ORIGINAL ARTICLE

FREQUENCY OF CHRONIC COMPLICATION IN TYPE 2 DIABETES AT A TERTIARY CARE HOSPITAL IN THE PROVINCE OF PUNJAB

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ABSTRACT

Objective: To find out the frequency of chronic complication among type 2 diabetic subjects in a Tertiary Care Hospital in the province of Punjab.

Methodology: This retrospective study elaborates the assessment of information records from people with type 2 diabetes (T2D) who visited the Outpatient department of Nishtar Medical College, a tertiary consideration clinic in Multan, from January 2013 to December 2018. The study comprised subjects who had preexisting microvascular complications or developed diabetic complications during the study period. Entities with gestational and type 1 diabetes were barred from the study. Statistical analysis was performed using Statistical Packages for Social Sciences (SPSS) version 20.

Result: The study comprised a total of 4556 participants, with 44.1% being male. The average age of the participants was 47.72± 10.82 years. A positive family history of diabetes was detected in 46.3% of the subjects. Furthermore, 21.2% of the participants had hypertension, and 10.3% were classified as obese. Among the subjects, 53.5% had been diagnosed with diabetes for less than 5 years. Among them 74.4% of the participants had hypertension and 58.1% were obese.

Conclusion: Frequency of hypertension and obesity was found higher in subjects with T2D in the province of Punjab-Pakistan. Furthermore, these findings underscore the necessity for a multi-center study to confirm their validity.

Key Words: Type 2 diabetes, microvascular complication, retinopathy, neuropathy, nephropathy.
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INTRODUCTION

Type 2 Diabetes (T2D) is on the rise globally due to lifestyle modifications, such as the increase in unhealthy diets and a lack of physical activity. The primary lifestyle-related risk factors accepted for causing diabetes are obesity and physical inactivity, making it possible to prevent the onset of diabetes through lifestyle interventions like weight loss and increased physical activity [1].

As per the Global Diabetes League (IDF) Chart book eighth version, there are 451 million individuals experiencing diabetes around the world, with a predominance rate in the Center Eastern and North African (MENA) district of 9.2% up to 2017. The new National Diabetes Survey of Pakistan (NDSP) for 2016-2017 detailed a sort 2 diabetes pervasiveness of 26.3%. With Pakistan's overall population at around 207.77 million, this indicates that

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approximately 27.4 million people in Pakistan have diabetes, and about 14.47% of the population is pre-diabetic. Several factors, including shifts in psychology and environment towards sedentary lifestyles and calorie-rich diets, contribute significantly to the high prevalence of diabetes [2]. Individuals with type 2 diabetes are at a higher risk of developing various complications due to interconnected and complex mechanisms involving insulin endurance, high blood sugar, fast-tracked disposition of plaque in the arteries, and substandard infection [3]. Epidemiological studies show that every 5th person with diabetes has two or more micro vascular complications [4]. These complications not only increase morbidity but also reduce the quality of life [5]. Microvascular complications are more common in individuals with a longer duration of diabetes and are often not present before diagnosis [6]. Reducing microvascular complications in people with type 2 diabetes is possible and can lead to lower mortality rates while simultaneously reducing healthcare costs and improving healthcare access for the population [7].

Diabetic microvascular consequences include nephropathy, neuropathy, and retinopathy. One of the main characteristics of type 2 diabetes is retinopathy, which is characterized by visual loss [8]. According to the American Diabetes Association (ADA), diabetic neuropathy is characterized by symptoms and indications of nerve abnormalities in the extremities; increasing the risk of conditions such Charcot joints, foot loss, and ulcers [9]. Renal failure is mostly caused by diabetic nephropathies, with microalbuminuria present in around 7% of type 2 diabetics at the time of diagnosis [10]. In type 2 diabetes individuals, the yearly incidence of microalbuminuria is found to be 2% according to the European Diabetes Prospective Complications Study [11].

Medical care professionals may better develop treatment plans and implement preventative actions for their patients by evaluating the frequency and severity of these complex circumstances. Thus, the aim of this research is to investigate the recurrence of persistent complications in patients with type 2 diabetes who visit a tertiary care clinic in Multan, Pakistan.

METHODOLOGY

The tertiary care hospital in Multan, Nishtar Medical College was the site of this retrospective investigation. The Institutional Ethical Review Committee of Nishtar Medical College, Multan, provided ethical approval. For type 2 diabetic patients who were 18 years of age or older, all pertinent parameters for the appropriate medical management of diabetes were examined during the initial outpatient department (OPD) visits between January 2013 and December 2018. Patients with gestational diabetes and Type 1 diabetes were excluded, whereas those with preexisting macrovascular problems or those who developed diabetic complications during the research period were included. Confidentiality of participants was maintained. A body mass index (BMI) of 30 or more, waist-to-hip ratios of 0.80 for women and 0.90 for men, and a waist circumference (WC) of 90 cm or more for men and 80 cm or less for women were considered indicators of obesity [12]. The Joint National Committee VII (JNC VII) standards, which specify a systolic blood pressure of at least 130 mmHg and a diastolic blood pressure of at least 80 mmHg, were used to identify hypertension. Additionally included were those who had previously used prescription antihypertensive medication. It was determined that the normal values for Fasting Blood Glucose (FBS) and Random Blood Glucose (RBS) were 126 mg/dL (= 7.0 mmol/L) and 200 mg/dL (= 11.1 mmol/L), respectively [13].

The typical diagnostic test for diabetes is the HbA1c, as defined by the American Diabetes Association (ADA). DiaSTAT is then used to calculate the Glycemic Index based on glycosylated hemoglobin (HbA1c). The ADA guidelines specified a 6.5% (48mmol/mol) HbA1c cutoff. The glucose oxidase method was used to analyze fasting blood glucose level [14].

An enzymatic approach (GPO-PAP and CHOD-PAP) was utilized to evaluate the lipid profile. Serum triglyceride >150 mg/dl, serum cholesterol >200 mg/dl, serum high-density lipoprotein <40 mg/dl (male) and <50 mg/dl (female), and serum low-density lipoprotein >130 mg/dl are the cutoff values for lipid profile according to the WHO Adult Treatment Panel III recommendation [15].

An ophthalmologist utilized a Vista 20 direct ophthalmoscope to assess retinopathy. Retinopathy is categorized as maculopathy, pre-proliferative and proliferative (soft exudates and new vessels), and normal backdrop (microdots and hard exudates).

In contrast to peripheral neuropathy, which is defined as the absence of vibratory or touch feeling in the feet, nephropathy is defined as >1+ on the dipstick (Combur 10, Rouche Diagnostics) in the absence of any other abnormalities in the urine examination. Vibration sense was measured using a 128 Hz tuning fork, while touch sense was assessed with a 10gm monofilament [16].

Statistical Analysis

The student T-test, Mann Whitney U test and Chi-square were used to measure the frequency of chronic complications and their association with gender. P-values less than 0.05 were regarded as statistically noteworthy. The Statistical Packages for Social Sciences (SPSS) version 20 was used to analyze the data.

RESULTS

A total of 4556 participants were included in the study, of which 44.1% were men. The mean age was determined to be 47.72±10.82 years. The mean weight, height, and BMI of male patients were as 70.81±14.19 kg, 165.87±10.35 cm, and 25.81±5.17 kg/m^2, while the females were 64.45±13.57 kg, 154.74±9.61 cm, and 27.03±5.82 kg/m^2 respectively. A positive family history of diabetes was found in 46.3% of the participants. 10.3% of the individuals were headed towards obesity, and 21.2% of them had hypertension. 53.5% of the participants had diabetes for less than five years. The p-value for the Midsection to Hip Proportion was less than 0.0001 in comparing the gender, as shown in table 1.

Table 1: Baseline Characteristic of Studied Participants

Parameters	Male	Female	P-value	Overall
N	2007	2549	-	4556
Age (years)	48.23±11.35	47.32±10.37	0.005	47.72±10.82
Weight (kg)	70.81±14.19	64.45±13.57	<0.0001	67.25±14.2
Height (cm)	165.87±10.35	154.74±9.61	<0.0001	159.64±11.38
BMI (kg/m^2)	25.81±5.17	27.03±5.82	<0.0001	26.5±5.57
Waist circumference (cm)	103.99±17.11	101.96±18.87	<0.0001	102.85±18.14
Hip circumference (cm)	100.08±11.6	100.52±11.97	0.202	100.33±11.81
Waist Hip ratio	1.04±0.1	1.01±0.11	<0.0001	1.02±0.1
Normal	181(9%)	62(2.4%)	<0.0001	243(5.3%)
High	1826(91%)	2487(97.6%)		4313(94.7%)
Systolic blood pressure (mmHg)	130.43±22.57	131.08±22.35	0.333	130.79±22.44
Diastolic blood pressure (mmHg)	82.39±13.42	82.31±13.39	0.846	82.35±13.4
Duration of DM (years)	5.45±5.49 4(1.5-8) *	5.61±5.19 4(1.6-8) *	0.051	5.54±5.33 4(1.5-8) *
<5 years	841(56.1%)	970(51.4%)	<0.0001	1811(53.5%)
=5 years	658(43.9%)	918(48.6%)		1576(46.5%)
Family history of obesity				
No	1849(92.1%)	2238(87.8%)		4087(89.7%)
Yes	158(7.9%)	311(12.2%)	<0.0001	469(10.3%)
Family history of diabetes				
No	959(55.2%)	1144(52.4%)		2103(53.7%)
Yes	778(44.8%)	1038(47.6%)	0.083	1816(46.3%)
Family history of hypertension				
No	1402(81.7%)	1655(76.6%)		3057(78.8%)
Yes	315(18.3%)	506(23.4%)	<0.0001	821(21.2%)

Data given as mean ± SD, *Median (IQR) or n (%)
P-value<0.05 considered to be statistically significant

The result of biochemical parameters is displayed in table 2, and showed that the mean values of random glucose and fasting glucose were 191.73±76.43 (mg/dl) and 261.49±95.28 (mg/dl), respectively. Serum creatinine and cholesterol had p-values less than 0.0001, indicating significance value in comparing between males and females. HbA1c (%) was 7.49±1.28 on average.

Table 2: Biochemical Parameters of Studied Participants

Parameters	Male	Female	P-value	Overall
N	2007	2549	-	4556
Fasting blood sugar (mg/dl)	185.13±74.69	196.93±77.43	0.007	191.73±76.43
Random blood sugar(mg/dl)	257.74±96.87	264.53±93.89	0.044	261.49±95.28
Serum Creatinine (mg/dl)	1.13±0.67	1.02±0.99	<0.0001	1.07±0.87
Cholesterol (mg/dl)	191.54±44.2	201.8±56.09	<0.0001	197.22±51.38
Triglyceride (mg/dl)	216.87±123.88	224.07±132.86	0.162	220.84±128.93
LDL (mg/dl)	113.11±52.12	115.55±45.48	0.313	114.44±48.62
HDL (mg/dl)	46.19±15.39	46.85±13.09	0.347	46.55±14.19
HbA1c (%)	7.5±1.25	7.49±1.31	0.861	7.49±1.28

Data presented as mean±SD or n (%).
P-value<0.05 considered to be statistically significant

The prevalence of chronic complications is depicted in table 3. The most prevalent metabolic anomaly observed was hypertension, affecting 74.4% of individuals, followed by obesity at 58.1%. Regarding micro vascular complications, nephropathy was documented in 84.9% of cases, neuropathy in 76%, and retinopathy in 54.7%. Among these complications, nephropathy exhibited the highest incidence rate.

Table 3: Various Complications Among Studied Participants

Parameters	Male	Female	P-value	Overall
N	2007	2549	-	4556
Neuropathy				
No	97(26.1%)	110(22.4%)	0.209	207(24%)
Yes	274(73.9%)	380(77.6%)		654(76%)
Nephropathy				
No	91(14%)	120(16.1%)		211(15.1%)
Yes	560(86%)	624(83.9%)	0.263	1184(84.9%)
Retinopathy				
No	54(46.2%)	52(44.4%)		106(45.3%)
Yes	63(53.8%)	65(55.6%)	0.793	128(54.7%)
Hypertension				
No	526(26.2%)	639(25.1%)		1165(25.6%)
Yes	1481(73.8%)	1910(74.9%)	0.381	3391(74.4%)
Obesity				
No	938(47%)	960(37.8%)		1898(41.9%)
Yes	1058(53%)	1578(62.2%)	<0.0001	2636(58.1%)
Hypercholesterolemia				
No	938(61.3%)	1055(55.6%)		1993(58.1%)
Yes	592(38.7%)	844(44.4%)	0.001	1436(41.9%)
Hypertriglyceridemia				
No	346(30.4%)	411(29.3%)		757(29.8%)
Yes	794(69.6%)	993(70.7%)	0.554	1787(70.2%)
High Low Density Lipoprotein				
No	540(72.2%)	612(68.7%)		1152(70.3%)
Yes	208(27.8%)	279(31.3%)	0.122	487(29.7%)
Low High Density Lipoprotein				
No	530(70.9%)	303(34%)		833(50.9%)
Yes	218(29.1%)	587(66%)	<0.0001	805(49.1%)

Data presented as mean±SD or n (%).
P-value<0.05 considered to be statistically significant

In table 4 the relationship of microvascular complexity with span of diabetes is demonstrated. Neuropathy in <5 year was 87.1% and =5 year was 88.8% as for span of diabetes. "Neuropathic prevalence was 92.3% in individuals under 5 years and 91.2% in those aged 5 years or older. As for retinopathic frequency, it affected 69% of individuals under 5 years and 63.2% of those aged 5 years or older".

Table 4: Association of Microvascular Complication with Duration of Diabetes

Micro vascular complication	<5 years	≥5 years	P-value	Overall
Neuropathy				
No	33(12.9%)	39(11.2%)	0.505	72(11.9%)
Yes	222(87.1%)	310(88.8%)		532(88.1%)
Nephropathy				
No	32(7.7%)	41(8.8%)	0.545	73(8.3%)
Yes	384(92.3%)	424(91.2%)		808(91.7%)
Retinopathy				
No	18(31%)	25(36.8%)	0.499	43(34.1%)
Yes	40(69%)	43(63.2%)		83(65.9%)

Data presented as n (%).
P-value<0.05 considered to be statistically significant

DISCUSSION

Our research indicates that nephropathic symptoms are 30% common in people with T2D, usually appearing after a decade of diabetes; in patients with type 1 diabetes, symptoms may appear as early as five years of diabetes. It's crucial to remember, though, that in certain situations diabetic nephropathy may already exist at the time of the diagnosis of T2D [17].

One reason for the increased rate of microvascular problems is inadequate glycemic management. Nephropathy was the most common microvascular problem in our research. In our study, neuropathy; a condition that impairs both peripheral and autonomic nerves was found in 76% of the participants. Different ethnic groups have varied rates of neuropathy prevalence; North India has a rate of 29.2%. The rates reported in other research range from 48.7% to 56.1%. A major contributor to loss following foot injuries or ulcers is peripheral neuropathy, which can manifest as sensory, site, or autonomic neuropathy [18].

Both hypertension and the degree of hyperglycemia were shown to be related to the prevalence of retinopathy in type 2 diabetes. Retinopathy affected 54.7% of study participants, which was greater than prior studies' findings but less common than other microvascular problems. One research conducted in Rawalpindi found that the prevalence of retinopathy was 14.5%, while another study found that the incidence rate of retinopathy was 92.9 per 1000 person-years. For better management in Pakistan, ophthalmologists must do better screening and early intervention [19].

While T2D and hypertension can be promptly analyzed at the bedside, they are unpredictable and various circumstances, each conveying an expanded risk of extreme cardiovascular illness (CVD). Their common co-occurrence in individuals is not coincidental, as certain aspects of their pathophysiology overlap, notably those associated

with obesity and insulin resistance. As a representation, in the San Antonio Heart Study, it was seen that as 85% of people with T2D had hypertension by their fifth decade of life, while half of those with hypertension experienced either disabled glucose resistance or created T2D [20].

The data was inadequately organized and maintained at the center, which may introduce bias into the results. Furthermore, the dataset was collected solely from patients' initial visits to the OPD, lacking information regarding the duration and severity of their complications. Many essential parameters were missing, resulting in the exclusion of a significant number of patients from the study. Given that this study is based on a single center, its findings cannot be extrapolated to the entire population.

CONCLUSION

Frequency of hypertension and obesity was found higher in subjects with T2D in the province of Punjab-Pakistan. Considering the concerning prevalence of chronic complications, it becomes crucial to undertake comprehensive research in this area to enhance both diagnosis and intervention strategies. Moreover, these findings should be validated through a multicenter study. There is an urgent necessity for the establishment of advanced diabetology institutes in Pakistan. Such foundations cannot just work with early analysis and improved therapy arranging yet additionally give imaginative therapy modalities to ongoing diabetes intricacies.

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Author's Contribution

MAT: Concept & study design, manuscript writing, result interpretation and analysis
SD: Critical review, content analysis and approved the manuscript
AS: Data collection, manuscript writing and data entry
SHG: Literature search and data collection
FMDC: Edited and approved the manuscript
GMDC: Edited and approved the manuscript

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