ORIGINAL ARTICLE

ASSOCIATION OF COMPLICATIONS OF DIABETES MELLITUS WITH SOCIODEMOGRAPHIC DETERMINANTS IN PATIENTS PRESENTING TO AYUB TEACHING HOSPITAL ABBOTTABAD

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Background: Diabetes mellitus is a disease with many possible complications like macrovascular, i.e., stroke, coronary artery disease, peripheral artery disease, and microvascular, i.e., retinopathy, neuropathy and nephropathy. Many studies have been done in past to find the frequencies of these complications and their association with sociodemographic determinants of diabetic patients, but there was limited data available in our setup. This study was carried out to determine the frequency of micro and macrovascular complications of diabetic patients and their association with socioeconomic determinants at Ayub Teaching Hospital, Abbottabad. **Methods**: This cross-sectional study was carried out at Ayub Teaching Hospital, Abbottabad, Pakistan, from July 2022 till December 2023 on 113 diabetic patients. The data was collected on micro and macrovascular complications of diabetes on a pre-designed structured proforma and analyzed by means of SPSS-23. **Results:** The most common macrovascular complication was coronary artery disease 10 (8.8%) while neuropathy 35 (31%) was the most common microvascular complication. Among macrovascular complications stroke was associated significantly with age (p=0.01) and duration of diabetes (p=0.032). Among microvascular complications neuropathy was associated with gender (p=0.047), nephropathy with smoking (p=0.02) and retinopathy with both gender (p=0.019) and smoking (p=0.017). **Conclusion:** In this study there was significant association between, gender with neuropathy and retinopathy, smoking with nephropathy and retinopathy, stroke with age and duration of diabetes.

Keywords: Diabetes mellitus; Microvascular complications; Macrovascular complications; Retinopathy; nephropathy; Neuropathy; Coronary artery disease; Stroke, Peripheral artery disease

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INTRODUCTION

Diabetes mellitus is a group of metabolic abnormalities in which there is chronic hyperglycemia. The cause may be problem with insulin secretion or abnormality in insulin effect or usually both.[1] Diabetes mellitus (DM) can be classified mainly as Type I, in which there is absolute insulin deficiency because of destruction of Beta cells of pancreas, Type II where there is mainly insulin resistance, maturity onset diabetes of young (MODY), latent autoimmune diabetes in adults (LADA) and gestational diabtetes.[2] The most common type among all of them is Type II Diabetes mellitus (DM) and its prevalence has been increasing all over the world. Although this disease has many risk factors that can be modified like dietary control, exercise and control of obesity, many drugs has also been developed for this disease.[3] Diabetes has acute complication like Diabetic ketoacidosis (DKA), Hyperglycemic hyperosmolar state (HHS), microvascular complications like retinopathy, nephropathy and neuropathy, and can also have macrovascular complications like cardiovascular diseases, peripheral arteries, and cerebrovascular disease.[4]

In this study we intended to find the frequency of complications of diabetes mellitus and their association with socioeconomic determinants of patients presenting at Ayub Teaching Hospital, Abbottabad because there was limited data available in our setup. This study can benefit diabetic patients, by educating them about these socioeconomic determinants which were strongly associated with bad outcomes, in early stage of disease or as soon as patient is diagnosed with diabetes mellitus to prevent such disastrous possible outcomes later in life. Also, the hospital administration can initiate policies regarding screening of diabetic patients for common complications through proper setups inside the wards and outpatient departments where proper history, examinations and relevant investigations should be done, and patients must be counseled about the possibility of such bad outcomes in future, administration can also spread awareness in general population through media and pamphlets for prevention of common complications.

The sample size of 113 was calculated by using world health organization (WHO) software at 95% confidence interval, 3.4% absolute precision and 3.5%frequency of stroke among diabetic patients.[5]

MATERIAL AND METHODS

After approval from ethical committee of Ayub Teaching Hospital, Abbottabad, this study was conducted. Patients from both genders, >12 years of age and of both type I and II diabetes mellitus between July 2022 till December 2023 were enrolled. After taking informed consent from the patients, proforma were filled with patient's bio data, duration of diabetes, body mass index, and complications of diabetes mellitus. The sample size of 113 was calculated by using world health organization (WHO) software at 95% confidence interval, 3.4% absolute precision and 3.5%frequency of stroke among diabetic patients.[5]

Patients were diagnosed to have diabetes mellitus either if they had serum fasting blood glucose ≥126 mg/dl, or random blood sugar ≥200 mg/dl along with symptoms of, i.e., polyphagia, polydipsia, polyuria or HBA1c levels of ≥6.5% or history of intake of antidiabetic medication. Retinopathy in patients was diagnosed through fundoscopy in ophthalmology unit.Nephropathy in these patients was defined as the presence of albuminuria of >300 mg/24h. Neuropathy in these patients was diagnosed by history and clinical examination to check muscle strength, reflexes and sensitivity to position, vibration, temperature and light touch. All results were analyzed by means of SPSS-23. Shapiro-Wilk test was used to find the normality of data and variables like age and BMI were not normally distributed, they were expressed as median and IQR, frequencies and percentages were calculated for variables like gender, history of smoking, type of diabetes, duration of diabetes, presence of complications, retinopathy, nephropathy, neuropathy, coronary artery disease, stroke, peripheral artery disease. Chi-square test was applied to see the association of socioeconomic determinants with micro and macrovascular complications in diabetic patients. *p*-value of ≤0.05 was taken as significant.

RESULTS

Out of the total 113 patients enrolled, 41 (36.3%) were males and 72 (63.7%) were females. Median age of participants was 53(17.5) years and BMI was 23.8(4.85) Kg/m^2. About 50 (44.2%) patients were of age ≤50 years. Out of total, 57 (50.4%) patients developed complications of diabetes while 56(49.6%) had no complications. About 41 (36.3%) developed microvascular complications, of which 35 (31%), 17 (15%) and 16 (14.2%) developed neuropathy, nephropathy and retinopathy respectively. Macrovascular complications occurred in 3 (2.7%), of which 5 (4.4%), 10 (8.8%) and 3 (2.7%) developed stroke, coronary artery disease and peripheral vascular disease respectively as shown in table 1.

As illustrated in table-2, among the macrovascular complications, there was statistically significant association between stroke and age of patient (p=0.01) and duration of diabetes (p=0.03). It is evident that 50 (44.2%) patients were ≤50 years and all, i.e., 5(100%) had stroke. Similarly stroke developed in all patients 5 (100%) with >5years duration of diabetes.

Table-3 shows that among the microvascular complications, retinopathy was found to be significantly associated with gender (p=0.01) and smoking (p=0.01). Retinopathy was more common among male patients 10 (62.55%) and non- smokers 10 (62.5%). Neuropathy was also found to be significantly associated with gender (p=0.04) and was more common among females 27 (77.1%) while nephropathy was significantly associated with smoking (p=0.02).

Table-1: Sociodemographic characteristics and complications among diabetic patients (n=113)

Characteristics	Categories	Frequency (%age)
Gender	Males	41 (36.3%)
	Females	72 (63.7%)
Age category	≤50y	50(44.2%)
	>50y	63(55.8%)
Smoking	Smokers	19 (16.8%)
	Non-smokers	94 (83.2%)
Type of diabetes mellitus	Type I	6 (5.3%)
	Type II	107(94.7%)
Duration of DM	<5 years	53 (46.9%)
	≥ 5 years	60 (53.1%)
Complications	Present	57 (50.4%)
	Absent	56 (49.6%)
Macrovascular complications	Stroke	5 (4.4%)
	Coronary artery disease	10 (8.8%)
	Peripheral artery disease	3 (2.7%)
Microvascular complications	Retinopathy	16 (14.2%)
	Nephropathy	17 (15%)
	Neuropathy	35 (31%)

Table-2: Association of macrovascular complications with demographic determinants

Variables		Complication (Stroke)		*p*- value
		present	absent	
Age	≤50 years	5 (100%)	45 (41.7%)	0.01
	>50 years	0 (0%)	63 (58.3%)	
Duration of DM	<5years	0 (0%)	53 (49.1%)	0.03
	≥5years	5 (100%)	55 (50.9%)	

Table-3: Association of microvascular complications with demographic determinants

Variables		Complications		*p*-value
Gender		Retinopathy		0.01
		Present	Absent	
	Male	10 (62.5%)	31 (32.0%)	
	Female	6 (37.5%)	66 (68.0%)	
		Neuropathy		0.04
		Present	Absent	
	Male	8 (22.9%)	33 (42.3%)	
	Female	27 (7.1%)	45 (57.7%)	
Smoking		Retinopathy		0.01
		Present	Absent	
	Yes	6 (37.5%)	13 (13.4%)	
	No	10 (62.5%)	84 (86.6%)	
		Nephropathy		0.02
		Present	Absent	
	Yes	6 (35.3%)	13 (13.5%)	
	No	11 (64.7%)	83 (86.5%)	

DISCUSSION

Apart from poor drug compliance, complications in patients with diabetes mellitus have been associated with few important socioeconomic determinants.

The total number of patients in our study was 113, in which 50 (44.2%) were ≤50 years of age and 63 (55.8%) were above 50 years of age. There was significant association of age of patient with development of cerebrovascular accidents, with *p*-value 0.01. Among 113 patients only 5 developed stroke and they were ≤50 years of age, it was similar to one study conducted which reported that diabetic patients who developed stroke were 3.2 years younger patients who doesn't developed stroke.[6]

Gender of patients was also associated with some possible complications of diabetes mellitus such as retinopathy. In our study out of 113 patients, 16 developed retinopathies of which 10 (62.5%) were male and 6 (37.5%) were females with *p*-value 0.01. One study in past done on association of gender and retinopathy showed that frequency of retinopathy was higher in male than in female, i.e., 22.0% vs 19.3% respectively with p-value <0.0001.[7] Another study in past showed that frequency of retinopathy was higher in male than in female, i.e., 31.6% vs 25.7% respectively with *p*-value 0.04.[8] Another association was also observed between gender and development of neuropathy of patients, among 113 patients, total of 38 developed neuropathy, of which 27 (77.1%) were females and 8 (22.9%) were males with *p*-value 0.04. One study in past also supports our study, where A significantly large number of females (38%) than males (31%) had painful neuropathy symptoms with *p*-value <0.0001.[9] One more study also showed significant association of gender with diabetic neuropathy with *p*-value 0.04.[10]

Similar to the results about age and gender has been associated with complications in diabetic patients, duration of diabetes also has effect on possible complications of diabetes, and in this study, duration was found to be associated with development of stroke in diabetic patients. Out of total 113 patients 53 (46.9%) were those who had less than 5 years of diabetes, and 60 (53.1%) were those who had ≥5 years of diabetes. Among these 113 patients only 5 (100%) developed stroke and they all were having duration of diabetes of ≥5 years, which showed duration of the disease has effect on outcomes with strong association and with *p*-value of 0.03. Previously done, one study also concluded that more is the duration of diabetes, more is the risk of development of stroke in patients, their study also had strong association between duration of diabetes mellitus and stroke in diabetic patients with p-value of 0.02 for duration less than 5 years and p-value of <0.001 for duration ≥5 years.[10]

Out of 113 patients, 16 patients developed retinopathy and among these 16, 6 (37.5%) were smokers and 10 (62.5%) were non-smokers with p-value of 0.01. A study done previously showed some similar association between smoking and diabetic retinopathy, in that study, compared with non-smokers, the risk of

retinopathy was found to be significantly decreased in smokers with *p*-value 0.02.[11]

We were unable to conduct study on pregnant women. We did not have financial support from Hospital administration or any other source. Majority of Patients were unaware of their Exact history regarding diabetes and its complications

CONCLUSION

This study concluded that coronary artery disease was the most common macrovascular complication while neuropathy was the most common microvascular complication and there was significant association of age and duration of diabetes with stroke. Gender of patient was significantly associated with retinopathy and neuropathy, and smoking was associated with nephropathy and retinopathy.

RECOMMENDATIONS

This study is the first step in assessing complications of diabetes in terms of different risk factors however future studies with better study designs and sample sizes providing better insight into the natural history of diabetes in the local population is recommended. Based on the results of this study it is suggested that hospital administration should initiate policies regarding screening of diabetic patients for common complications like retinopathy by fundoscopy, peripheral neuropathy by proper history and neurological examination and nephropathy by tests for checking albuminuria among indoor and outpatient medical departments. Also, the general population should be educated about the possible disastrous complications, through media and pamphlets for prevention of common complications.

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AUTHORS' CONTRIBUTION

SM: Conceptualization, interpretation, discussion. FN: Data analysis, discussion, literature review. FI: Data collection, Literature review.

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