

Study on Metabolic and Mineral Balance, Oxidative Stress and Cardiovascular Risk Factors in Type 2 Diabetic Patients on Different Therapy

Authors : E. Nemes-Nagy, E. Fogarasi, M. Croitoru, A. Nyárádi, K. Komlódi, S. Pál, A. Kovács, O. Kopácsy, R. Tripon, Z. Fazakas, C. Uzun, Z. Simon-Szabó, V. Balogh-Sămărghițan, E. Ernő Nagy, M. Szabó, M. Tilinca

Abstract : Intense oxidative stress, increased glycosylated hemoglobin and mineral imbalance represent risk factors for complications in diabetic patients. Cardiovascular complications are most common in these patients, including nephropathy. This study was conducted in 2015 at the Procardia Laboratory in Târgu Mureș, Romania on 40 type 2 diabetic adults. Routine biochemical tests were performed on the Konleab 20XTi analyzer (serum glucose, total cholesterol, LDL and HDL cholesterol, triglyceride, creatinine, urea). We also measured serum uric acid, magnesium and calcium concentration by photometric procedures, potassium, sodium and chloride by ion selective electrode, and chromium by atomic absorption spectrometry in a group of patients. Glycosylated hemoglobin (HbA1c) dosage was made by reflectometry. Urine analysis was performed using the HandUReader equipment. The level of oxidative stress was measured by serum malondialdehyde dosage using the thiobarbituric acid reactive substances method. MDRD (Modification of Diet in Renal Disease) formula was applied for calculation of creatinine-derived glomerular filtration rate. GraphPad InStat software was used for statistical analysis of the data. The diabetic subject included in the study presented high MDA concentrations, showing intense oxidative stress. Calcium was deficient in 5% of the patients, chromium deficiency was present in 28%. The atherogenic cholesterol fraction was elevated in 13% of the patients. Positive correlation was found between creatinine and MDRD-creatinine values ($p < 0.0001$), 68% of the patients presented increased creatinine values. The majority of the diabetic patients had good control of their diabetes, having optimal HbA1c values, 35% of them presented fasting serum glucose over 120 mg/dl and 18% had glucosuria. Intense oxidative stress and mineral deficiencies can increase the risk of cardiovascular complications in diabetic patients in spite of their good metabolic balance. More than two third of the patients present biochemical signs of nephropathy, cystatin C dosage and microalbuminuria could reveal better the kidney disorder, but glomerular filtration rate calculation formulas are also useful for evaluation of renal function.

Keywords : cardiovascular risk, homocysteine, malondialdehyde, metformin, minerals, type 2 diabetes, vitamin B12

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