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Original Article

Concomitant Macro and Microvascular Complications in Diabetic Nephropathy

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ABSTRACT. To determine the prevalence of concomitant microvascular and macrovascular complications of diabetic nephropathy we retrospectively reviewed the medical records of all 1,952 type 2 diabetic patients followed-up at Security Forces Hospital, Riyadh, Saudi Arabia from January 1989 to December 2004. There were 626 (32.1%) patients (294 (47%) were males) who developed diabetic nephropathy. Their mean age was 66.9 ± 11.4 years, mean duration of diabetes was 15.4 ± 7.5 years, mean age at the onset of nephropathy was 61.5 ± 12.4 years, and mean duration of nephropathy was 3.9 ± 3.8 years. Concomitant diabetic complications included cataract (38.2%), acute coronary syndrome (36.1%), peripheral neuropathy (24.9%), myocardial infarction (24.1%), background retinopathy (22.4%), stroke (17.6%), proliferative retinopathy (11.7%), foot infection (7.3%), limb amputation (3.7%) and blindness (3%). Hypertension was documented in 577 (92.2%) patients, dyslipidemia in 266 (42.5%) and mortality from all causes in 86 (13.7%). There were 148 (23.6%) patients with one complication, 81 (12.9%) with two, 83 (13.3%) with three, and 61 (9.7%) with four or more. Deterioration of glomerular filtration rate was observed in 464 (74%) patients and doubling of serum creatinine in 250 (39.9%), while 95 (15.2%) developed end-stage renal disease (ESRD) at the end of study and 79 (12.6%) required dialysis. Complications were significantly more prevalent among males with greater number reaching ESRD level than females ($P< 0.05$). Relative risks of developing complications were significant after the onset of nephropathy; ACS (1.41), MI (1.49), stroke (1.48), diabetic foot (1.6), amputation (1.58) and death (1.93). We conclude that complications of diabetes are aggressive and progressive including high prevalence of diabetic nephropathy. Careful monitoring and proper institution of management protocols should be implemented to identify diabetic patients at high risk for complications and mitigate progression into ESRD.

Keywords: Diabetes mellitus, Nephropathy, Complications

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Introduction

The World Health Organization (WHO) estimates that more than 180 million people worldwide have diabetes mellitus (DM) and is likely to double by 2030.[1] Estimates on diabetes prevalence have been published previously.[2,3] In the

US, DM affects nearly 17 million Americans, and it is considered the 7th leading cause of death.[1] Over the past two decades, the prevalence of DM in Saudi Arabia has dramatically increased and is now considered among one of the highest in the world with prevalence between 9.7% and 23.7%.[4,5]

Prevalence studies on type 2 diabetic complications showed that 15-48% of type two diabetics develop retinopathy,[6-9] 11-25% angina and/or myocardial infarction (MI),[10-14] 20-40% stroke,[15-17] 25-60% peripheral neuropathy,[18,19] and 40-50% end-stage renal disease (ESRD).[20-23] Moreover, patients with long-term diabetes had associated hypertension in 50-75%[14] and dyslipidemia in almost 75% of the cases.[14,17,21,22] Diabetic nephropathy (DN) occurs in 24% of Saudi diabetics and it accounts for 45% of the causes of chronic kidney disease (CKD).[4-6]

Since 1995 when Huraib et al[6] reported the patterns of DN among Saudi patients, there is no current systematic or detailed report on this issue or its concomitant complications.

We aim in this study to determine the epidemiological characteristics and patterns of concomitant complications and comorbidities in type two diabetics including DN in a large population followed-up at a single tertiary care hospital in Saudi Arabia.

Patients and Methods

This retrospective review includes medical files 1952 type 2 diabetic patients followed-up at Security Forces Hospital in Riyadh, Saudi Arabia from January 1989 to January 2004 (16 years). Patients with gestational diabetes as well as patients who were already on dialysis and recently diagnosed diabetics (less than one year from diagnosis) were excluded.

Demographics (age and sex) and anthropometric characteristics (height and weight), duration of diabetes, family history of diabetes, duration of follow-up, and dates of onset of complications and comorbidities were recorded.

Hypertension among diabetics was based on pre-existing history of hypertension and measurement of BP; systolic BP was considered if > 130 mmHg and/or diastolic BP > 80 mmHg based on the 7th Joint National Committee on Hypertension (JNC 7) recommendation.[28] Baseline and last visit Body Mass Index (BMI) values were calculated and corrected using the Dubois equation.

Cataract was considered with the finding of nuclear sclerosis, and retinopathy with the presence of retinal hemorrhages, exudates, and macular edema. Neuropathy was diagnosed in the presence of persistent numbness, paresthesia, loss of hearing of the tuning fork and sense of vibration, and failure to elicit knee and/or ankle jerk. Acute coronary syndrome (ACS) and MI were considered in the presence of clinical, electrocardiographic, biochemical, and angiographic evidence of these conditions. Stroke was supported by clinical or radio-diagnostic evidence of cerebrovascular accident (CVA).

DN was considered by positive persistent proteinuria for at least three consecutive readings per year and/or serum creatinine (SCr) > 130 μmol/L and/or GFR < 60 mL/min.

Baseline and follow-up laboratory values included SCr, fasting blood sugar (FBS), urine dipstick, and serum total cholesterol (TC). Glomerular filtration rate (GFR) was calculated using the Cockcroft-Gault equation without correction for body surface area. Parameters at initial visit, yearly follow-ups and at last visit were recorded and summarized as mean ± SD. Time course of all the above parameters were recorded.

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) program version 11.5. Descriptive analysis was used for the demographic data. The data were tested for normality of distribution and presented as mean ± SD. Significance of measured changes was assessed using a student "t" test. Correlations were evaluated using Chi-square test. A statistical significance level was considered if value was $P < 0.05$.

Results

Of the reviewed type 2 diabetic cases, 626 (32.1%) patients developed DN (294 (47%) males

Table 1. Frequencies of the concomitant diabetic complications according to gender in 626 diabetic nephropathy patients

	Males	Females	*P* values
No. of patients	294	332	
Cataract	122 (41.5)	117 (35.2)	0.10
Background diabetic retinopathy	77 (26.2)	63 (19.0)	0.03
Proliferative diabetic retinopathy	42 (14.3)	31 (9.3)	0.05
Blindness	12 (4.0)	7 (2.1)	0.17
Arrhythmia	7 (2.4)	5 (1.5)	0.41
Atrial fibrillation	12 (4.1)	12 (3.6)	0.74
Acute coronary syndrome	117 (39.8)	109 (32.8)	0.06
Myocardial infarction	79 (26.9)	72 (21.7)	0.13
Stroke	58 (19.7)	52 (15.7)	0.19
Neuropathy	92 (31.3)	64 (19.3)	0.0006
Persistent proteinuria	252 (85.7)	198 (59.6)	< 0.0001
Foot infections	30 (10.2)	16 (4.8)	0.01
Amputations	14 (4.8)	9 (2.7)	0.17
Dialysis	47 (16.0)	32 (9.6)	0.0057
Death	46 (15.6)	40 (12.0)	0.19

and 332 (53%) females). The mean age at the time of the study was 66.9 ± 11.4 years (range: 29-100 years). The mean duration of diabetes was 15.4 ± 7.5 years (range: 1-40 years), the mean duration of DN was 3.9 ± 3.8 years (range: 1-16 years) and mean duration of follow-up period was 10 ± 4.1 years (range: 1-18 years). The mean duration from diagnosis of diabetes to onset of DN was 12.6 ± 7.2 years (range: 1-18 years). Family history of DM was documented in 287 (45.8%) patients with 105 (36.6%) of paternal link.

Age at onset of diabetes

The mean age at the onset of diabetes was 51.6 ± 12.3 years (range: 19-95 yrs). There were 25 patients (4.0%) who had diabetes at age ≤ 30 years, 94 (15%) had diabetes between 31 and 40 years, 171 (27.3%) had diabetes between 41 and 50 years, 188 (30%) had diabetes between 51 and 60 years, 110 (17.6%) had diabetes at age between 61 and 70 years, 31 (5%) had diabetes at age between 71 and 80 years and 7 (1.1%) had diabetes beyond 80 years of age.

Age at onset of nephropathy

The mean age at the onset of DN was 61.5 ± 12.4 years (range: 22-95 years). There were 4 (0.6%) patients who had nephropathy at age < 30 years, 21 (3.4%) between 31 and 40 years, 59 (9.4%) between 41 and 50 years, 130 (20.8%) between 51 and 60 years, 225 (36%) between 61 and 70 years, 129 (20.6%) between 71 and 80 years and 58 (9.3%) had DN beyond 80 years of age.

Diabetic complications according to gender

Table 1 shows that male patients were significantly more susceptible to diabetic complications such as background diabetic retinopathy (BDR), peripheral diabetic neuropathy (PDR), foot infection, persistent proteinuria, and progression to ESRD requiring dialysis. However, there was only trend for more prevalence in males than females for other complications such as cataract, proliferative retinopathy, blindness, cardiac complications (including non-specific arrhythmia, atrial fibrillation, ACS and MI), stroke, amputation, and death.

Associated diabetic complications

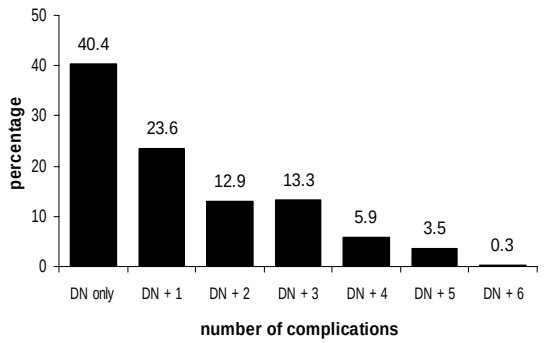
Table 2 shows the frequencies of the concomitant diabetic complications in the study patients according to duration of diabetes. Cataract was the most prevalent, followed by ACS, peripheral neuropathy, MI, BDR, stroke, and PDR. All complications increased in frequency with the increased duration of the disease. Hypertension was documented in 577 (92.2%) patients, dyslipidemia in 266 (42.5%) patients, and overall mortality in

Table 2. Frequencies of concomitant complications according to duration of diabetes in 626 DN patients

Complications	Total Number	Duration of diabetes in years					
		1-5	6-10	11-15	16-20	21-25	> 25
No. patients (%)	626	74 (11.8)	125 (20)	135 (21.6)	136 (21.7)	104 (16.6)	52 (8.3)
Age at enrolment	66.9 ± 11.4	63.2 ± 15.1	65.2 ± 12.6	65.7 ± 9.9	68.1 ± 10.6	69.9 ± 8.9	71.4 ± 9.6
Cataract (%)	239 (38.2)	14 (18.9)	19 (15.2)	47 (34.8)	67 (49.3)	64 (61.5)	28 (53.9)
BDR (%)	140 (22.4)	1 (1.4)	2 (1.6)	33 (24.5)	38 (28.0)	43 (41.4)	23 (44.2)
PDR (%)	73 (11.7)	1 (1.4)	2 (1.6)	8 (5.9)	15 (11.0)	35 (33.7)	12 (23.1)
Blindness (%)	19 (3.0)	-	4 (3.2)	2 (1.5)	4 (3.0)	3 (2.9)	6 (11.5)
Arrhythmia (%)	12 (1.9)	-	4 (3.2)	2 (1.5)	-	3 (2.9)	3 (5.8)
Atrial Fib (%)	24 (3.8)	3 (4.1)	2 (1.6)	3 (2.2)	9 (6.6)	4 (3.9)	3 (5.8)
ACS (%)	226 (36.1)	16 (21.6)	29 (23.2)	42 (31.1)	66 (48.5)	41 (39.4)	32 (61.5)
MI (%)	151 (24.1)	7 (9.5)	18 (14.4)	15 (11.1)	49 (36.0)	39 (37.5)	23 (44.2)
Stroke (%)	110 (17.6)	8 (10.8)	16 (12.8)	25 (18.5)	22 (16.2)	28 (26.9)	11 (21.2)
Neuropathy (%)	156 (24.9)	6 (8.1)	16 (12.8)	28 (20.7)	49 (36.0)	36 (34.6)	21 (40.4)
PP (%)	450 (71.9)	33 (44.6)	77 (61.6)	101 (74.8)	110 (80.9)	86 (82.7)	43 (82.7)
Dialysis (%)	79 (12.6)	5 (6.8)	6 (4.8)	11 (8.2)	23 (16.9)	18 (17.3)	16 (30.8)
Foot infection (%)	46 (7.3)	5 (6.8)	4 (3.2)	11 (8.2)	9 (6.6)	12 (11.5)	5 (9.6)
Amputation (%)	23 (3.7)	1 (1.4)	1 (0.8)	4 (3.0)	7 (5.2)	8 (7.7)	2 (3.9)
Death (%)	86 (13.7)	8 (10.8)	10 (8.0)	14 (10.4)	20 (14.7)	20 (19.2)	14 (26.9)
Hypertension (%)	577 (92.2)	60 (81.0)	119 (95.2)	122 (90.4)	129 (94.9)	100 (96.2)	47 (90.4)
Dyslipidemia (%)	266 (42.5)	26 (35.1)	49 (39.2)	57 (42.2)	56 (41.2)	56 (53.8)	22 (42.3)

BDR: Background Diabetic Retinopathy, PDR: Proliferative Diabetic Retinopathy, MI: Myocardial Infarction, DN: Diabetic Nephropathy, Atrial Fib: Atrial Fibrillation, ACS: Acute Coronary Syndrome, PP: Persistent Proteinuria

Figure 1. Prevalence of multiple complications in patients with diabetic nephropathy



86 (13.7%).

Presence of multiple complications

Figure 1 shows that 253 (40.4%) patients had nephropathy alone without other apparent concomitant complication/s, 148 patients (23.6%) had nephropathy with one associated complication, while the rest had more than one complication.

Concomitant diabetic complications according to age of onset of diabetes

Table 3 shows the frequency of complications according to the age at onset of diabetes. There were no significant differences in terms of frequencies of complications whether the age at onset of diabetes was young or old.

Frequency of complications in relation to onset of nephropathy

The frequency of microvascular complications such as cataract, BDR, PDR, and neuropathy occurred more significantly before the onset of nephropathy (P= 0.05). In contrast, the prevalence of macrovascular complications such as stroke, ACS, MI and foot amputation was significantly more after the onset of nephropathy (P< 0.05). Prevalence of death, hypertension, and dyslipidemia was significantly magnified after the onset of nephropathy (P< 0.0001). Table 4 shows increased relative risk of developing complications after the onset of nephropathy such as cardiovascular disease, infection, hypertension, and dyslipidemia.

Changes in serum creatinine and GFR

The mean baseline SCr was 89.5 ± 57.2 µmol/L (range: 39-509 µmol/L), and increased significantly at the last visit to 199 ± 176 µmol/L. Table 5 shows the frequencies of the different levels

Table 3. Frequencies of concomitant complications according to age of onset of diabetes in 626 DN patients

Complications	N (%)	Age at onset of diabetes in years				
		< 30	31-40	41-50	51-60	> 60
No. of patients	626	25 (4.0)	94 (15)	171 (27.3)	188 (30)	148 (23.7)
D. of diabetes		18.5 ± 9.9	18.5 ± 8.5	17.7 ± 6.2	14.6 ± 6.5	11.1 ± 6.5
Cataract (%)	239 (38.2)	8 (32.0)	38 (40.4)	73 (42.7)	69 (36.7)	51 (34.5)
BDR (%)	140 (22.4)	6 (24.0)	26 (27.7)	52 (30.4)	37 (19.7)	19(12.8)
PDR (%)	73 (11.7)	3 (12.0)	12 (12.8)	28 (16.4)	22 (11.7)	8 (5.4)
Blindness (%)	19 (3.0)	3 (12.0)	2 (2.1)	3 (1.8)	3 (1.6)	8 (5.4)
Arrhythmia (%)	12 (1.9)	-	1 (1.1)	3 (1.8)	4 (2.1)	4 (2.7)
Atrial Fib. (%)	24 (3.8)	1 (4.0)	1 (1.1)	5 (2.9)	6 (3.2)	11 (7.4)
ACS (%)	226 (36.1)	8 (32.0)	33 (35.1)	64 (37.4)	60 (31.9)	61 (41.2)
MI (%)	151 (24.1)	4 (16.0)	18 (19.2)	50 (29.2)	42 (22.3)	37 (25)
Stroke (%)	110 (17.6)	4 (16.0)	17 (18.1)	33 (19.3)	31 (16.5)	25 (16.9)
Neuropathy (%)	156 (24.9)	7 (28)	21 (22.3)	48 (28.1)	44 (23.4)	36 (24.3)
PP (%)	450 (71.9)	24 (96.0)	87 (92.6)	139 (81.3)	118 (62.8)	82 (55.4)
Dialysis (%)	79 (12.6)	7 (28)	18 (19.2)	27 (15.8)	15 (8)	12 (8.1)
Foot Infect. (%)	46 (7.3)	3 (12.0)	9 (9.6)	13 (7.6)	10 (5.3)	11 (7.4)
Amputation (%)	23 (3.7)	1 (4.0)	6 (6.4)	9 (5.3)	4 (2.1)	3 (2)
Death (%)	86 (13.7)	1 (4.0)	8 (8.5)	29 (17)	20 (10.6)	28 (18.9)
HTN (%)	577 (92.2)	22 (88.0)	89 (94.7)	161 (94.2)	174 (92.6)	131 (88.5)
Dyslipid (%)	266 (42.5)	10 (40.0)	44 (46.8)	77 (45.0)	81 (43.1)	54 (36.5)

BDR: Background Diabetic Retinopathy, PDR: Proliferative Diabetic Retinopathy, MI: Myocardial Infarction, DN: Diabetic Nephropathy, Atrial Fib: Atrial Fibrillation, ACS: Acute Coronary Syndrome, PP: Persistent Proteinuria, D. of Diabetes: Duration of diabetes, Foot Infect: Foot infection, HTN: Hypertension, Dyslipid: Dyslipidemia

Table 4. Relative risk ratios of concomitant diabetic complications after the onset of nephropathy in 626 diabetic nephropathy patients

Concommitant Complications	Relative Risk (RR)	*P* value
Cataract	0.84	0.031*
BDR	0.81	0.039*
PDR	0.70	0.015*
Blindness	1.27	0.356
ACS	1.41	< 0.0001**
MI	1.49	< 0.0001**
Stroke	1.48	< 0.0001**
Neuropathy	0.69	< 0.0001*
Foot infections	1.60	< 0.0001**
Amputation	1.58	0.010**
Death	1.93	< 0.0001**
Hypertension	1.88	< 0.0001**
Dyslipidemia	1.81	< 0.0001**

*Statistically significant before onset of nephropathy
**Statistically significant after onset of nephropathy

of SCr at the baseline and last visit. There was a significant and constant deterioration of renal function over time, and 250 patients (39.9%) doubled SCr over a mean duration of 9.98 ± 6.04 years (range: 1-39 years) of diabetes.

The mean baseline GFR was 77.7 ± 30.8 mL/min (range: 16-228 mL/min). GFR progressively declined over the years of follow-up. At last visit, the mean GFR for all patients was 44.8 ± 24.2 mL/min (range: 5-163 mL/min). Table 6 shows a significant decline of GFR below 60 mL/min in 83.6% of patients (P< 0.0001). There were 95 patients (15.2%) who reached ESRD level and 79 (12.6%) required dialysis.

Fasting blood sugar and cholesterol levels in diabetic nephropathy patients

At initial visit, there were 82 patients (13.1%) who had FBS < 7.0 mmol/L, 293 (46.8%) between 7-10 mmol/L, 123 (19.6%) between 11-15 mmol/L, and 128 (20.4%) above 15 mmol/L. The mean FBS level at initial visit was 9.67 ± 2.5 mmol/L (range: 5.3-23.2 mmol/L). At last visit, 444 (70.9%) had FBS level < 7.0 mmol/L, 46 (7.3%) between 7-10 mmol/L, 104 (16.6%) between 11-15 mmol/L and 32 (5.1%) above 15

Table 5. Frequencies of serum creatinine levels in 626 diabetic nephropathy patients

SCr levels (μmol)	No. (%)	
	At baseline	At end of study
> 110	567 (90.6)	232 (37.1)
110-130	16 (2.5)	65 (10.4)
131-150	11 (1.8)	53 (8.5)
151-200	7 (1.1)	108 (17.3)
> 200	25 (9.0)	168 (26.8)

Note: Initial vs. end of study values, $P < 0.0001$

Table 6. Frequencies of glomerular filtration rate (GFR) levels in 626 diabetic nephropathy patients

GFR levels (mL/min)	N (%)	
	At baseline	At end of study
> 120	60 (9.6)	10 (1.6)
90-120	113 (18.1)	18 (2.9)
60-89	271 (43.3)	74 (11.8)
30-59	160 (25.6)	350 (55.9)
15-29	17 (2.7)	103 (16.4)
< 15	5 (0.8)	71 (11.3)

Note: Initial vs. end of study values, $P< 0.0001$

mmol/L. The mean last visit FBS level was 7.38 ± 3.62 mmol/L (4.2-21.8 mmol/L). A total of 182 (29.1%) patients had uncontrolled blood sugar at last visit.

The mean baseline serum cholesterol was 4.14 ± 1.0 mmol/L (range: 2.25-8.9 mmol/L). Table 7 shows the frequencies of patients diagnosed as dyslipidemic and prevalence of therapy in them. There were 92 (14.7%) DN patients who had serum TC ≥ 5.2 mmol/L, and only 8 (8.7%) patients were on statins, while 534 patients had baseline serum TC < 5.2 mmol/L, and only 46 (8.6%) of them were on statins. At baseline there were 138 (22.0%) documented dyslipidemic patients, while at the last visit there were 266 (42.5%).

Hypertension in DN patients

At baseline, there were 527 (84.2%) documented hypertensive DN patients by history and/or measurement of BP or by record of antihypertensive medications, and 358 (67.9%) patients had uncontrolled BP; 151 (42.2%) had isolated systolic hypertension, 14 (3.9%) had isolated diastolic hypertension, and 193 (53.9%) had both systolic and diastolic hypertension. At last visit, there were 577 (92.2%) documented hypertensive

Table 7. Serum cholesterol and use of statins in diabetic nephropathy patients

Serum cholesterol levels	On statins	
	At baseline	At last visit
< 5.2 mmol/L	46/534 (8.6%)	146/506 (28.9%)
≥ 5.2 mmol/L	8/92 (8.7%)	44/120 (36.7%)
Total with dyslipidemia at baseline		138 (22.1%)
Total with dyslipidemia at last visit		266 (42.5%)

patients of whom 292 (50.6%) were still uncontrolled. Of patients with uncontrolled BP at last visit, 131 (44.9%) had isolated systolic hypertension, 22 (7.5%) had isolated diastolic hypertension and 139 (47.6%) had both systolic and diastolic hypertension.

Discussion

Diabetic nephropathy is a serious complication of diabetes. It aggravates both macro and microvascular complications of diabetes mellitus, results in CKD and eventually death. Such relationship coincides with longer duration of diabetes, non-optimal control of co-morbid conditions, non-compliance to treatment and lifestyle modifications. Currently, the extent of multi-organ damage brought about by the adjunctive effect of nephropathy was thought to increase the severity of diabetes resistant to the different management protocols, and heighten the morbidity and mortality of diabetes and its concomitant complications.

Due mostly to the continued increase of prevalence of diabetes among Saudi's secondary to the rapid economic development and changes in lifestyles, we found in our study of diabetic nephropathy and its associated complications a higher percentage of DN (32.1%) compared to the 2006 Saudi Center for Organ Transplantation report (28.3%) on dialysis patients.[5] Moreover, in contrast to the 1995 Huraib et al report,[6] the prevalence has significantly increased. Our 32.1% prevalence from a hospital-based collection, however, may reflect the tip of the iceberg, with a more profound and larger problem hidden among the unreported cases.

Of the microvascular complications, we found in our study a 22.4% prevalence of BDR and 11.7% PDR, higher when combined than that reported elsewhere.[7-9] Accordingly, the presence of diabetic retinopathy may predict other diabetic complications.

Cardiac complications and stroke were also high in our study compared to other reports.[10-15] In fact, even our very young patients developed cardiac complications secondary to diabetes. Mortality of 13.7% may not be reflective of the real rate since most deaths may have occurred outside institutions, thus were under-reported.

Our diabetic population is old reflecting either late diagnosis and/or late referral to special care. The sedentary lifestyle, dietary preferences towards fatty meals and sweets among Saudis and unpopular visits to fitness clubs may attribute to early onset of diabetes and even nephropathy.

Our 92.2% prevalence of hypertension is high compared to other studies.[3,10,14] The American Diabetes association and the National Heart, Lung and Blood Institute recommended that diabetics keep their blood pressure below 130/80 mmHg. Our report showed that only 49.4% of our patients achieved that goal. Coupled with dyslipidemia, hypertension may result in a dangerous spiral of events.

Furthermore, 15.2% of our study population reached ESRD, though lower than reported by others.[4,16,17,20] This may reflect short duration of diabetic nephropathy (3.9 years approximately). Most microvascular complications occur before DN and most macrovascular complications occur after DN and this may be partially due to genetic predisposition, change in lipid profile, increase in blood pressure, and better blood sugar control. Elevation of GFR and increase in SCr especially in type 2 diabetics eventually increase the risk of developing complications, thus increasing mortality as shown in our recently published report.[24]

We conclude that there is a high prevalence of both micro and macrovascular complications in patients with diabetes with 32.1% develop nephropathy in at least ten years duration of diabetes. Although the rates of complication reflect some racial and social aspects, the onset of nephropathy among diabetic patients still serves as a potential risk for developing the dreaded concomitant complications.

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