ASSESSMENT OF MINERAL STATUS AND BODY MASS INDEX OF WOMEN ATTENDING HEALTH CENTRES IN SOME NORTHERN STATES IN NIGERIA

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Abstract

Research interest on mineral status has been stimulated over the years, especially among the vulnerable groups such as women and children. This is because the relative status of minerals may be suggestive of one disease or the other. There is scarcity of data regarding mineral status and body mass index (BMI) among women in developing countries like Nigeria. To assess the state of mineral nutrition and evaluate BMI among women in some selected Northern states in Nigeria, five designated health centers were visited and blood samples collected for the estimation of packed cell volume (PCV) as well as serum zinc, copper, iron, magnesium and calcium using Atomic Absorption Spectrophotometer (AAS). The BMI was calculated from height and weight measurements. The mean levels of micronutrient elements were 13.02±9.24, 14.91±7.67 and 9.34±4.30 µmol/l for zinc, copper and iron respectively; the mean values for magnesium and calcium were 0.33±0.26 and 2.20±1.07 mmol/l respectively. For all the elements significant differences ($P<0.05$) were observed. The mean PCV was 39.10±3.82%. The mean BMI was 23.17±3.87 kg/m^2. Serum magnesium level was relatively low when compared with the normal range (0.7-1.0 mmol/l). This finding suggests the existence of prevalence of hypomagnesaemia. About 20% of the women were overweight and obese. Relevant agencies should be encouraged to strategize towards checking this abnormal trend among the women in the zone.

Keywords: minerals, hypomagnesaemia, body mass index, women

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Introduction

Micronutrient deficiency, whether clinical or subclinical, may affect growth and reproductive performance (Seshaddi, 2001). For instance, in pregnant women, moderate to severe deficiencies of zinc, iron and folic acid increase the risk of low birth weight, pregnancy complication and birth defects (Seshaddi, 2001). Tiber et al. (1986) suggested a possible relationship between dietary imbalance of zinc and iron levels as a factor in the etiology of coronary heart disease . Also, zinc deficiency has been associated with abnormalities of the metabolism of the element in patients with end-stage renal disease (Muirhead *et al.*, 1986). There exist some lines of evidence which suggest that low dietary intake of calcium or magnesium may be associated with several chronic diseases such as type 2 diabetes mellitus (Colditz *et al.*, 1992; Song *et al.*, 2004). Studies have also reported association of hypomagnesaemia with metabolic syndrome (Guerrero-Romero and Rodriquez-Moran, 2002).

Song et al. (2007) suggested that serum magnesium and copper could independently predict body weight or BMI in adult women, and that serum magnesium might be the more significant predictor. Magnesium level has been associated with the risk of sudden cardiac death possibly through antiarrhythmic mechanisms (Chiuve *et al.*, 2013). Obese individuals have been reported to have lower serum magnesium levels than the non obese (Rodriquez-Hernandez *et al.*, 2005). Research data on serum minerals and body mass index in women in

developing countries are limited. The present study, therefore, has been undertaken to assess the serum levels of some mineral elements as well as the BMI among women in some northern States in Nigeria.

Materials and Methods

Location of Health Centres:

The designated Health Centres used for the study were located in Karshi in Federal Capital Territory (FCT), Kafanchan (KDKF) in Kaduna State, Kaura (KDKR) also in Kaduna State, Bakori (KAT) in Katsina State and Tsafe (ZAM) in Zamfara State.

Experimental Design

A total of two hundred women aged 20-40 years attending the health centres were randomly selected among volunteers (that is, forty women per location). The potential participants who presented with medical cases of malignancy, tuberculosis, diabetes, thyroid, renal, rheumatoid or other endocrine disorder, or who were on drugs known to affect body weight as well as hormone replacement therapy were excluded. The fifty eligible women gave their written informed consent. All the participants completed questionnaires concerning smoking, exercise, alcohol consumption, medication or supplements used and medical history.

Body Mass Index Evaluation

Height and weight were measured (with light-weight clothing and bare footed) using a standiometer and the salter-bathroom type scale respectively. The BMI for each participant was calculated using a standard formula (weight (kg)/Height (m^2)) as given by WHO (1996).

Blood Sample Collection and Packed Cell Volume Estimation.

Blood samples, before breakfast, were collected by venepuncture from the forearm or back of the palm with the aid of sterile 5ml-syringes with disposable hypodermic needles. The Packed Cell Volume (PCV) was estimated as described by Tentoric and Salvati (1981).

Micro and Macronutrient Element Analysis

Serum levels of zinc, copper, iron, magnesium and calcium were estimated using Atomic Absorption Spectrophotometer (Solaar 969 Unicam Ltd, New York) as described by Whiteside (1979).

Statistical Analysis

Values for PCV estimation and BMI evaluation were expressed in simple percentages. Data obtained from micro and macronutrient element analysis were subjected to one way analysis of variance (ANOVA). Statistical level of significance was $P<0.05$.

Results

Table 1 shows the mean BMI for each of the five locations. The overall mean of BMI was 23.17±3.87 kg/m^2. The lowest mean BMI was recorded for KDKR (22.38±1.89 kg/m^2). The highest mean BMI among the locations was for KDKF (24.05±7.13 kg/m^2). There were significant differences in the BMI values among women in the five locations.

Table 2 shows the PCV values for the women. The overall mean recorded was 38.8±3.8%. The highest PCV was for KDKR (42.2±3.3%) while the least value was for KAT (33.2±3.3%). There were significant differences ($p>0.05$) in the PCV values.

Table 1: Body Mass Indices of Women in the five Locations (Mean ± SD)

Location	body mass index (kg/m^2)
FCT	22.60 ± 1.76
KDKF	24.05 ± 7.13
KDKR	22.38 ± 1.89
KAT	22.86 ± 2.76
ZAM	23.95 ± 3.65
Mean ± SD (N=200)	23.17± 3.87

Table 2: Mean Packed Cell Volume (PCV) % of Women in all Locations

Location	PCV
FCT	39.9 ± 5.8
KDKF	40.0 ± 4.6
KDKR	42.2 ± 3.3
KAT	33.2 ± 3.3
ZAM	38.6 ± 3.5
Mean ± SD	38.8 ± 3.8

Figure 1 depicts the serum levels of micronutrient elements. Zinc was higher in FCT followed by KDKF while ZAM had the least concentration. Significant differences exist in the levels of Zinc among the women. KDKF had the highest copper concentration followed by FCT while KAT had the least copper concentration. There were significant differences ($p>0.05$) in the copper concentration among the women. The highest Iron concentration was obtained among women in KDKF followed by KAT while ZAM had the least concentration. There were significant differences ($p>0.05$) in the iron concentration among the women.

The highest serum magnesium level was observed in KDKR; while FCT and KDKF recorded the least magnesium level (Fig 2). The overall mean magnesium level was 0.33±0.26 mmol/l. There was a significant difference ($p<0.05$) in the magnesium levels in women in all the locations.

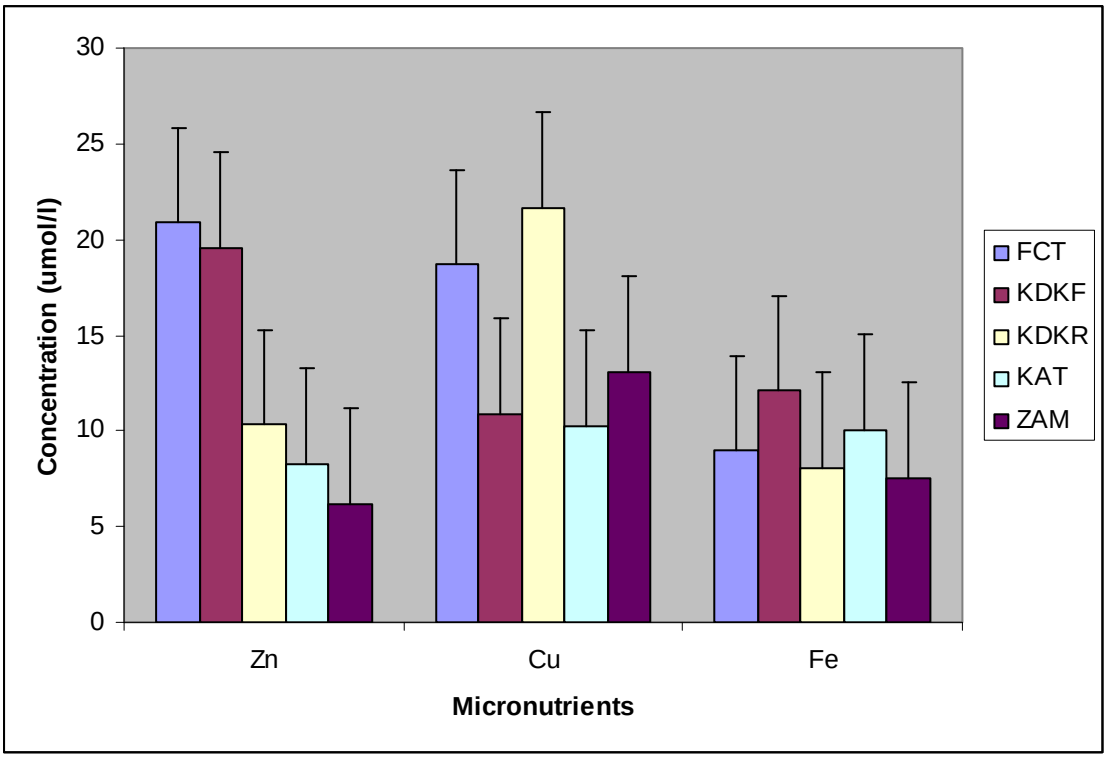

Fig 1. Micronutrient levels in women population studied

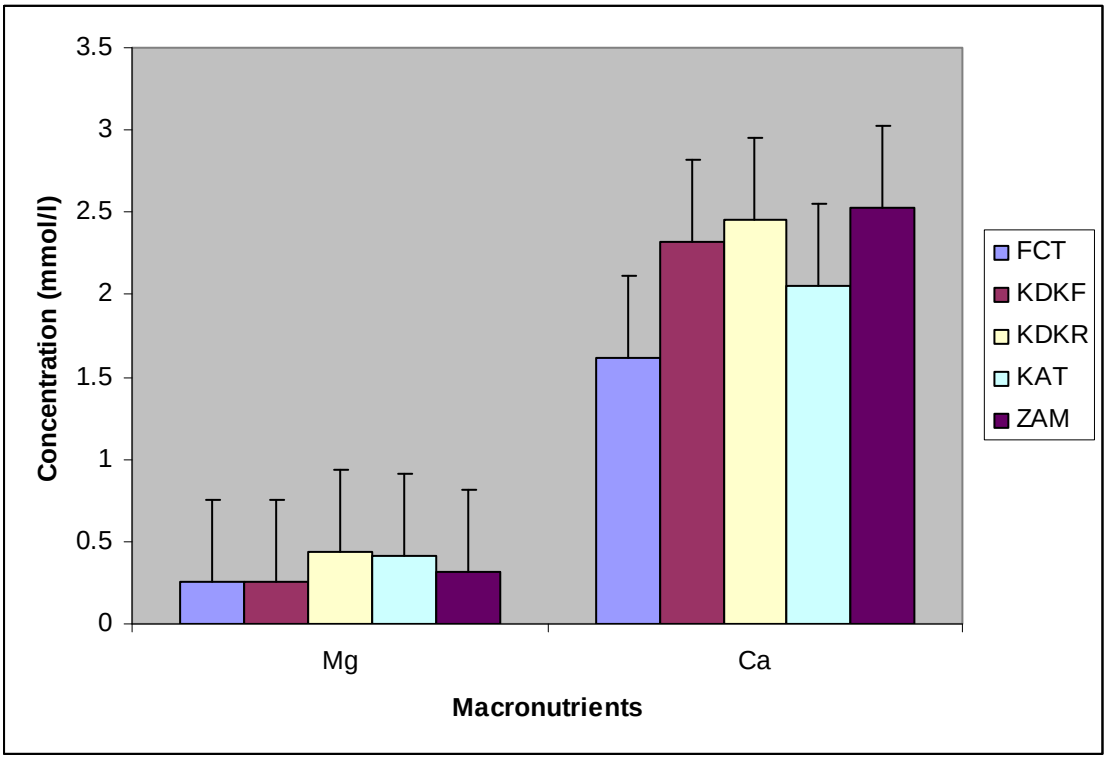

Fig 2. Macronutrient levels in women population studied.

Discussion

The overall mean BMI was 23.17±3.87 kg/m^2. This figure is high when compared with the normal range of 18.50 – 24.90 kg/m^2 (WHO, 1996). By the classification of National Institute of Health, NIH (1998), 16.0% were overweight, 4.0% were obese while 4.0% were underweight. Varying nutritional status and patterns of food consumption, life style, eating habits and medical conditions may account for these differences (Nordstrom, 1982).

The overall mean PCV was 38.8 ±3.7%. This falls within the normal range of 36.0 – 47.0% as suggested by Falashe and Akinkugbe (2000). Likely, anaemia and related diseases were not common among the women.

The mean serum zinc, copper and iron levels (13.02±9.24, 14.91±7.67 and 9.34±4.30 µmol/l respectively) were normal. Also, serum calcium level (2.19±1.07 mmol/l) fell within the normal range (2.20 – 2.80 mmol/l) as reported by Nduka (1999). This pattern observed may be due to varying socio-economic status from one location to another (Nordstrom, 1982).

The mean serum magnesium level (0.33±0.26 mmol/l) observed for women was very low when compared with the normal range of 0.70 – 1.00 mmol/l (Nduka, 1999). This result demonstrated the incidence of hypomagnesaemia among the women. This observation might be due to dietary pattern as most of the foods consumed were cereal based. Processing methods may also be responsible for losses in magnesium (Briggs and Calloway, 1979).

Conclusion

The study showed that hypomagnesaemia was common prevalent among the women. The mean Body Mass Index (BMI) reflected the tendency of many of them becoming overweight or obese. There is a need for appropriate agencies such as Ministries of health and Women affairs to map out policies and programs to check this trend.

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