early-stage retinopathy which means growing new blood vessels in the eye region and Proliferative retinopathy is also called as advanced diabetic retinopathy which means progression to most severe type by causing the damage of blood vessels, jelly-like substance fill into the retina, retina may detach from back of eye and leak the fluid out from eye. Neuropathy is of four types that occur due to the damage different nerves of the body, which include peripheral neuropathy, amyotrophy, autonomic neuropathy, mononeuropathy. The risk of foot ulcers, amputations and Charcot's joints comes under peripheral neuropathy, genitourinary, gastrointestinal, lungs and sex organs comes under autonomic neuropathy, damage of nerves in thighs, hip, buttocks or legs occurs due to diabetic amyotrophy, damage to the specific nerves in the face, torso or leg occurs due to mononeuropathy. (American diabetes association, 2014), For the diagnosis, control, and management of diabetes mellitus, they developed the number of internationally recognized guidelines, algorithms and position of statements which are more important to reduce the risk of getting these complications (Home *et al.*, 2013). The prevalence of microvascular complications in DM subjects was diagnosed by the long duration of hyperglycemia (Harris *et al.*, 1992). As for the "Asian Indian Phenotype" Asians are more prevalent to diabetes and its complications because most of the Indians have clinical and biochemical abnormalities which include impaired insulin secretion, insulin resistance, higher waist circumference or lower BMI, decreased adiponectin and increased levels of highly sensitive C- reactive protein levels (Mohan and Deepa, 2006). According to the American diabetes association, the main goal is to control the blood glucose levels of diabetic patients whose HbA1C level should not exceed >7%, so we can reduce the risk of complications (Ali *et al.*, 2013). Early detection and identification of risk factors for retinopathy, nephropathy, and neuropathy may delay or prevent progression of microvascular complications (Margolis, 2005). Clinical trials have shown that there is a correlation that exists between them if there is strict control of blood sugar levels, which may reduce the risk of microvascular complications (DCCT, 1995).

The patients who are diagnosed with DM should Screen for microvascular complications. Patients should understand that early detection, effective prevention, and management of DM may reduce the risk of getting these complications. The patients who are diagnosed with diabetes mellitus greater than 10 years they should maintain the blood glucose levels normal so that there is no chance of getting these microvascular complications. The main aim is assessing the prevalence of microvascular complications of DM patients in public tertiary care hospitals in India.

MATERIALS AND METHODS

Study design

In the in-patient department of public tertiary care hospitals, the retro-prospective and observational study was conducted.

Study site

The study was carried out in different departments of public tertiary care hospitals in Chama.

Duration of study

The duration of the study was 6 months.

Sample size

300 samples.

Data collection

All necessary details will be collected from patient medical records. All medical records will be reviewed on a daily basis, and then this data will be entered based on specific study design. The needed parameters for the estimation of microvascular complications of diabetes mellitus were collected and recorded.

Study criteria

In this, there are two types of criteria's which include inclusion and exclusion criteria.

Inclusion criteria

1. All the patients are included between the ages of 30-80 years who are diagnosed with DM.

2. In this, we include both males and females who are diagnosed with the microvascular complication of diabetes mellitus like retinopathy, neuropathy, and nephropathy.

3. It also includes the patients who have both T1DM and T2DM with duration >10 years.

Exclusion criteria

1. In this, we should exclude patients with comorbid conditions like heart-related diseases [stroke, CHF], chronic liver diseases, hypertension, thyroid, dyslipidemia.

2. And also patients who are not interested in participating in the study were excluded

3. Patients who are left on LAMA are excluded from this study.

4. Patients who are >80 years are excluded.

Data analysis

Data that is collected and should be entered in the excel sheet. Demographic details of patients should be entered. The laboratory parameters like FBS, RBS, PLBS, HbA1c, BU, SC, HDL.LDL, TR, BMI, Microalbuminuria, macroalbuminuria, and duration of diabetes. Analyze the data and interpret it. Results were expressed as their proportions

Study procedure

Based on the retro-prospective and cross-sectional study, the data should be collected. In this, we should consider the inclusion and exclusion criteria for collecting the data. By this, we should analyze the data to know that how many patients were affected with microvascular complications of diabetes mellitus like diabetic retinopathy, diabetic nephropathy, diabetic neuropathy based on age, gender, BMI, duration of DM, type of DM, HbA1c. By this, we can know that which complication is more prevalent. Then we should interpret the results. And submit the reports.

RESULTS AND DISCUSSION

A total of 300 patients in this study, 160 were males and 140 were females [Table 1]. The age range was 30-80 years, with a mean age of 46.04 years.

In this study 23% study subject has normal BMI [18.5-24.99kg/m^2, 55%] subjects were over-weight [25-29.99kg/m^2 and 21.3% subjects were obese (>30kg/m^2)].

31% of patients are found to be neuropathy, 41 [44.08%] females and 52[55.9%] males. In this peripheral neuropathy was present in 31 patients [33.3%], in that males were 14[45.1%] and females 17[54.8%]. Autonomic neuropathy was present in 30 patients [32.2%] in that males 21[70%] and females 9[30%]. In this mono, neuropathy was present in 18[19.3%] patients, in that males 10[55.5%] and females 8[44.4%]. Amyotrophic was present in 14 patients, in that males were 7[50%] and females 7[50%]. (Figure 1).

Retinopathy was present in 105[35%] of patients, in that 58 [55.2%] males and 47[44.7%] females. The majority 57[54.2%], males 30[53.3%] and females 27[47.3%] have non-proliferative retinopathy and 48[45.1%] have proliferative retinopathy in that males 28[58.3%] and females 20[41.6%]. (Figure 2).

Nephropathy was present in 102[34%] patients, including 49[48.0%] males and 53[51.9%] females. Microalbuminuria was present in 70[68.6%] patients, including 33[47.1%] males and 37[52.8%] females, whereas macroalbuminuria was present in 32[31.3%] patients including 16[50%] males and 16[50%] females (Figure 3).

Subjects were classified into two groups based on HbA1C levels. Group first with HbA1C in the range 6.5-7.5% had 117[39%] patients and group second with HbA1C >7.5% had 183[61%], which has more microvascular complication compared to the group first, the association was not statistically significant [Table 2].

Based on the type of diabetes mellitus, they are grouped into two categories in that type-1 diabetes 139[46.33%] patients, including males 73 [52.51%] and 66 [47.48%] females. In type-2 diabetes 161[53.66%] patient including males 91 [56.52%] and 70[43.47%] females. By this, we can conclude that patients with type-2 diabetes are more prone to a diabetic microvascular complication when compared with type-1.

Based on the duration of diabetes mellitus in this study from the 5-10 years, 91[30.30%] patients are affected in that males are found to be 47 and females are 44.from the range 10-15 years 145[48.3%], patients are affected in that females are 63 and 82 are males. From the range 15-20 years, 64 patients are affected in that 34 are females and 30 are males.

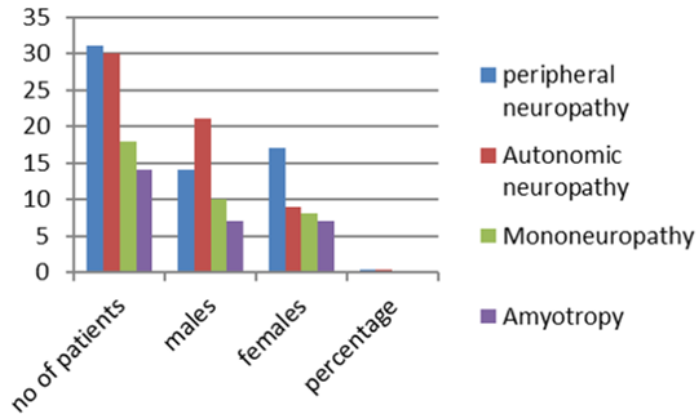In this, 35% are diabetic retinopathy, 34% are dia-

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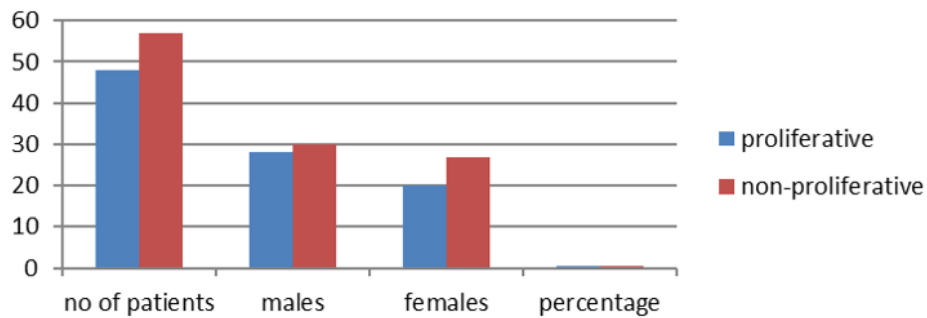**Figure 1: Types of neuropathy complications**

Figure 2: Types of retinopathy complications include proliferative and non-Proliferative
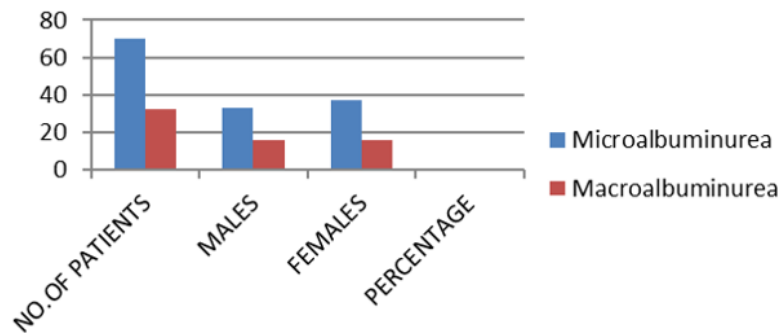

Figure 3: Types of nephropathy complications

betic nephropathy and 31% are diabetic neuropathy [Figure 4].

Types of complications

In this, the patients with diabetic microvascular complications like 35%-diabetic retinopathy, 34%-diabetic nephropathy and 31%- diabetic neuropathy are affected.

The major cause of mortality and morbidity in diabetic microvascular complications. Micro vascular complications occur due to the long duration of hyperglycemia. Complications are not exposed to the body at the time of diagnosis of diabetes. After a long asymptomatic phase, these are exposed. In this study, the large number of subjects with T2DM is more prone to microvascular complications when compared to T1DM.

The patients who are diagnosed with diabetes complications were calculated and evaluated in the study. The patients mean age was 46.04 years which says that most of the patients are in young age group in developing counties that is from [45-65 years] in this study, but according to wild study he says that most of the complications occur in older age that is age [>65 years] in developing countries (Wild *et al.*, 2004).

In this study, males are more prone to diabetic microvascular complications when compared to females because of their sedentary lifestyle, civil status, lack of physical exercise, smoking and hypertension.

In this study, the microvascular complications are mostly present in patients with T2DM when com-

PERCENTAGE

- ■ DIABETIC RETINOPATHY
- ■ DIABETIC NEUROPATHY
- ■ DIABETIC NEPHROPATHY
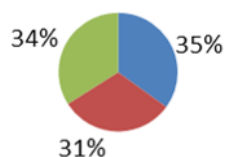
Figure 4: Types of complications

Table 1: Patient details and clinical features of study subjects

S. No	Patient characteristics	Frequency %
1.	Age [Mean, SD]	49.43±13.45
2.	Sex	
	Males	160
	Females	140
3.	BMI[kg/m2]	
	18.5-24.99	71
	25-29.99	165
	>30	64
4.	Type of DM	
	Type-1 DM	139
	Type-2 DM	161
5.	Duration of DM	
	5-10 Years	91
	10-15 Years	145
	15-20 Years	64
6.	Complication	
	Neuropathy	93
	Retinopathy	105
	Nephropathy	102
7.	HbA1c	
	6.5-7.5%	117
	>7.5%	183

SD: Standard deviation, HbA1c: glycated hemoglobin,
DM: Diabetes mellitus, BMI: Body mass index

Table 2: Correlations between HbA1C and Diabetic Complications

Complications	HbA1C% [6.5-7.5][n=117]	HbA1C% [>7.5][n=117]	p-value
Neuropathy	33[28.2]	60[32.78]	0.71
Nephropathy	40[34.18]	62[33.8]	0.467
Retinopathy	10[8.54]	95[51.91]	1.00

HbA1c: glycated hemoglobin

pared with T1DM because type-2 DM patients are having a major risk of getting these microvascular complications.

If there is an increase in the duration of diabetes, the subjects are not controlling the blood sugar levels. Then they have more risk of microvascular complications like nephropathy, neuropathy and retinopathy. So that the duration of diabetes is directly proportional to the risk of complication. In this study, the duration [5-10] years, 91 patients are affected, which is less when compared to the duration of [10-15] years, 145 patients are affected.

BMI is also one of the major parameters for the risk of getting these complications. The patients with normal BMI [18.5-24.99] are present in 71 patients, overweight [25-29.99] are present in 164 patients and obese [>30] are present in 64 patients. Patients with more BMI are more prone to DM complications.

In this study, the complications were evaluated and calculated for 300 consecutive patients. We found that retinopathy [35%] was having high prevalence as compared to the neuropathy [31%] and nephropathy [34%], But according to pradeepa study, the most common complications are neuropathy and nephropathy (Pradeepa et al., 2010; Namperumalsamy et al., 2009). In this 45.7%, subjects are found to be proliferative retinopathy and 57% of patients are found to be non-proliferative retinopathy. As the study was mainly conducted in all the patients who are having T1DM and T2DM from the past 10-20 years so that we can easily find the patients who are having diabetic retinopathy. Diabetic retinopathy was mostly found in older age groups due to their sedentary lifestyle. According to the study by Sankara nethralaya, diabetic retinopathy says that 23% of patients are found to be diabetic retinopathy (Raman et al., 2009). According to Xu et al. and Yash et al. The 19.6% are affected with retinopathy and 24% of patients, respectively (Patel et al., 2011; Xu et al., 1997). [Table 1].

The second most complication was nephropathy, which was found to be 34% in patients. In the view, Ali et al. have also said that nephropathy was found in 44.24% of subjects (Ali et al., 2013).

The least prevalent complication was Neuropathy, which was present in 31% of patients. When compared to other complications, neuropathy had less prevalence. But according to Yash et al., 36% of patients are prone to diabetic neuropathy and Nambuya, 46% patients are affected with diabetic neuropathy (Patel et al., 2011; Nambuya et al., 1996), [Table 2].

The subjects with HbA1C > 7.5% are more prone to microvascular complications when compared to the patients with HbA1C <7.5%. These values may not be statically significant (>0.05)

Limitations

This study is not a community-based study, which is a tertiary care hospital-based study. In this study, we can't compare the difference between the prevalence of microvascular complications in hospital-based and community-based studies because the sample size is smaller. But we compare the difference between these complications in a bigger sample size.

CONCLUSION

Now a day's diabetic microvascular is a major cause of mortality and morbidity. In this, we concluded that patients are more prone to type-2 DM compared to type-1, mostly in older age groups. In this, we observed that diabetic retinopathy is the major microvascular complication due to vision impairment because of disturbed blood sugar levels, which may lead to the damage of retinal nerves, mainly in older age groups. Early detection of these parameters like HbA1C, FBS, PLBS, RBS, and BMI, etc. may reduce the risk of getting microvascular complications of DM. We should maintain the blood sugar levels if not causes hyperglycemia and leads to the further progression of the microvascular complications of diabetes mellitus. Clinical pharmacists should encourage the patients regarding the early detection and management of microvascular complications of diabetes mellitus. The pharmacist provided an intervention by improving medication adherence and decreases the levels of HbA1C, BP, LDL, BMI in patients who are diagnosed with DM, so that may reduce the risk of getting these complications.

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Ethical Approval

Ethical approval was obtained from the Ethical Committee of Anurag Pharmacy College.

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