Original Article

Correlation between Retinopathy, Nephropathy and Peripheral Neuropathy among Adult Sudanese Diabetic Patients

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Abstract:
Diabetes Mellitus is a worldwide common metabolic disorder. Increasing prevalence of diabetes, lack of proper education about the nature and course of the disease and necessary control are the main factors for an early onset of micro vascular complications.
Objective: To correlate between retinopathy, nephropathy and neuropathy, among adult Sudanese diabetic patients at Elshaab Teaching hospital, Ahmed Gasim Teaching hospital and Gabber Abu Eleaz centre, from December 2006 to September 2008.
Methodology: This is a descriptive prospective cross sectional hospital based study, 71 patients were included.
Result: Male to female ratio was1.4:1.Common age group affected was 60-69 (32.4%).Common duration of diabetes mellitus was 20-24 years (23.9%).All patients who had diabetes for 25 years or more had developed complications (19.7%).The commonest long term microvascular complication was found to be retinopathy (71.2%), followed by neuropathy (69 %) and nephropathy (50.7%).It was found that (47.6%) of our patients had the three complications.
Conclusion: Long-term micro vascular complications affect male more than female, with average age of onset 60-69 years. All patients who had diabetes for 25 years or more had developed complications. Retinopathy is the most common micro vascular complication, followed by neuropathy. There is a significant correlation between retinopathy, nephropathy and neuropathy in association with the duration and control of blood glucose level.

Key words: diabetes mellitus, hyperglycemia, microvascular.

Diabetes mellitus (DM) comprises a group of common metabolic disorders that share the phenotype of hyperglycemia[1]. Several distinct types of DM exist and are caused by complex interactions of genetics, environmental factors and life style choices[2]. With an increasing incidence world-wide, DM will likely to continue to be a leading cause of morbidity and mortality[3].
Depending on the etiology of DM, factors contributing to hyperglycemia may include reduced insulin secretion, decreased glucose usage and increased glucose production[4]. The metabolic dys-regulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that imposes tremendous burden on the individual and on the health care system[5].

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Diabetes is usually irreversible and although patients can have reasonable normal life style, its late complications result in reduced life expectancy and considerable uptake of health resources. Macro vascular disease leads to an increased prevalence of coronary artery disease, peripheral vascular disease and stroke[6]. In contrast to macro vascular disease, micro vascular disease is specific to DM. Small blood vessels throughout the body are affected but the disease process is of particular danger in three sites: the retina, the renal glomerulus and the nerve sheath[7]. DM can affect the eye in a number of ways, the most common and characteristic form is diabetic retinopathy which is subdivided into three stages: background retinopathy, preproliferative retinopathy, and proliferative retinopathy[8,9].
Diabetic nephropathy: Kidneys may be damaged by DM in three main ways:

glumerular damage, ischemia resulting from hypertrophy of afferent and efferent arterioles and ascending infection[10].

Diabetic neuropathy: The earliest change in diabetic nerve is delayed nerve conduction velocity and the earliest histological change is segmental demyelination. The following varieties of neuropathy may occur: symmetrical mainly sensory polyneuropathy, acute painful neuropathy, mononeuropathy and mononeuritis multiplex, diabetic amyotrophy and autonomic neuropathy[11].

Objectives

To correlate between retinopathy, nephropathy and peripheral neuropathy among Sudanese diabetic patients seen at Elshaab Teaching Hospital, Ahmed Gasim Teaching Hospital and Gabber Abu Elaez Diabetes Care Centre in the period between December2006- September 2008.

Methadology

This is a descriptive prospective cross sectional hospital based study. It was conducted at Elshaab Teaching Hospital, Ahmed Gasim Teaching Hospital and Gabber Abu Elaez Centre. The study population included patients with diabetes mellitus referred to these hospitals over a period of nine months, from December 2006 to September 2008. All of them were Sudanese. All patients gave their verbal consent to participate in the study. A questionnaire was elaborated and filled for each patient by the authors. The questionnaire consisted of the following: Clinical history. Clinical examination was divided into general systemic examination and a detailed neurological examination emphasizing on the cranial nerves, upper and lower limbs examination in addition to autonomic nervous system examination. Dilated fundal examination using medriacyl, phenylepherine to evaluate the posterior segment and the retina was done by the authors and re-evaluated by ophthalmologist. Then retinopathy was staged into: mild non-proliferative, moderate non-proliferative, severe non-proliferative and proliferative diabetic retinopathy. Neuropathy was diagnosed when the patient complained of burning or loss of sensation, pain or tingling in addition to impaired or absent tendon reflexes, decreased sensitivity to light touch and pinprick, impaired vibration and position senses in addition to abnormalities detected by nerve conduction studies of the median ,ulnar, lateral peroneal and sural nerves. Nephropathy was diagnosed by finding of enlarged kidneys in U/S of the abdomen, micro and macro albuminuria in the urine and raised serum creatinine and blood urea. The following investigations were done for each patient: total blood count, FBG, P P B S, RFT, urine for micro and macro-albuminuria and lipid profile, in addition to ECG, U/S abdomen, nerve conduction study and EMG. Hemoglobin $A1_C$ ($HbA1_c$) was measured to assess the degree of metabolic control. Data were introduced into the computer from a master sheet recording using software programme. Data entered and analyzed, then the results expressed in the form of tables, figures and graphs using SPSS programme (Statistical Package for Social Science).

Result: Out of 71 patients 41 were males, with male to female ratio of 1.4:1. Age distribution was found as follows: 20-29 years represents 4.2%, 30-39 years represents 12.7% , 40-49 years represent 12.7%, 50-59 years represents 23.9%, 60-69 years represents 32.4%, and 70-79 year represents 14.1%. Regarding occupational background, housewives were 28.2%, workers and employees were 28.2%, retired were 22.5%,teachers were 8.5% , farmers were 5.6% , students were 2.8%, drivers were 2.8% and 1.4% were jobless. Concerning geographical distribution; 45.1% of the patients were from Khartoum, 28.2% from central Sudan, 11.2% from the West, 8.5% from the North, 5.65 from the East and 1.4% from the South. The duration of DM among the studied group ranged between 5-34years, 5-9years represents 11.3%, 10-14 years represents 23.9%, 15-19years represents 21.2%, 20-24years represents 23.9%, 25-29years represents 15.5%, and> 30years represents 4.2%.The study showed that 70.4%

had type2 DM. It did appear that 46 patients had medical history of associated systemic diseases; 50.7% had hypertension, 33.8% had ischemic heart disease, and 16.9% had dyslipideamia. It was found that 33.8% of the patients were smokers. The common presenting ocular symptom, among patients with diabetic retinopathy, was found to be blurring of vision (88.2%), floater in 45.1%, three patients (5.9%) presented with loss of vision while 11.8% had no symptoms. Numbness was detected in 79.6% of our patients, parasthesia in 42.6%, 28.5% presented with burning sensations, 32.6% with weakness, and 34.7% with no symptoms. Regarding fundal examination, 28.2% had normal fundus, 39.4% had dot and blot hemorrhages, 19.7% had hard exudates and cotton wool, 12.7% had newvascularization, while 5.6% had retinal detachments. Concerning examination of the upper and lower limbs, 53.1% had wasting and 34.7% had power grade 4, 24.4% had power grade 3, 18.4% had power grade 5, and 4.1% had power grade 2. The study showed varieties of sensory disturbance, 81.6% presented with decrease vibration sense, 71.45% presented with decreased pinprick sensation, and 69.3% presented with loss of position sense and 2% had ataxic gait (Figure1).

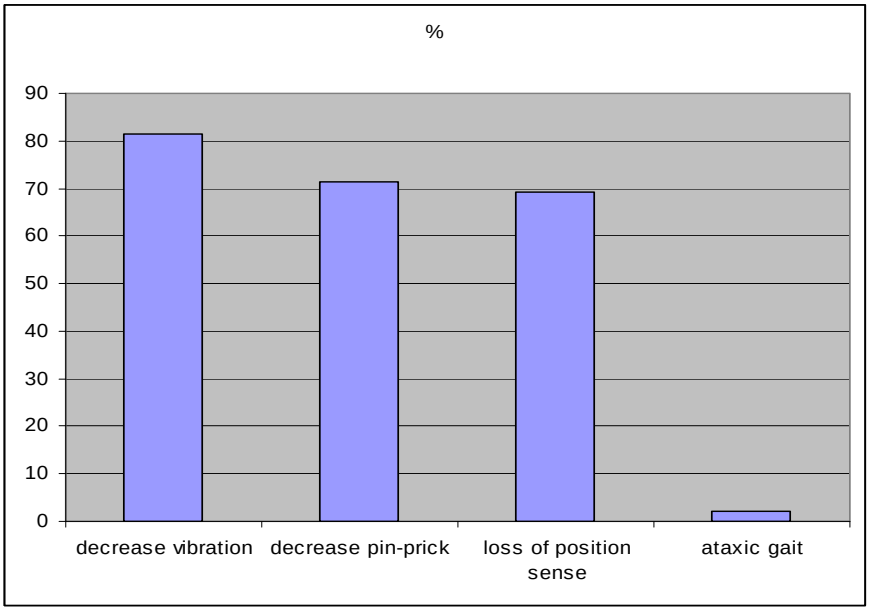

Figure 1: Varieties of sensory disturbance among 71 adult Sudanese diabetic patients seen in Khartoum (Dec2006- Sep 2007.)

The following types of neuropathy were seen among our patients: 44.9%had symmetrical distal sensory-motor polyneuropathy, 18.4% had a symmetrical polyneuropathy, 18.4% had mononeuropathy and cranial nerves palsies were detected in 12.2%. Concerning long-term micro- vascular complications, 71.2% developed retinopathy, 69% developed neuropathy, 50.7% developed nephropathy, while 11.3% had no complications. The distribution of different types of microvascular complications among our studied group was found as follow: patients who developed all three complications represent 47.6%, those developed retinopathy and nephropathy were 9.5%, retinopathy and neuropathy were11.1%, 19.1% represents those who developed nephropathy and neuropathy (Table1) . Sixty of our patients were not on regular treatment or follow up, with mean Hb A_{1C} of 8.2 +1.4%.

Table 1: Various combination of micro vascular complications among 71 adult Sudanese diabetic patients seen in Khartoum Dec2006- Sep 2007.

micro vascular complications	NO	%
Retinopathy, nephropathy, neuropathy	30	47.6
Retinopathy, nephropathy	6	9.5
Retinopathy, neuropathy	7	11.1
Retinopathy	8	12.7
Neuropathy	12	19.1

Discussion

The study showed that male to female ratio was found to be 1.4 to 1; this is similar to what was mentioned in the literature[12].

According to age distribution 70% of our patients their age above 50 years and more than 65% of the patients had diabetes for more than 15 years. 70.4% of our patients have type 2 DM.

The micro vascular complications are highly distributed in Khartoum (45.1%). This is due to the fact that it is the area where the study was conducted.

Like what was reported by other researchers blurring of vision, numbness, parasthesia, were the most common symptoms among our diabetic patients[13, 14]. Significant number of our patients was asymptomatic; this is similar to what was reported by Boulton AJM in Manchester UK[15].

1t was found that non-proliferative changes in ocular fundal examination were the commonest abnormalities (ranging from mild, moderate and severe). This goes with the findings in Peshawar[16].

Symmetrical sensory polyneuropathy is the commonest type of peripheral neuropathy. Multiple cranial nerves involvement is one of the neurological complications associated with diabetes. The most common cranial nerves involved were the third, the fourth, and the six respectively. This is similar to what was mentioned in the literature[17, 18].

Duration of diabetes and poor glycemic control were shown significantly (p=001) associated with the complications. This is similar to reports from Japan[19, 20].

Hypertension is a highly co-morbid condition in diabetic patients. In our study it was observed in 50.7%, this similar to study conducted in Punjab[21]. Hypertensive and non-hypertensive patients were compared for retinopathy, nephropathy and neuropathy, patients with hypertension had more complications with statistical significance as compared to those without hypertension ($P <$ 0.01 for retinopathy and < 0.05 in case of nephropathy and neuropathy). This is similar to Gadhavi R study in India[22].

Significant numbers of patients with complications were smoker, and this definitely increases the risk of developing complications in the presence of hyperglycemia. There was high percentage of micro vascular complications patients, this goes with the findings from Peshawar, but differs from those from UAE[16, 23-27]. This can be due to the fact that our study included more patients with older age, longer diabetes duration, and poor glycemic control. The percentage of diabetic patients who have peripheral neuropathy is higher than what was mentioned in the literature[14, 25, 26]. The commonest long term micro vascular complication in our study was retinopathy. It differed from reports from Pakistan and India. Environmental, nutritional and genetic variations may stand behind that[16, 28, 29]. All patients with nephropathy, had retinopathy, while two third of our patients with retinopathy developed peripheral neuropathy, this is similar to literature. Most of our patients were not on regular treatment (60%) or follow up.

Conclusion: Long term micro vascular complications of diabetes mellitus are more common in males. The most affected age group was found to be 60-69 years. Going with international reports we found significant correlation between the duration of the disease and the development of

retinopathy, nephropathy and peripheral neuropathy, and also between the onset of micro vascular complications and blood glucose control. A considerably high percentage of microvascular complications were discovered in our diabetic patients with the retinopathy being the commonest. Health education and through medical checkup are mandatory to improve the welfare of our diabetic patients.

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