

*Family Physician Corner*

## **Diabetic Micro Vascular Complications: Prevention and Screening**

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Diabetes mellitus is a common chronic illness, which is associated with micro vascular complications. Diabetes was found to be the leading cause of renal failure, the second commonest cause of lower limb amputation, and the leading cause of blindness in working age group<sup>1,2</sup>. In addition, it has been recently associated with ear disease and deafness<sup>3</sup>. Strong evidence exists to support that effective treatment is available to prevent the macro- and micro vascular complications of diabetes<sup>4</sup>. Screening for diabetic complications, can delay the progress to devastating end results. Diabetic screening for micro vascular complications recommends yearly ophthalmologic screening for retinopathy, annual comprehensive foot examinations, and urinalysis for microalbuminuria<sup>5</sup>. Based on recent finding that diabetes is associated with deafness, it is suggested that hearing testing be added to the yearly checks recommended for diabetics<sup>3</sup>. Compliance with practice screening guidelines by primary care physicians has historically been poor<sup>6</sup>.

Diabetes mellitus is a chronic illness, which is common. In Eastern Mediterranean and Middle East Region, it was found to be one of the highest in the world; it ranged from 2.3 percent to 13.6 percent<sup>7,8</sup>. In recent years, the prevalence had exceeded twenty percent in many countries of the Region<sup>8</sup>. Based on WHO criteria of 1985, a study in Bahrain 1995, found that the prevalence of diabetes in the population aged thirty years and above was 21.1 percent known diabetes, 8.5 percent not known to be diabetic, and an additional 14.8 percent with impaired glucose tolerance test (IGT)<sup>8</sup>. A similar study in 1996 revealed nearly the same prevalence<sup>7</sup>.

Diabetes has been associated with many chronic complications. There are two types of chronic complications of diabetes: macro vascular and micro vascular. The macro vascular involves large vessels causing cardiovascular disease, cerebrovascular disease, and peripheral vascular disease. Micro vascular complications include retinopathy, nephropathy, and neuropathy. In a recent study, it was found that hearing loss is exacerbated in diabetics less than 60 years of age. This was explained by the theory that diabetes is associated with accelerated aging of the auditory system<sup>3</sup>. In type II diabetes, which is dealt with mostly in primary care, chronic complications develop five to seven years prior to diagnosis. With the new criteria of a lower threshold to diagnose diabetes, it is hoped that early diagnosis of diabetes will reduce the stage at which these complications are discovered<sup>1</sup>. This paper will discuss only micro vascular complications. Retinopathy and eye screening were discussed in the previous issue; other micro vascular complications will be discussed in this paper.

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Evidence exists that supports a range of interventions to improve diabetes outcome<sup>9</sup> and prevent micro vascular complications. These interventions include: intensive glucose, lipid, and blood pressure control, treatment of microalbuminuria, and regular use of aspirin. Both Diabetes Control and Complications Trial (DCCT) and UK Prospective Diabetes Study (UKPDS) trials have shown that intensive glycaemic control is associated with reduced rates of retinopathy, nephropathy, and neuropathy. It reduced the rate of eye disease by one quarter and early renal damage by one third in UKPDS trial. Furthermore, foot care and regular check reduced the rate of amputation by two-thirds<sup>10</sup>. Unlike UKPDS and DCCT trials where single-factor interventions were studied, a recent study (THE STENO DIABETES STUDY) compared intensive multifactorial interventions against conventional treatment among group of type II diabetic patients with microalbuminuria over 7.8 years. The intensive treatment consisted of lifestyle and pharmacological interventions aimed at keeping glycated hemoglobin <6.5%, blood pressure <130/80mmHg, total cholesterol <175mg/dl, and triglycerides<150 mg/dl, along with aspirin. After 7.8 years, cardiovascular disease was reduced in the intensive group by 53%. One cardiovascular disease was prevented for every five patients treated in the intensive group. Furthermore, the risks for neuropathy, retinopathy, and autonomic neuropathy were also lower in the multifactorial treatment by 61, 58, and 63%, respectively. This study provides evidence that aggressive multifactorial interventions and treatment among patients with type II diabetes and microalbuminuria reduces the risk of cardiovascular and micro vascular events by about 50% if applied in clinical practice<sup>4,11</sup>.

Most of chronic diabetic complications are asymptomatic at their initial stages, and once symptoms develop, there is little to be done to cure them<sup>1</sup>. Hence, adherence to screening guidelines for diabetic complications became an important aspect of diabetic care. Diabetic screening recommendations (for micro vascular complications) include yearly ophthalmologic screening for retinopathy, annual comprehensive foot examinations, and urinalysis for microalbuminuria.

All individuals with diabetes should receive an annual foot examination to identify high-risk foot conditions<sup>12</sup>. Risk identification is fundamental for effective preventive management of the foot in people with diabetes. The risk of ulcers or amputations is increased in males who have had diabetes  $\geq 10$  years, poor glucose control, cardiovascular, retinal, or renal complications. Foot examination should include assessment of protective sensation using a 10-g monofilament or vibration, foot structure and biomechanics (inspection of foot shape and footwear), vascular status (palpation of foot pulses), and skin integrity. Once examined, people with one or more high-risk foot conditions should be evaluated more frequently for the development of additional risk factors by specialized podiatry/foot care team. Those patients who have ulcerated foot should have an urgent foot ulcer care from a vascular specialist<sup>13</sup>. People with neuropathy should have a visual inspection of their feet at every visit with a health care professional.

In the results of preliminary study, that was done recently to evaluate the diabetic service provision in one of government health centres in Bahrain, it was shown that only one out of 430 patients had foot examination recorded in their medical notes. This is by far much lower than that found in UK by Audit Commission Survey 75-90 percent<sup>10</sup>. Furthermore, patients studied were at risk of neuropathy and diabetic foot disease, as they had poor control rate of diabetes, and associated co-morbidities. Providing podiatry services would be helpful to increase foot examination rate in government health centres.

Micro-albuminuria is an early manifestation of diabetic nephropathy. Its presence is an indication to screen for, and control all other coexistent cardiovascular risk factors<sup>14</sup>. It is recommended that a test for the presence of microalbumin should be performed in type 2 diabetes at diagnosis, and annually thereafter if negative. Microalbuminuria rarely occurs with short duration of type I diabetes; therefore, screening in individuals with type I diabetes should begin after 5 years of the disease duration<sup>14</sup>. Before labeling the patient to have proteinuria, conditions that cause proteinuria like urinary tract infections, fever, exercise should be ruled out. All positive tests for microalbuminuria should be repeated twice over six months period and if persistently positive, intervention is warranted<sup>1</sup>.

Screening for microalbuminuria can be performed by three methods: measurement of the albumin-to-creatinine ratio in a random spot collection, 24-h collection with creatinine, allowing the simultaneous measurement of creatinine clearance, timed (eg., 4-h or overnight) collection. Normal albumin excreted in the urine is <30µg/mg of creatinine (albumin to creatinine ratio), <30mg/24 hours (24 hour specimen), <20µg/min (timed specimen). Microalbuminuria is the earliest sign of kidney damage and is indicated by albumin creatinine ratio of between 30 and 300µg/mg. At this time the urine dipstick is still negative although kidney damage has already started. When the level of albumin in the urine exceeds 300µg/mg, the condition is known as macroalbuminuria<sup>1</sup>. At this stage a urinalysis dipstick will be positive. This implies that we should not use it as a screening test for microalbuminuria, rather we should use the albumin creatinine ratio which is the easiest to carry out in an office setting, generally provides accurate information, and is therefore preferred<sup>14</sup>. All positive tests by reagent strips should be confirmed by more specific methods.

Based on Bahrain's diabetic sheet, Bahrain's diabetic committee recommends doing 24 hours' test for protein for all new patients and urine dipstick for follow up. In preliminary results of the previously mentioned study in one of government health centers, 24 hours' test for protein was rarely done for the new patients in the studied group. Although the median duration of diabetes in this study group was 4.3 years, routine urine dipstick screening for albumin was rarely done also for both new and follow-up cases. In contrast, audit commission survey in UK found that 50-75 percent of patients had their kidney function done<sup>10</sup> during their annual review.

In a study presented recently, researchers found that diabetics may be more prone than others to hearing loss in middle age. The authors suggest that hearing testing be added to the yearly checks recommended for diabetics as well<sup>3</sup>.

Guidelines for diabetes treatment and screening in primary care are available, but doctors often find them complex and feel they have insufficient staff and time to follow the recommendations<sup>6</sup>. In fact, compliance with practice guidelines by primary care physicians was found to be poor. Mechanisms such as the use of patient problem lists, diabetic flow sheets in the medical records, and computerized systems with diabetic registers, were solutions to remind physicians and facilitate better adherence to these guidelines<sup>7</sup>.

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