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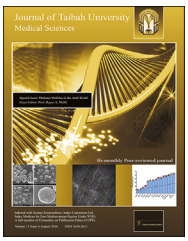

Original Article

# Predictors of proliferative diabetic retinopathy among patients with type 2 diabetes mellitus in Malaysia as detected by fundus photography

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**الملخص**

**أهداف البحث:** مرض العين الناتج عن داء السكري هو السبب الأكثر شيوعا لفقدان البصر لدى البالغين واعتلال الشبكية السكري التكاثري هو السبب الرئيس للعمى. تهدف هذه الدراسة لتحديد العوامل المهيئة لاعتلال الشبكية السكري التكاثري التي تم تحديدها بواسطة تصوير قاع العين بين مرضى السكري النوع ٢ في عيادة السكر بالمستشفى الجامعي بجامعة سينز ماليزيا.

**طرق البحث:** في هذه الدراسة الاستعادية, روجعت صور قاع العين لمرضى داء السكري النوع ٢ الذين خضعوا لفحص اعتلال الشبكية السكري باستخدام كاميرا قاع العين غير الموسعة للحدقة في الفترة من يناير ٢٠٠٨م إلى ديسمبر ٢٠١٢م. وصنفت صور قاع العين إلى مجموعتين: اعتلال الشبكية السكري التكاثري، وعدم وجود اعتلال الشبكية السكري. تم الحصول على البيانات الاجتماعية والديموغرافية, والملف الشخصي السريري والأيضي من السجلات الطبية. كما تم استخدام الانحدار اللوجستي لتحديد العوامل المرتبطة لاعتلال الشبكية السكري التكاثري.

**النتائج:** تم اختيار ١٢٠ مريضا، منهم ٣٠ مريضا في مجموعة اعتلال الشبكية السكري التكاثري و ٩٠ مريضا في مجموعة عدم وجود اعتلال الشبكية السكري. كان متوسط العمر لمرضى اعتلال الشبكية السكري التكاثري ٥٢ عاما و ٥٨ عاما في مجموعة عدم وجود اعتلال الشبكية السكري. وكان ارتفاع ضغط الدم وارتفاع الدهون الأكثر شيوعا للأمراض المصاحبة في هذه الدراسة. مستوى الهيموغلوبين الغليكوزيلاتي > ٦.٥٪ ومستوى البروتين الشحمي خفيض الكثافة < ٢.٦ ممول/ل كانا أعلى في مجموعة اعتلال الشبكية السكري التكاثري. العمر (قيمة ب = ٠.٠٣٢) مدة داء السكري (قيمة ب = ٠.٠٢٢) اعتلال الكلية (قيمة ب = ٠.٠٠٢) والاعتلال العصبي الطرفي (قيمة ب = ٠.٠٠١) كان له ارتباط كبير مع اعتلال الشبكية السكري التكاثري.

**الاستنتاجات:** التنبؤات الكبيرة لاعتلال الشبكية السكري التكاثري بين مرضى السكر النوع ٢، كما تم كشفها بتصوير قاع العين هي العمر, ومدة الإصابة بداء السكري, واعتلال الكلية, والاعتلال العصبي الطرفي.

**الكلمات المفتاحية:** اعتلال الشبكية السكري التكاثري؛ الاعتلال العصبي الطرفي السكري؛ ارتفاع ضغط الدم؛ مراجعة صورة قاع العين؛ تصوير قاع العين

## Abstract

**Objectives:** Diabetic eye disease is the most common cause of visual loss in adults, and proliferative diabetic retinopathy (PDR) is the main cause of blindness. This study aimed to determine the predisposing factors for PDR that were identified by fundus photography among patients with type 2 diabetes mellitus (DM) at the Diabetic Clinic at Hospital Universiti Sains Malaysia.

**Methods:** In this retrospective study, fundus photo review was performed on patients with type 2 DM who had undergone diabetic retinopathy screening using a non-mydriatic fundus camera from January 2008 until December 2012. Fundus photos were classified into 2 groups, PDR and no apparent diabetic retinopathy (no DR). Socio-demographic data and clinical and metabolic profiles were obtained from the medical records. Logistic regression was used to determine the factors associated with PDR.

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**Results:** A total of 120 patients were selected, with 30 patients in the PDR group and 90 patients in the no DR group. The mean age of patients with PDR was 52 (7.94) years and was 58 (12.31) years in the no DR group. Hypertension and hyperlipidaemia were the most common comorbidities identified in this study. The HbA1c level >6.5% and LDL level >2.6 mmol/L were higher in the PDR group. Age ($p = 0.032$), duration of DM ($p = 0.022$), nephropathy ($p = 0.002$) and peripheral neuropathy ($p = 0.001$) were significantly associated with PDR.

**Conclusion:** The significant predictors of PDR among patients with type 2 DM as detected by fundus photography were age, duration of DM, nephropathy and peripheral neuropathy.

**Keywords:** Diabetic peripheral neuropathy; Fundus photo review; Fundus photography; Hypertension; Proliferative diabetic retinopathy



## Introduction

Diabetic retinopathy can be present at the time of diagnosis of type 2 diabetes mellitus (T2DM) due to the insidious onset of the disease, as documented in the United Kingdom Prospective Diabetes Study (UKPDS), in which 39% of men and 35% of women had retinopathy at the time of diagnosis.[1] Diabetic retinopathy is a microvascular complication that results from prolonged uncontrolled diabetes mellitus (DM).[2] Diabetic retinopathy can be graded into categories of no apparent diabetic retinopathy (no DR), non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR) and advance diabetic eye disease (ADED).[3] PDR and ADED are major causes of blindness among patients with DM and are associated with an increased risk of cardiovascular disease, diabetic nephropathy and mortality.[4]

The occurrence of PDR is due to progressive retinal ischemia leading to vision loss, traction retinal detachment and vitreous haemorrhage.[5] Early detection of vision loss and blindness resulting from diabetic retinopathy is important as it is reversible.[3] Therefore, an annual eye examination is recommended for patients with DM. Despite this recommendation, according to the National Health Malaysian Survey (NHMS) III 2006 findings, only 45% of patients with DM had undergone an eye examination at least once after their diagnosis of diabetes.[6]

The prevalence of diabetic retinopathy in Malaysia has been reported to range from 44.1%[7] to 48.6%.[8] Other studies have shown that the prevalence of diabetic retinopathy in Malaysia is 12.3% for Type 1 DM and 22.3% for Type 2 DM.[9] Most published Malaysian data are primarily hospital-based.[9–11] Nevertheless, the prevalence of PDR varies from 2.0% for patients who had diabetes for less than 5 years to 15.5% for patients who had diabetes for 15 years or more.[4] In Malaysia, the 2007 Diabetic Eye Registry reported a prevalence of PDR of 7.1%.[12] Meanwhile, a recent study conducted in a primary care setting on Borneo Island in 2011 reported a prevalence of PDR of 3.2%.[13]

Many risk factors for PDR have been identified, such as elevated glycosylated haemoglobin A1c (HbA1c), elevated diastolic and systolic blood pressure, increased duration of diabetes, the severity of retinopathy at baseline, increased waist-to-hip ratio and the onset of type 1 DM before puberty.[14] PDR is unavoidable and develops irrespective of pharmacological treatment of DM and hypertension. Most published Malaysian data primarily focus on diabetic retinopathy as a whole rather than considering its different stages. In this study, we focused on patients with PDR who were identified during diabetic retinopathy screening using a non-mydriatic fundus camera with the aim of determining the associating factors among PDR patients. These data will provide useful local information regarding PDR and create awareness about the severity of PDR among patients with type 2 DM.

## Materials and Methods

This was a retrospective record review of fundus photos from patients with type 2 DM at the Diabetic Clinic, Hospital Universiti Sains Malaysia (HUSM) from January 2008 until December 2012. All patients with diabetes who were referred to the Diabetic Clinic were screened for diabetic retinopathy using a non-mydriatic fundus camera. Patients who were more than 18 years old with type 2 DM and who were diagnosed with PDR on the fundus photograph were selected. Patients with Type 1 DM, NPDR, ADED, glaucoma, cataract, retinal vaso-occlusive disease, or poor fundus view or had images due to opaque media and retinal disease were excluded.

The definition for PDR was based on the International Clinical Diabetic Retinopathy and Diabetic Macular Oedema Disease Severity Scale,[3] which consist of one of the following:

i) Neo-vascularisation
ii) Vitreous/preretinal haemorrhage

For the study group (PDR group), either unilateral or bilateral PDR features on fundus photography were included in the study, while, for the control group, only a bilateral normal fundus was considered for simple random sampling.

The screening process for the study group was based on cases that were diagnosed one year before or after the first fundus photography result. This is because many of the diagnostic tests were not routinely performed in the study centre.

Diabetic nephropathy was diagnosed based on the presence of proteinuria determined by a positive dipstick on 2 separate occasions, 1 year before or after the first fundus photography. The urinary albumin creatinine (UACR) ratio test is not routinely performed in the study centre.

Diabetic neuropathy is recognized by the American Diabetes Association (ADA) as the presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after the exclusion of other causes.[15] In this study, any documentation regarding numbness and/or abnormal