SUMMARY

**Background:** The management of Diabetes Mellitus (DM) should begin with Medical Nutrition Therapy (MNT), which is a nutrition prescription based on assessment and treatment goals and outcomes. The ideal diet should contain macronutrients (carbohydrate, fat, and proteins), micronutrients (minerals and vitamins), and water. Diabetes mellitus has been shown to be associated with abnormalities in the metabolism of these nutrients e.g. micronutrients such as chromium, zinc, copper and manganese. There seems to be paucity of data concerning the relationship between micronutrients status and glycaemic control/complications DM in our locale.

**Objectives:** This study set out to determine the magnitude of trace mineral (chromium, zinc and copper) derangement and identify associated clinical and biochemical indices in a population of Nigerians with type 2 DM.

**Materials and Methods:** This was a cross sectional study on the trace mineral status of Nigerians with type 2 DM. A total of 420 (210 males and 210 females) consecutive persons with type 2 DM and 210 (105 males and 105 females) non diabetic control subjects were assessed. Socio- demographic and clinical data was
obtained from all subjects. All the subjects had a detailed physical examination and clinical parameters such as Height, weight, body mass index (BMI), waist circumference (WC), hip circumference (HC), waist hip ratio (WHR) and blood pressure were measured. Blood samples were collected from all subjects (after an overnight lasting 8-10 hours) for assessment of fasting blood glucose (FBG), glycosylated haemoglobin (HbA1c), serum lipid profile, serum chromium, zinc and copper, serum urea and creatinine, and packed cell volume (PCV). The student t test was used for comparison of means and comparison of proportions was done using the chi square test. Differences were statistically significant when p-value is < 0.05.

**Results:** The study subjects had a mean (± SD) age of 54.0 (± 7.4) years and the control subjects 50.4 (± 7.5) years. The mean (±SD) duration of diabetes was 4.3 (± 4.0) years. The mean (± SD) BMI of the study group was 29.8 (± 5.1) kg/m², while that of the controls was 30.2 (± 2.6) kg/m². The study subjects had a mean (± SD) WC of 94.3 (± 11.1) cm compared to 79.6 (± 5.8) cm for the control subjects. The control subjects had a mean (± SD) WHR of 0.97 (± 0.01) compared to 0.94 (± 0.06) for the study subjects. The prevalence of chromium deficiency amongst persons with type 2 DM was 66.7% and 33.3% in the non diabetic control subjects, while the prevalence of zinc deficiency in the study group was 60% and
63.3% in the control group. The mean (± SD) serum level of chromium was found to be significantly higher in the study subjects than in the control (0.4 ± 0.2 mcg/L and 0.3 ± 0.3 mcg/L, in the study and control groups respectively, p-value < 0.05) but the study subjects had a higher percentage of persons with low serum levels of chromium [280 (66.7%) subjects] than the control subjects [70 (33.3%) subjects]. There was no significant difference in the serum levels of zinc and copper between the study subjects and the control subjects. Among the study subjects, 375 (89.3%) subjects had complications of diabetes while 45 (10.7%) subjects had no complication. It was also found that 231 (55%) study subjects had peripheral neuropathy, [112 (53.3%) males and 119 (56.7%) females]. A total of 28 (6.67%) persons had diabetic foot syndrome, [21 (910%) males and 7 (3.33%) females], while 109 (51.9%) males in the study group had erectile dysfunction. It was also found that the study subjects with low serum levels of chromium had a significantly higher number of persons with complications of diabetes.

The mean (± SD) FBG for the study subjects was 159 (± 79) mg/dl while that for the control was 101 (± 9) mg/dl. The mean (± SD) HbA1c for the study subjects was 8.8 (± 2.7)% and 5.6 (± 0.4)% in the control subjects. A total of 171 (40.71%) study subjects had FBG < 126 mg/dl, and 249 (59.29%) subjects had FBG > 126 mg/dl. Of the study subjects, 157 (37.38%) had HbA1c < 7%, and 263 (62.62%) had HbA1c >
7%. Serum chromium level correlated inversely with FBG and HbA₁c. A total of 375 (89.3%) study subjects had one or more complications of DM; of these, 266 (70.9%) had low serum concentration of chromium and 108 (29.1%) had normal serum chromium. Of the 45 (10.7%) study subjects without complications, 14 (31.1%) had low serum chromium while 31 (68.9%) had normal serum chromium concentration. The serum concentration of zinc and copper had no significant effect on the presence of complications and no statistically significant relationship with FBG, HbA₁c, TC/HDL-C, and complications. Zinc and copper did not show any significant correlation with age, DM duration, BMI, WC, WHR, FBG, HbA₁c and TC/HDL-C.

**Conclusion:** This study showed that persons DM had a higher mean serum level of chromium although a higher percentage of the study subjects had a lower level of serum chromium than the control. Diabetic subjects with higher FBG and HbA₁c, had lower serum chromium concentration. Also noteworthy is the finding that DM subjects with low serum levels of chromium had more complications than those with normal serum chromium levels. Persons with DM may have good glycaemic control evidenced by the FBG and HbA₁c, they may still have low serum concentration of trace minerals. Therefore all persons with DM must be encouraged to take locally available and affordable food rich in micronutrients.