EFFECT OF CHROMIUM SUPPLEMENTATION ON CHROMIUM STATUS AND BLOOD SUGAR (FBS AND HbAlc) AMONG TYPE 2 DIABETICS ATTENDING THIKA HOSPITAL, KENYA: A RANDOMIZED PLACEBO CONTROLLED STUDY

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Introduction

Adequate chromium levels potentiate insulin sensitivity increasing cell sensitivity and uptake of blood sugar 1. Deficiencies are believed to be positively associated with risk of Type 2 Diabetes and its Complications 2,3. However, some studies have reported the contrary warranting more researches for evidence based conclusion 3.

Studies in Kenya have reported challenges with management of hyperglycaemia resulting to lower limb amputations and blindness among Type 2 Diabetics 4. Chromium supplementation however has remained absent in the efforts to manage hyperglycaemia among the diabetics in Kenya.

Effect of chromium supplementation on blood sugar has been demonstrated in Indian and Chinese populations. However, there is paucity of literature on the same among Africans especially Kenya. Hence the need to determine effect of chromium supplementation on blood sugar, in addition to hypoglycaemic drugs.

Materials and Methods

This was a double blind randomized placebo controlled trial with 180 participants that were divided into intervention and control groups in the ration of 1:1. In addition to the usual hypoglycaemic medication, participants in the intervention group received 500mcgs of chromium picolinate capsules while the control group received placebo daily for a period of 4 months.

Baseline study was conducted and there was no difference between the study groups. Serum chromium levels, fasting blood sugar (FBS) and glycated haemoglobin (HbAlc) were determined at baseline and end of month 4 in the study.

Venipucture was used to draw blood form participants under SOP after an overnight fast of 10-14 hours at baseline and end of month 4 in the study .The samples were collected as indicated in Table 1.

Indicator	Specimen	Type of tube
FBS	plasma	4 ml tube with potassium oxalate and sodium fluoride
HbAlc	whole blood	3 ml tube with K_2EDTA
Chromium levels	serum	5ml plain vacutainer with gel

Blood samples were allowed to clot at 15-24 °C (Vacuum gel tubes at temperature s 20-22°C) for at least 30 minutes; centrifuged at 15-24°C and serum samples separated and frozen at -70°c for analysis within 7 days.

Serum Chromium was determined by QuantiChrom™ Chromium assay kit (DCRM-250); **HbAlc** determined by CERA-STAT™ 2000 HbAlc test kit with automated analyzer (H113A240100 and CERAGEM MEDISYS Inc, Korea); **FBS** was analyzed using Colorimetric procedure by Centronic GmbH, Wartenburg Germany. Absorbance of the solution determined at 500 nm using auto analyzer (Dirui, CS-300B, China).

Descriptive statistics such as means and standard deviations were used to describe the serum chromium levels, FBS and HbAlc among the study groups at baseline and end of month 4. **T-test** was used to determine differences between the intervention and the control groups. in reference to mean serum chromium levels, FBS and HbAlc and their magnitude of change at the end of month 4. **Regressions** were used to determine association between serum chromium levels and FBS and HbAlc.

Ethical clearance was obtained from Kenyatta University, Thika Hospital and NACOSTI Kenya. Consent sought from participants

Results

Baseline results: Both the intervention and control study groups were similar at baseline (p>0.05) in reference to socio-demographic characteristics, medical history, FBS, HbAlc and serum chromium levels (Table 2).

Low mean chromium levels, high FBS elevated HbAlc were noted in both groups. Hyperglycaemia depletes chromium stores that in turn increases excretion in urine among the diabetics 5, 6.

Table 2

Variable	Intervention Means(sd)	Control Means(sd)	Total Mean (sd)	p-value
Fasting blood sugar (mmol/l)	10.1 ±1.39	9.88 ±1.01	9.84±3.92	0.803
HbAlc (%)	9.45 ±1.43	8.38 ±0.76	8.92±2.96	0.109
Serum chromium (ng/ml)	0.23 ±0.03	0.23 ±0.02	0.23±0.77	0.690

Post Intervention results:

There was no significant difference in the mean and magnitude of change in chromium levels between the study groups (p=0.172) despite higher increase in the intervention group (-0.09±0.07) than the control group (-0.03±0.04).

There was no significant difference in FBS between the study groups (p=0.075) despite higher levels in control compared the intervention group (Table 3). Mean HbAlc was significantly lower (p=0.003) in the intervention group compared to the control group.

Table 3

Variable	Intervention Mean (95% CI)	Control Mean (95% CI)	t-test P-value
FBS (mmols/l)	10.30±0.99	11.58±1.02	0.075
HbAlc (%)	7.90±0.5	9.24±0.53	0.003*
Serum chromium (ng/ml)	0.31±0.07	0.27±0.03	0.241

Magnitude of change in HbAlc indicated significant decrease (p=0.001) in the intervention group (1.44±1.03) compared to an increase in the control group (-0.79±0.84) at end of month 4. There was positive association between serum chromium levels and HbAlc that stabilized (6.5-8.4%) at chromium levels of 0.3ng/ml which was also the mean serum chromium levels in intervention group at end of month 4 that could result from self regulation. Negative association was observed at HbAlc >10% where chromium levels decreased (Fig 1). Elevated HbAlc results to chronic diuressis from hyperglycaemia that incurs chromium losses in urine 7. Normal chromium levels of 0.3ng/ml would therefore reduce hyperglycaemia and preventing chromium losses among Type 2 diabetics.

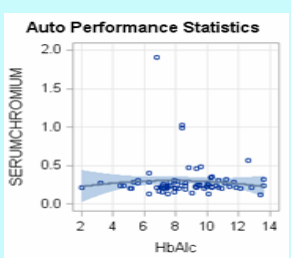

Figure 1

Conclusions

•Chromium supplementation increased the chromium levels of the intervention group to normal level of 0.3 ng/ml registering a significant reduction in HbAlc levels

•Chromium supplementation should be incorporated in routine treatment and management of blood sugar among Type 2 Diabetics

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