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Energy and Macronutrients Intake in Two Age Groups of Black South African Women

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Abstract: The transition to a more westernized diets, became evident in the macronutrient intake of women in this study. The consumption of an energy-dense and diverse diet, typical of this transition, contributed to the high mean total energy and protein intakes. High mean total carbohydrate intakes, a staple diet of cereals and grains was also reported. The adequate intake of dietary fibre by the population group in this study was in contrast with international studies that reported that westernization leads to increased consumption of fibre-depleted carbohydrates. The high total fat intake observed in this study may be ascribed to the increasing preference for cheaper red meat, offal, eggs, full-cream milk, cheese, brick margarine and meat drippings used in food preparation. The inclusion of these foods in the diet could explain the high total cholesterol intake reported in this study. Although the food trends of the studied group of women tended to move towards a more westernized style, traditional foods have not been totally eliminated. It is thus clear that urbanisation in this study group has led to high consumption rates of carbonated drinks, cold drinks, coffee, tea and commercial beer. A cereal-based diet was still taken; unfortunately, many of these foods were consumed in the refined form.

Key words: Energy intake, macronutrients intake, two age groups, South African women, diets, transition, westernization

INTRODUCTION

The general health and nutrition situation world-wide has changed significantly from the early periods to the 21st century. From nutrition viewpoint, research and policies in many lower-income countries have previously focused on problems of under-nutrition (Popkin, 1998). A marked decline in infectious diseases and a trend towards an increase in chronic diseases have now become endemic face (Kim *et al*., 2000; Oguntibeju *et al*., 2005) globally and have been shown to be related to dietary intake. Degenerative chronic diseases such as diabetes mellitus and obesity have become major health concerns around the world, especially among populations that have been subjected to a rapid change in lifestyle (O'Dea *et al*., 1991). Many developing countries such as South Africa are however experiencing a health transition in which the double burden of chronic diseases and infectious diseases will have to be fought simultaneously (WHO, 1998). South Africa, like many other countries, is a country in transition, leading to political, demographic, socio-economic and nutritional changes, affecting, mainly the black South African population. This new era is characterised by changes from the traditional lifestyle to a more western lifestyle and eating habits associated with chronic diseases of lifestyle.

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Women's health in South Africa and particularly black South African women living in urban areas such as Mangaung, is being influenced by three major factors. These include the political transition from apartheid to democracy, rapid urbanization and the internationally growing awareness of the need for health care. The development of appropriate health services for women has now become a priority. Westernization and urbanization are internationally receiving more recognition as major determinants of health. The global process of urbanization in South Africa has been predicted to increase to 75% of the population by the year 2010 (Hoffman *et al*., 1997), affecting mainly the black population. This condition leads to considerable urban poverty and the growth of informal settlements which have a profound effect on the population's health status as these previous rural dwellers now adopt new ways of life. Measurements of what people eat and analyses of their diets can give valuable information on nutritional status and provides an avenue to determine the potential risk associated with their dietary intake. Nutrient intake data can be used to evaluate the adequacy of diets to establish nutrients goals for food and nutrition policy decisions and to study the relationship between nutrient intakes and health and disease.

The increasing rate of urbanization accompanied by the abandoning of the more healthy traditional diet for a western diet have led to an increase in chronic diseases of lifestyle in many countries. This trend has been reported in Mangaung, the black South African residential area of Bloemfontein. This study was therefore designed to determine the dietary intake of two groups of women in the Mangaung area of Bloemfontein, South Africa and the possible risk that may be associated with their dietary intake.

MATERIALS AND METHODS

Population and Sampling

A sample of 500 black South African women, from the two age groups of 25-34 and 35-44 years were selected randomly in Mangaung (the black residential area of Bloemfontein), using a township map obtained from the Bloemfontein Municipality. The sample included respondents from two built-up areas, namely Pahameng and Botchabela and two informal settlements: Joe Slovo and Namibia. The residential plots in the four selected areas were counted and numbered and a proportionate number of respondents were selected randomly from these plots. The size of the sample was considered representative of the Mangaung population.

Inclusion/Exclusion Criteria
Participation in the study was voluntary.
Black South African female residing in the designated area
Age group of 25-44 years
Non-pregnant, non-diabetic and non-hypertensive
Persons had to be available for assessment.

Socio-Demographic Status

The socio-demographic composition of the subjects was determined by means of questionnaires. The questionnaires were administered by members of the research team and included the following: demographic information: identifiable details of the respondent (date of birth, residential address, telephone number language spoken); number of years residing in the Mangaung area; number of children born and alive; smoking habits, household composition; marital status; highest level of education; employment status of respondent, husband/partner; head of household, type and size of dwelling; facilities available (source of drinking water, type of toilet and fuel, cold storage and freezing facilities, type of stove (s), television and radio); income (number of people contributing, average household income per month and amount of money spent on food weekly.

Energy and Macronutrients Intake

To determine the habitual intake of nutrients of the participants, a standardised Food Frequency Questionnaire (FFQ), adapted from the Transition and Health during Urbanization of South Africans (THUSA) study (Potchefstroom University) was used. A FFQ was chosen to determine dietary intake because FFQ is good for describing intake of groups rather than individuals (Dwyer, 1998) and are commonly used in epidemiological research on diet and disease (Willet, 1990). Furthermore, it provides an overall picture of food intake (Dwyer, 1998; Hammond, 2000) which may be more representative of the usual intake of the individual than a few days of diet records. This method is also relatively inexpensive for large sample sizes. The design can be based on large-population data and it is a suitable method to choose for research on diet-disease relationships (Dwyer, 1998; Lee and Nieman, 1996). The FFQ comprised food items that are habitually consumed by the participants. Both traditionally and western foods were included. Provision was made for the addition of unlisted food items. Additional sections added to the FFQ included the following: if respondents were on special diet; use of salt and flavoured salts; use of commercial stock cubes in cooking; use of dietary supplements; eating pattern usually followed; inclusion of breakfast in the day's meals; regularity of food consumed away from home; regularity of tea and coffee consumed; consumption of fresh fruit and vegetables during meals. FFQ were administered by the research team after attending a training session organised by a Dietician. Prior to each interviewing session, the procedures for reporting dietary intake were explained to the respondents. Dietary intake was reported as food consumed on daily, weekly or monthly basis. The following materials and equipment were used to determine food choices and portion sizes: a set of household measuring cups (250, 125, 62 and 31 mL); a set of household measuring spoons (15, 7.5, 5, 2.5, 1.2 and 0.6 mL); a large household spoon used for dishing up (heaped spoon, 125 mL); empty labelled food containers; real food (snack foods), weighed on an analytical scale to determine the weight for commonly used portion sizes; food models. The recorded food items were coded by means of the Food Composition Table of the South African Medical Research Council (Langenhoven *et al*., 1998). The quantities of food items recorded were converted to gram weights using the Food Quantity Manual (Langenhoven *et al*., 1991). The data was summarized on a coded summary sheet before it was processed. The weight of food items consumed on a daily basis was entered as such. The weight of food item not selected by the respondents on a daily basis was calculated as follows: food in grams consumed on a monthly basis divided by 30 days and food in grams consumed on a weekly basis divided by 7 days. Complex dishes not appearing in the Food Composition Tables were broken down into individual ingredients and weights and coded as such.

Statistical Analysis

The data were categorised into age groups 25-34 and 35-44 years. For each group, continuous variables were described by means and percentage. Categorical variables were described by frequencies and percentages. The nutrient intake of each respondent was calculated using Food Composition Tables of the Medical Research Council (Langenhoven *et al*., 1991) and described for each group by mean and percentages. All nutrients were categorised as <67 or >67% of the Recommended Dietary Allowance (RDA).

RESULTS

Socio-demographic Details

The mean age of the women was 29.2 years (age group 25-34) and 39.5 years (age group 35-44). In the age group 25-34, the mean number of years living in Mangaung (urban area) was 15 years while in the 35-44 age group, it was 19 years. Room density was high in both groups (mean is 3.2 persons/room and 3.1 persons/room for the age group 25-34 and 35-44, respectively). Results on the

level of education showed that the highest level of education appeared in women from the younger group at secondary school level (standard 6-8: 37.6% and standard 9-10: 47.3%). In the older group, the highest level of education appeared in the 6-8 category (42.4%) while 15.7% had standard 9-10. The employment status showed that the largest percentage of women from both age groups were unemployed (74.6 and 67.7% in the young and older groups, respectively).

Energy and Macronutrients Intake

Table 1A, B, 2A and B indicate the intake of energy and macronutrients of the two age groups. Maximum intakes of energy were also extremely high for both age groups while only 11.5% of the younger group and 12% of the older group of women showed intakes less than 67% of the Estimated Energy Requirement (EER). The mean total protein intakes were above the RDA of 46 g day^{-1} for women of both age groups. Only 4.3% of women in the younger group and 6% in the older age group took in less than 67% of the RDA. Mean total fat intake, in both age groups were higher than the

Table 1A: Energy macronutrients intake (carbohydrate and protein intake) in group 25-34 years of age

Parameters	Min intake	Mean	Max intake	RDA/AI*	<67% RDA
Energy (kJ)	1670.5	12425.4	35312.0	ND	NA
Total protein (g)	8.0	90.5	295.5	46	4.3
Plant protein (g)	2.9	38.8	126.0	ND	NA
Animal protein (g)	2.4	48.0	209.0	ND	NA
Total CHO (g)	51.3	375.8	1091.8	ND	NA
Sucrose (g)	1.4	60.2	195.0	ND	NA
Starch (g)	0.9	30.6	341.6	ND	NA
Total fibre (g)	1.5	24.9	85.4	ND	NA

The minimum and maximum intake represents the calculated dietary intakes of the respondents. ND: Not Determined, NA: Not Applicable

Table 1B: Macronutrients Intake (Fat intake) in group 25-34 years of age

Parameters	Min intake	Mean	Max intake	RDA	<67% RDA
Total fat (g)	14.4	106.3	371.2	ND	NA
Sat fat (g)	4.50	30.80	122.2	ND	NA
Monounsat fat (g)	3.90	35.00	132.9	1.2	0
Polyunsat fat (g)	2.70	29.90	103.5	12	0
Chol (mg)	13.2	377.9	14800	ND	NA

The minimum and maximum intake represents the calculated dietary intakes of the respondents. ND: Not Determined, NA: Not Applicable

Table 2A: Energy and macronutrient intake (carbohydrate and protein intake) in group 35-44 years of age

Parameters	Min intake	Mean	Max intake	RDA	<67% RDA
Energy (kJ)	2646.8	1392.0	26782.0	ND	NA
Total protein (g)	12.8	81.7	215.6	46	6
Plant protein (g)	4.7	35.6	107.8	ND	NA
Animal protein (g)	2.0	43.6	154.9	ND	NA
Total CHO (g)	78.8	352.6	949.5	ND	NA
Sucrose (g)	2.2	61.2	236.4	ND	NA
Starch (g)	1.4	31.3	342.2	ND	NA
Total fibre (g)	1.5	24.9	85.4	ND	NA

The minimum and maximum intake represents the calculated dietary intakes of the respondents. ND: Not Determined, NA: Not Applicable

Table 2B: Macronutrients Intake (Fat intake) in group 35-44 years of age

Parameters	Min intake	Mean	Max intake	RDA	<67% RDA
Total fat (g)	2.2	94.0	318.4	ND	NA
Sat fat (g)	3.8	26.7	81.6	ND	NA
Monounsat fat (g)	4.0	31.0	92.8	1.2	0
Polyunsat fat (g)	2.7	26.6	133.6	12	0
Chol (mg)	3.3	339.3	1928.8	ND	NA

The minimum and maximum intake represents the calculated dietary intakes of the respondents. ND: Not Determined, NA: Not Applicable

Table 3: Macronutrient intake as percentage of total energy of group 25-34 years of age

Parameters	Min intake	Mean (%)	Max intake	RDA (%)
Total protein (g)	7.0	12	22	12-20
Plant protein (g)	2.0	5	10	NA
Animal protein (g)	0.4	6	19	NA
Total fat (g)	10.0	32	54	<30
Sat fat (g)	2.0	9	18	<10
Monounsat fat (g)	3.0	10	21	>10
Polyunsat fat (g)	3.0	9	26	10
Total CHO (g)	33.0	51	77	50-60
Total sucrose (g)	1.0	12	39	NA

NA: Not Applicable

Table 4: Macronutrient intake as percentage of total energy of group 35-44 years of age

Parameters	Min intake	Mean (%)	Max intake	RDA (%)
Total protein (g)	4.0	12	24	12-20
Plant protein (g)	2.0	5	11	NA
Animal protein (g)	0.5	6	20	NA
Total fat (g)	8.0	31	53	<30
Sat fat (g)	2.0	9	17	<10
Monounsat fat (g)	3.0	10	19	>10
Polyunsat fat (g)	2.0	8	23	10
Total CHO (g)	31.0	53	83	50-60
Total sucrose (g)	2.0	13	37	NA

NA: Not Applicable

Acceptable Macronutrient Distribution Range (AMDR). Mean mono-unsaturated fat in both groups were higher than the level recommended by Truswell while the mean poly-unsaturated fat intake of the older age group fell within the range recommended by Truswell. For cholesterol, the mean intakes were higher than the guideline of less than 300 mg day^{-1} (Truswell, 1994).

Macronutrients Intake as Percentage of Total Energy Intake

The macronutrient intakes as percentage of total energy intake for the two age groups are indicated in Table 3 and 4. The total recommended carbohydrate allowance for women of both age groups was taken as 50-60% of the EER of total energy. The mean dietary fibre intake of 24.9 g for the younger age group and 22.7 g for the older age group fell within the recommended 25 g day^{-1}. The recommended total fat for both age groups was considered as 30% of the value of total energy intake. Poly-unsaturated fats constituted 10%, mono-unsaturated fats >10% and saturated fats <10% of the total fat intake. The mean total protein intake as percentage of the total energy intake for both age groups fell within the recommended 12-20% of the total daily energy intake. Animal and plant proteins both contributed mean figures of 5% of total energy intake for women of the two age groups. Mean total fat intake contributed 32 and 31% of the total energy intake for the younger and older age groups in that order. Saturated fats contributed a mean intake of 9% of the total energy intake for both age groups, mono-unsaturated fats 10% for both age groups and poly-unsaturated fats 9% for the younger age group and 8% for the older age group. The mean total carbohydrate intake of 51% for the younger age group and 53% for the older age group fell within the recommended 50-60% of the total daily energy intake.

DISCUSSION

The mean energy intake of women in both age groups was markedly higher than the Estimated Energy Requirement of 9196 kJ (Johnson, 2000) and higher than the results obtained from other studies utilizing food frequency questionnaires in South Africa and overseas (Bonifaci *et al*., 1997;

Romieu *et al*., 1997; Vorster *et al*., 1999). A significant difference between the energy intake of rural and urban black women has been reported (Vosrter *et al*., 1999), with urban women taking in more kilojoules than their rural counterparts. Although it is difficult to compare mean intake of nutrients obtained by means of other dietary assessment methods, total mean energy intake in this study was higher than a similar study performed on black South African women (Bourne *et al*., 1993). The transition to a westernized lifestyle, usually lead to an increased consumption of energy-dense diets (O'Dea, 1991; Vorster *et al*., 1999) which was observed in this study. Urban black South Africans are exposed to a more diverse diet than their rural counterparts who may have led to the high total energy intake reported in this study. The increasing number of street food vendors (Oguntona and Kanye, 1995) in townships, offering various snack foods high in energy value may also have played a large role in contributing to the total energy intake. The mean figures for total protein intake for both age groups indicate an intake that exceeded the RDA of 46 g day^{-1} (Earl, 2000). These high intakes of total protein have been observed to be international tendency (Bonifaci *et al*., 1997; Romieu *et al*., 1997; Vorster *et al*., 1999). Vorster *et al*. (1999) reported from South African study that the intakes of total protein of adult whites, black, coloured and Indians were found to either meet or exceeded recommended intakes. In present study, the mean intake of total protein for both age groups exceeded the mean intake of 71.2 g day^{-1} for urban black South African women. This trend of high total protein intake may be ascribed to the fact that urbanization is accompanied by the increased intake of animal protein typical of a more western diet and this in accordance with reports from (Bourne *et al*., 1993; Oguntona and Kanye, 1995). It is known that diet become more diverse with urbanization, with more people adding meat, fish, eggs and cheese into their habitual diet. The free availability of cheaper cuts of red meat, offal, sausage, chicken and chicken offal could have contributed to the high intake of total protein in this study. According to MacIntyre (1998), the ratio of plant to animal protein has changed dramatically in the diets of urbanized black South Africans, with rural black South African women consuming more plant proteins than their urban counterparts. This was also true of the respondents in this study, where the mean plant protein intake was lower in both age groups than animal protein intake. The consumption of cheaper vegetable proteins, including a bean-samp combination typical of a black diet, commercial baked beans and texturised vegetable protein, amongst others could however have contributed to the fairly balanced intake of animal and plant proteins of subjects in this study.

The mean total carbohydrate intake of women of both age groups in this study exceeded the RDA. This is similar to the mean intakes of carbohydrates in other studies (Bonifaci *et al*., 1997; Romieu *et al*., 1997). In South Africa, Bourne *et al*. (1993) reported a considerably lower mean intake of carbohydrates 214 g day^{-1} among urban black South African women in the age group 19-44 years in a similar study. Higher mean carbohydrates intakes were however reported for black South Africans by Vorster *et al*. (1999). Notwithstanding the high mean total carbohydrate intake; a stable diet of cereals and grains with high fibre content, typical of this study group, may have beneficial health effects. Although the mean total carbohydrate intake of women of both age groups fell within the recommended 50-60% of the total energy intake/day, the total mean energy intake of women of both groups was extremely high, placing them at risk of developing chronic diseases, such as obesity and type 2 diabetes mellitus.

The mean total sugar intake of women in both age groups in the current study seem to be lower than the mean intake of 94.2 g day^{-1} reported for urban black South African women by Vorster *et al*. (1999) and even lower than the mean total sucrose intake reported from two overseas studies (Bingham *et al*., 1994; Krummel, 2000). Mean intakes were however higher than the 44.6 g day^{-1} reported for rural black South African women. With urbanization, new foods high in sugar become freely available (Drewnowski and Popkin, 1997) while preferences for sweetened foods are also regarded by many people as an innate human trait. The mean intake of total dietary fibre of women

in both groups fell within the recommended 20-30 g day^{-1} (Truswell, 1994) with possible beneficial effects against the development of certain chronic diseases of lifestyle. Figures obtained in this study compared favourably with figures from two other studies (Bingham *et al*., 1994; Romieu *et al*., 1997). Dietary guidelines for fibre were met in several other South African groups using a variety of assessment methods, including the food frequency questionnaire. The fact that approximately half of all the respondents in this study had been living in Mangaung for less than ten years and perhaps still in the process of urbanization, may possibly explain the dietary fibre intake of these women including the consumption of freely available fruits in urban African groups. From the questionnaire, it became evident that fruits such as apples, bananas and oranges and vegetables such as spinach and cabbage and cereals such as oats porridge are popular food choices of the black South African women who participated in this study.

The mean total fat intake of women in both age groups was considerably higher than results of fat intakes obtained from overseas studies (Bonifaci *et al*., 1997; Romieu *et al*., 1997). The typical black South African diet consists of 23% fat (Gresse *et al*., 1993) while in this study fat made up 32% for the younger age group and 31% for the older age group of the total energy intake. These results compared favourably with reported results of approximately 30% fat intake by (Vorster *et al*., 1999; Bourne *et al*., 1993). Saturated fat intake of 30.5 g and 26.7 g day^{-1} for women in the young and older age groups were considered high. These figures were higher than figures reported by Romieu *et al* (1997) but lower than figures reported by Bonifaci *et al*. (1997). The high intake of saturated fats may be ascribed to the preference for higher proportions of meat, eggs, milk and cheese, typical of a more westernized diet (Drewnowski and Popkin, 1997) and the inclusion of brick margarine and meat drippings used in cooking. It has also been observed in this study that eggs are included in the diet of most black South Africans. The mean intake of mono-unsaturated fats in the study group was high for women of both age groups. This is similar to the finding of Bonifaci *et al*. (1997); however, low mean intake was reported by Romieu *et al*. (1997). The mono-unsaturated fat intake calculated as percentage of the total energy intake was 10% in women of both age groups. The high intakes of these fats can be ascribed to the availability of cheap vegetable oils used in cooking; resulting in greatly increased mono-unsaturated fat consumption among low-income groups (Drewnowski and Popkin, 1997). Furthermore, mono-unsaturated fats are found in foods such as peanuts, a rich source of these fats which is freely available from street vendors. Mono-unsaturated fats are also found in small quantities in foods such as popcorn, red meat, chicken, mayonnaise and potato crisps which are favourite foods in this black community. The mean poly-unsaturated fat intake for women of both age groups was high. These findings were in contrast with South African findings of 11 g day^{-1} reported by Bourne *et al*. (1993). Although the percentage of energy from fats was not excessive, the actual intake of fats (in gram) was high. The mean daily cholesterol intake was high and this could be due to availability of cheaper fatty red meat, eggs, offal and organ meat including liver which are rich sources of cholesterol and are consumed on a fairly regular basis by black South African which include the women in this study. The results obtained in this study are similar to that reported by Bonifaci *et al*. (1997). The figures of 377.9 and 339.3 mg cholesterol intake/day exceeded the guideline of less than 300 mg day^{-1} (Truswell, 1994). According to Vorster *et al*. (1999), mean cholesterol intake in rural black South African women were much lower 232 mg day^{-1} than levels in urban black South African women which were reported as 329 mg day^{-1}.

CONCLUSION

The mean energy intake of women in both age groups was high. The mean figures for total protein intake for both age groups indicate an intake that exceeded the RDA of 46 g day^{-1}. The mean total

carbohydrate intake of women of both age groups in this study group exceeded the RDA. The mean total fat intake of women in both age groups was considerably higher than the ones reported in other studies.

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