

# Prevalence of Vascular Complications among Type 2 Diabetes Mellitus Outpatients at Teaching Hospital in Malaysia

Salwa Selim Ibrahim Abougalmou<sup>1\*</sup>, Mohamed Azmi Hassali<sup>2</sup>, Syed Azhar Syed Sulaiman<sup>3</sup> and Ayman S. Abougalmou<sup>4</sup>

<sup>1</sup>Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia (USM)

<sup>2</sup>Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, USM

<sup>3</sup>Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, USM

<sup>4</sup>Cardiologist, National Heart Institute (IJN), Kuala Lumpur

## Introduction

Diabetes mellitus is associated with an increased risk for a number of serious and sometimes life-threatening macro-and microvascular complications. Macrovascular disease, that includes coronary heart disease (CHD), cerebrovascular disease, and peripheral vascular disease, is the leading cause of mortality in people with diabetes. Diabetes mellitus patients carry an increased risk two to four times greater for heart attack, stroke and other complications related to poor circulation [1] and depend on ADA [2] the majority of deaths are due to CHD. In another study by Vijan et al. [3] said that up to 80% of Type 2 diabetic patients will develop or die of macrovascular disease.

Microvascular complications include effects on small vessels, including arterioles, capillaries and venules. The development of these complications starts early in the pathogenesis of Type 2 DM and accounts for morbidity in the form of retinopathy, neuropathy and nephropathy

In Malaysia, there is a growing public concern due to the escalation with number of people with diabetes while complication rates and associated diseases amongst diabetics are high. In addition high prevalence of complications such as blindness, end stage renal disease, lower extremity amputations as well as premature cardiovascular disease, stroke and premature mortality related to poor control of blood glucose [4].

The present study was to determine prevalence and focused on presence risk factor affecting on diabetic vascular complications among type 2 diabetic outpatients in tertiary center.

## Material and Methods

A prospective study was conducted for study period of one year (1<sup>st</sup> Jan 2008 till 31<sup>st</sup> Dec 2008) in order to determine the prevalence diabetic vascular complications and risk factors affect on these complications among type 2 diabetes mellitus in outpatient diabetic care at teaching hospital USM which is located in the state of Kelantan, Malaysia.

The research's protocol was approved by the Human Research and Ethics Committee of the School of Medicine in the Universiti Sains Malaysia. Signed informed consent was obtained from all patients

All patients with type 2 diabetes mellitus, age range 18 to 88years, were screened for diabetic vascular complications.

The information obtained from the interview included the patient's identification data such as age, sex, and race, alcohol, smoking history, physical activity and level of education. They were classified smoking history to (never, previous, current), the level of education was classified by the level of completion of their formal education either less than secondary school, secondary and more than secondary school and physical activity was classified into active (if the duration of physical activity was equal or more than 150min/week), and non active (if physical activity duration was less than 150 min/week). Glycaemic control based on measurement (poor glycaemic control if HbA1c >7%),

and blood pressure (BP hypertension if systolic BP > 130 mm Hg or diastolic BP > 80 mm Hg.

Diagnosis of retinopathy is based on finding the diagnostic signs of retinopathy on eye exams by fundoscopy.

Patients were considered to have neuropathy if symptoms of pain anesthesia, paresthesia, muscular weakness, loss of tendon reflexes, and impaired vibration sense.

Patients were considered to have nephropathy if they have microalbuminuria or proteinuria.

Coronary artery disease was diagnosed by documented angina symptoms and confirmed by performed an ECG, or from results of percutaneous transcoronary angiography (PTCA) in patients record.

Cerebrovascular disease was defined by present of transient ischemic attack or stroke in past medical history.

## Ethical approval of study

Ethical approval was obtained for this research study from research and ethics committee, USM in January 2008.

## Result

A total of 1077 Type 2 diabetic patients were involved in this study. About 476 were males and 601 were females, the mean ( $\pm$  SD) duration of Type 2 DM is 11 ( $\pm$  6.81) years, ranging from less than one year to forty years. The majority of patients 794 (73.7%) did not achieve target of HbA1c levels  $\leq$  7.0%. Positive family history of DM was 141 patients while a total of 936 patients had no known family history of diabetes.

## Type of vascular complications among type 2 dm patients

Most of the patients, 841 (78%) had microvascular complications alone and 188 (17.5%) had combination of microvascular and macrovascular complications (Figure 1).

## Macrovascular complications

In this study most of the diabetic patients 1014 (82.6%) had

**\*Corresponding author:** Salwa Selim Ibrahim Abougalmou, Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains, Malaysia (USM), E-mail: [salwasl2005@yahoo.com](mailto:salwasl2005@yahoo.com)

**Received** January 19, 2011; **Accepted** January 26, 2011; **Published** January 27, 2011

**Citation:** Abougalmou SSI, Hassali MA, Sulaiman SAS, Abougalmou AS (2011) Prevalence of Vascular Complications among Type 2 Diabetes Mellitus Outpatients at Teaching Hospital in Malaysia. J Diabete Metab 2:115. doi:10.4172/2155-6156.1000115

**Copyright:** © 2011 Abougalmou SSI, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

no macrovascular complications, 188 (17.5%) had macrovascular complications and out of those 137 (12.8%) had coronary heart disease, only 51 (4.7%) had cerebrovascular disease see (Figure 2).

### Microvascular complications

Out of 1077 type 2 diabetic patients 1028 (95.5%) had microvascular complications. (Table 1 and Table 2) showed type of microvascular complications.

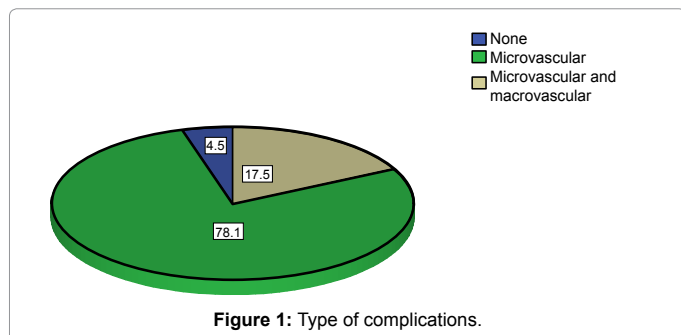


Figure 1: Type of complications.

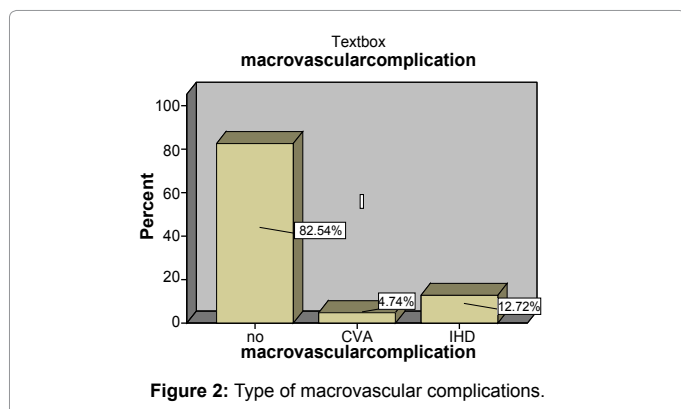


Figure 2: Type of macrovascular complications.

Variable	n (%)
<b>Gender</b>	
Male	476 (44.2)
Female	601 (55.8)
<b>Age (years)</b>	
≤ 35 years	15 (1.4)
>35-50 years	194 (18)
>50-65 years	626 (58.1)
>65 years	242 (22.5)
<b>Race</b>	
Malay	916 (85.1)
Chinese	150 (13.9)
Indian	11 (1.0)
<b>Smoking History</b>	
Current smoker	66 (6.1)
Previous smoker	81 (7.5)
Never smoked	930 (86.4)
<b>Alcohol History</b>	
Current drinker	10 (0.9)
Previous drinker	6 (0.6)
Never drink	1061 (98.5)
<b>Physical activity</b>	
Active ≥ 150 min/wk	471 (43.7)
Non active < 150 min/wk	606 (56.3)
<b>Level of education</b>	
Less secondary school	580 (53.9)
More than secondary school	497 (46.1)
<b>Family history of diabetes</b>	
Yes	141 (13.1)
No	936 (86.9)

Table 1: Sociodemographic characteristics of Type 2 diabetic patients.

Type of Microvascular complications	n (%)
No Microvascular complications	49 (4.5%)
Retinopathy	15 (1.4%)
Neuropathy	22 (2.1%)
Nephropathy	321 (29.8%)
Retinopathy , Neuropathy	14 (1.3%)
Retinopathy , Nephropathy	102 (9.5%)
Neuropathy , Nephropathy	262 (24.3%)
Retinopathy , Neuropathy and Nephropathy	292 (27.1%)
Total	1077 (100%)

Table 2: Frequency and distribution of microvascular complications among Type 2 DM patients.

Complication	Male n(%)	Female n(%)
None	36(6%)	12(2.5%)
Microvascular	468(77.9%)	373(78.4%)
Microvascular and macrovascular	97(16.1%)	91(19.1%)
Total	601(100%)	476(100%)

P = 0.014

Table 3: Frequency of diabetic complications according to gender.

Complication	Age			
	<35 n(%)	35-50 n(%)	>50-65 n(%)	>65 n(%)
None	5(33.3%)	31(16%)	12(1.9%)	0
Microvascular	9(60%)	153(78.9%)	509(81.3%)	170(70.2%)
Microvascular and macrovascular	1(6.7%)	10(5.2%)	105(16.8%)	72(29.8%)
Total	15(100%)	194(100%)	626(100%)	242(100%)

P < 0.001

Table 4: Frequency of diabetic complications according to age.

Complication	BMI	
	<23 kg/m <sup>2</sup> n(%)	≥ 23 kg/m <sup>2</sup> n(%)
None	0	48(5.5%)
Microvascular	155(77.9%)	686(78.1%)
Microvascular and macrovascular	44(22.1%)	144(16.4%)
Total	199(100%)	878(100%)

P = 0.001

Table 5: Frequency of diabetic complications according to body mass index (BMI).

Complication	Duration	
	<10 years n(%)	≥10 years n(%)
None	34(6.8%)	14(2.4%)
Microvascular	411(81.9%)	430(74.8%)
Microvascular and macrovascular	57(11.4%)	131(22.8%)
Total	502(100%)	575(100%)

P < 0.001

Table 6: Frequency of diabetic complications according to diabetic duration.

Complication	Control	
	Control n(%)	Uncontrolled n(%)
None	10(3.6%)	38(4.7%)
Microvascular	217(78.9%)	624(77.8%)
Microvascular and macrovascular	48(17.5%)	140(17.5%)
Total	275(100%)	802(100%)

P = 0.745

Table 7: Frequency of diabetic complications according to HbA1c control.

Complication	Hypertension	
	Normotensive BP<130/80 n(%)	Hypertensive BP≥130/80 n(%)
None	32(5.9%)	16(3%)
Microvascular	421(77.8%)	420(78.4%)
Microvascular and macrovascular	88(16.3%)	100(18.7%)
Total	541(100%)	536(100%)

P = 0.048

Table 8: Frequency of diabetic complications according to hypertension.

The major risk factor for the development of diabetic complications were gender, age, BMI, duration of diabetes and hypertension as (Tables 3-8).

### Discussion

The frequency of microvascular diabetic complications is clearly correlated to the duration of diabetes, quality of metabolic control (HbA1c) and systolic blood pressure [5]. Only a few investigations have focused on the role of obesity in the development or progression of microvascular complications.

Several studies considered that poor glycaemic control, disease duration, hypertension and dyslipidaemia are to be important risk factors for microvascular complications [6-8].

This study has shown a prevalence of macrovascular disease of 17.5% among diabetics and percentage of macrovascular disease lower than in study in UAE by Al-Maskari et al. [9] they found prevalence of macrovascular disease in 29.5% of diabetics. The differences in our rates of macrovascular complications among Type 2 DM patients as compared with others could be attributed to differences in study design, and population characteristics of various studies.

Previous studies in Malaysia indicate a high prevalence of suboptimal glycaemic control and that diabetes complications are common [10-12]. Morgan et al. [13] found evidence to show that multiple complications occur in almost one fifth of diabetic patients. In addition, the incidence of individual and multiple complications increases with both age and duration of diabetes.

The present study shows that the prevalence rate of retinopathy were 39.3% alone or in combination with other microvascular complications. The prevalence of retinopathy demonstrates wide variations between countries; in Type 2 DM it ranges from 17% in Switzerland to 52% in the United Kingdom [14].

The results of the present study showed that the overall prevalence of neuropathy was 54.7%, alone or in combination with the other complications. Percentage of neuropathy in this study is higher than in a study by Tesfye et al. [15] who recruited 3,250 diabetic patients and reported prevalence of neuropathy in 28% of them, but in other studies it counts 25-60% peripheral neuropathy (16-17).

The results of this study also showed that the overall prevalence of nephropathy was 91.7%. It is considered a high percentage in comparison with other studies on diabetic nephropathy which occurs in 40% in diabetic patients [18] and ADA [19] reported that diabetic nephropathy occurs in 20-40% of patients with diabetes and is the single leading cause of end-stage renal disease (ESRD).

Only 24.6 % of patients had optimal controlled, but glycaemic control in the current study insignificant factor affect the development of diabetic complications.

In this study, it did not find any relation between diabetic glycaemic control and the presence of macrovascular, similar as in these studies [20-21]. In contrast other study by singer et al. [22] have suggested an association between diabetic glycaemic control and the presence of macrovascular complication, or risk of the development of macrovascular complications [23-25].

The major risk factors in this study were gender, age, BMI, duration of diabetes and hypertension. Therefore the rate of diabetic complications may reduce by weight loss and controlled of hypertension.

## Conclusion

In conclusion, prevalence of diabetic complications was high. Identifying factors associated with the development of microvascular and macrovascular complications would be able to prevent the complications. In this study we saw the prevalence of diabetic complications was higher in elder people, longer duration of diabetes associated hypertension and obesity. We recommend screening of high risk type 2 diabetes for diabetic complication and highlight importance of early diagnosis of diabetes and detection diabetic complications so that appropriate treatment initiated at the earliest. It need to focus

on the treatment of hypertension and advised the diabetic patients to reduced weight to prevent or decreased the complications of diabetes.

## References

1. Ragucci E, Zonszein J, Frishman W (2003) Pharmacotherapy of diabetes mellitus: implications for the prevention and treatment of cardiovascular disease. *Heart Dis* 5: 18-33.
2. Economic consequences of diabetes mellitus in the U.S. in 1997. American Diabetes Association. (1998) *Diabetes Care* 21: 296-309.
3. Vijan S, Hayward R (2004) Pharmacologic lipid lowering therapy in type 2 diabetes: background paper for the American College of Physicians. *Ann Intern Med* 140: 650-658.
4. Mafauzy M (2005) Diabetes control and complications in private primary healthcare in Malaysia. *Med J Malays* 60: 212-217.
5. Girach A, Vignati L (2006) Diabetic microvascular complications can the presence of one development of another? *J Diabetes Complications* 20: 223-228.
6. The effect of intensive treatment of diabetes on the development and the progression of long-term complications in insulin-dependent diabetes mellitus. The Diabetes Control and Complications Trial Research Group (1993). *N Engl J Med* 329: 977-986.
7. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type II diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group (1998). *Lancet* 352: 837-853.
8. Stratton I, Kohner E, Aldington S, Turner RC, Holman RR, et al. (2001) UKPDS 50: risk factors for incidence and progression of retinopathy in type 2 diabetes over 6 years from diagnosis. *Diabetologia* 44: 156-163.
9. Al-Maskari F, El-Sadig M (2007) Prevalence of diabetic retinopathy in the United Arab Emirates: A cross-sectional survey. *BMC Ophthalmol* 16: 7- 11.
10. Mimi O, Teng CL, Chia YC (2003) The prevalence of diabetic peripheral neuropathy in an outpatient setting. *Med J Malays* 58: 533-538.
11. Lim T, Lim Y (2005) 13<sup>th</sup> Report of the Malaysian Dialysis & Transplant Registry. Kuala Lumpur. The National Renal Registry Malaysian Society of Nephrology.
12. Tan S, Shaflee Z, Wu L, Rizal A, Rey J (2005) Factors associated with control of Type 1 diabetes in Malaysian adolescents and young adults. *Int J Psychiatry Med* 35: 123-136.
13. Morgan C, Currie C, Stott N, Smithers M, Butlert C et al. (2000) The prevalence of multiple diabetes-related complications. *Diabetic Medicine* 17: 146 - 151.
14. Amos A, Mccarty D, Zimmet P (1997) The rising global burden of diabetes and its complications: estimates and projections to the year 2010. *Diabet Med* 14: S1-85.
15. Tesfaye S, Stevens LK, Stephenson JM, Fuller JH, Plater M, et al. (1996) Prevalence of diabetic peripheral neuropathy and its relation to glycaemic control and potential risk factors. The EURODIAB IDDM Complications Study. *Diabetologia* 39: 1377-1384.
16. Boru U, Alp R, Sargin H, Koçer A, Sargin M, et al. (2004) Prevalence of peripheral neuropathy in type 2 diabetic patients attending a diabetes center in Turkey. *Endocr J* 51: 563-567.
17. Tres GS, Lisboa HR, Syllos R, Canani LH, Gross JL, et al. (2007) Prevalence and characteristics of diabetic polyneuropathy in Passo Fundo, South of Brazil. *Arq Bras Endocrinol Metabol* 51: 987-992.
18. Parving H (1998) Benefits of and cost of antihypertensive treatment in incipient and overt diabetic nephropathy. *Journal Hyperten* 16: 99-101.
19. Standards of medical care in diabetes. (2007) American Diabetes Association. *Diabetes Care* 30: S4-S41.
20. Park K (2002) Park's Textbook of Preventive and Social Medicine. 17<sup>th</sup> edition.
21. Kirkman MS, McCarren M, Shah J, Duckworth W, Abbraira C (2006) The association between metabolic control and prevalent macrovascular disease in Type 2 diabetes. *J Diabetes Complications* 20: 75- 80.
22. Singer DE, Nathan DM, Anderson KM, Wilson PW, Evans JC (1992) Association of HbA1c with prevalent cardiovascular disease in the original cohort of the Framingham Heart Study. *Diabetes* 41: 202-208.
23. Klein R (1995) Hyperglycemia and microvascular and macrovascular disease in diabetes. *Diabetes Care* 18: 258-268.

24. Stratton I, Adler AI, Neil HA, Matthews DR, Manley SE, et al. (2000) Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *BMJ* 321: 405-412.
25. Selvin E, Marinopoulos S, Berkenblit G, Rami T, Brancati F, et al. (2004) Glycosylated hemoglobin and cardiovascular disease in diabetes mellitus: Golden SH: Meta-analysis. *Ann Intern Med* 141: 421-431.