ISSN 0378-5254 Journal of Consumer Sciences, Special Edition
Food and nutrition challenges in Southern Africa, Vol 2, 2017

DIETARY PATTERNS AND BMI STATUS OF ADULT WOMEN IN GREATER LETABA MUNICIPALITY, SOUTH AFRICA

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ABSTRACT

Recent studies suggest that chronic diseases of lifestyle account for 28.5% of deaths of all South Africans between the ages of 35 and 64 years and that more than 56% of all South Africans between the ages of 15 and 64 have at least one modifiable risk factor for chronic disease of lifestyle. The main aim of the study was to assess the dietary patterns, dietary diversity and body mass index (BMI) of adult rural women in Greater Letaba Municipality, Limpopo province, using the South African food-based dietary guidelines (SAFBDGs). The study design was a descriptive and correlational cross -sectional survey with an analytic component. The sample consisted of 160 randomly selected women aged 19–45 years. Demographic, socioeconomic and dietary-pattern data were collected using a researcher-administered questionnaire during home visits. Dietary variety and availability was determined by direct observation and questioning and weight and height were measured to determine the BMI. Data were analysed using SPSS 18.0. Descriptive statistics and chi square tests were used to explore relationships between variables. The majority of women (51%) were either overweight or obese. Their dietary patterns only complied with three of the eleven SAFDBGs messages and dietary diversity was low.

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ARTICLE INFO

Article history
Received June 2016
Revision November 2016

Keywords
dietary patterns, dietary diversity, food-based dietary guidelines

INTRODUCTION

South Africa is a society in transition and this is reflected in its health profile (Steyn *et al*, 2001:142). The co-existence of under- and over-nutrition is evident not only between populations but also within populations and even within the same household. Malnutrition may result from under- or over-nutrition and can occur at any age as either general malnutrition or related to specific nutrients. Malnutrition has adverse effects, particularly related to physiological disturbances (Solomons & Ruz, 2001:6). As demographic changes in South Africa favour an aging society, chronic diseases have become an increasingly significant public health problem. Cancer, cardiovascular disease, hypertension, diabetes, osteoporosis and osteomalacia and obesity dominate in industrialised societies and are rapidly increasing public health concerns in developing countries (Vorster *et al*, 2013:1-12). A better understanding of the determinants of change in dietary patterns and nutrient intake during the demographic transition in developing countries, especially in rural women, is crucial. This should inform the development of appropriate and relevant policies, strategies and intervention programmes to prevent and control disease. The nutrition transition in South Africa is described as a change from a traditional, indigenous diet high in fibre and low in fat, which is eaten mainly by rural people, to a Western type of diet, which is rich in animal fat and low in fibre (*MacIntyre*, 1998).

The theory of nutrition transition suggests that over the course of socioeconomic development overweight first emerges among the rich and urban poor before spreading to the rural poor (Sengupta *et al*, 2015:162). The prevalence levels of overweight and obesity in low- and-middle income nations is reported to have approached or exceeded the higher income countries (Popkin & Slining, 2013:18). Recent evidence suggests that overweight and obesity can no longer be considered a problem of urban and wealthier nations, but exist among people with low socioeconomic profiles (Poterico *et al*, 2011:2290; Jones-Smith *et al*, 2012:1116; Lozano *et al*, 2013:799; Razac *et al*, 2013:11).

The prevalence of overweight and obesity is high and increasing in South Africa and is said to affect mostly black women, with obesity prevalence estimated at 31.8% (Micklesfield *et al*, 2013:371). Several factors, including lifestyle, are suspected to contribute to the rising over-nutrition in black women; dietary patterns and nutrient quality have been associated with the risk of overweight and obesity. Several behavioural factors, including a sedentary lifestyle, are also linked to the development of obesity and overweight (Lozano *et al*, 2013:800). Even though high household food insecurity above 30% has been reported in Limpopo province, black women in this province present with overweight (16.3%) and obesity (11.5%) (Shisana *et al*, 2014:133-144). The coexistence of food insecurity and over-nutrition in the same household needs to be examined by exploring behavioural factors, values, beliefs and household situations related to food consumption. This study aimed to explore the dietary patterns, dietary diversity and body mass index (BMI) status of women residing in a rural environment. The objectives formulated were 1) to determine sociodemographic and environmental factors of the participating women, 2) to determine the BMI status of women, 3) to determine the dietary patterns of women and 4) to compare the sociodemographic and environmental factors with BMI and dietary patterns.

MATERIALS AND METHODS

Study area and subjects

The study design was a descriptive cross-sectional survey with an analytical component. The study population consisted of adult women aged 19–45 years (38 225 or 18% of the total population of Greater Letaba), residing in 129 villages, one township and one rural town of Greater Letaba Municipality, Mopani District, Limpopo province, South Africa (Statistics South Africa, 2012:2-13). The sampling design was multi-stage, using cluster sampling for selecting

villages and systematic sampling for selecting participants. A map of Greater Letaba Municipality was divided into four sections, namely North, East, West and South. One residential area from each section was randomly selected. The four residential areas were 29.5–50 km apart. This was done to ensure spread of sample within the municipal area, which covers 1 891 km^2. Systematic sampling was used to select participants. One residential area (or village) from each section was randomly selected, and thereafter, every fifth household was included until the required number was reached. The inclusion criteria were a household with women in the age group 19–45 years. A total of 40 women per village were interviewed making up a total of 160 participants. This sample size was decided upon due to the intensity of the methods, which included household visits in four different villages for direct observations across a large area, ensuring that data of adequate quality was obtained in the environment where participants live. Women who were ill, pregnant or lactating were excluded from the study due to known changes in dietary patterns and anthropometry during these periods.

Data collection procedures

Each village was visited between five and seven times over the study period which lasted eight months from February to September. The first visit was for the introduction of the study to the local tribal authority. Recruitment did not commence during this visit in order to prevent the introduction of bias. Subsequent visits were arranged for data collection, following an action plan. Data collected included demographic data, environmental factors, anthropometric measurements and dietary patterns. A standardised questionnaire was designed based on the eleven SAFBDGs (Vorster, Badham, & Venter, 2013) and was piloted to test for clarity, reliability, validity and feasibility. The questionnaire included data according to the four objectives stated earlier.

Personal face-to-face interviews were conducted in the local language of the participant (mainly Northern Sotho). The questionnaire was researcher-administered in order to prevent different interpretations of questions and to increase reliability. Demographic and environmental factors were recorded prior to measuring anthropometry. The weight of the participants, wearing light clothing and without shoes on, was measured using a portable solar scale. The scale was calibrated before taking measurements, which were repeated twice. Height was measured twice with a portable rod mounted to the wall with the participant standing upright without shoes on and with the head in the Frankfort position. A direct food inventory observation using a checklist was also made by the researcher in each household, after asking the participating women to display the variety of food items available on that day in order to increase the reliability of the dietary patterns reported. The researcher also observed the food storage and preparation areas, including equipment available.

Ethical clearance was obtained from the University of Venda Research and Ethics Committee prior to the commencement of the study. Permission to conduct the study was obtained from Greater Letaba Municipality and from traditional leaders and was granted both verbally and in the form of written letters. Participating women signed consent forms after the aim of the study and data-collection procedures were explained to them.

Statistical analysis

Data were interpreted and contrasted for appropriateness and compliance against the eleven messages of the SAFBDGs. BMI was calculated using the formula weight^2/height. Quantitative data were captured and analysed using SPSS 18.0. The services of a statistician from the University of Venda were used. Descriptive statistics such as mean, standard deviation and percentile were used. Chi-square tests and t-tests were also computed and a p-value of less than 0.05 signified significance.

RESULTS

Demographic and environmental factors

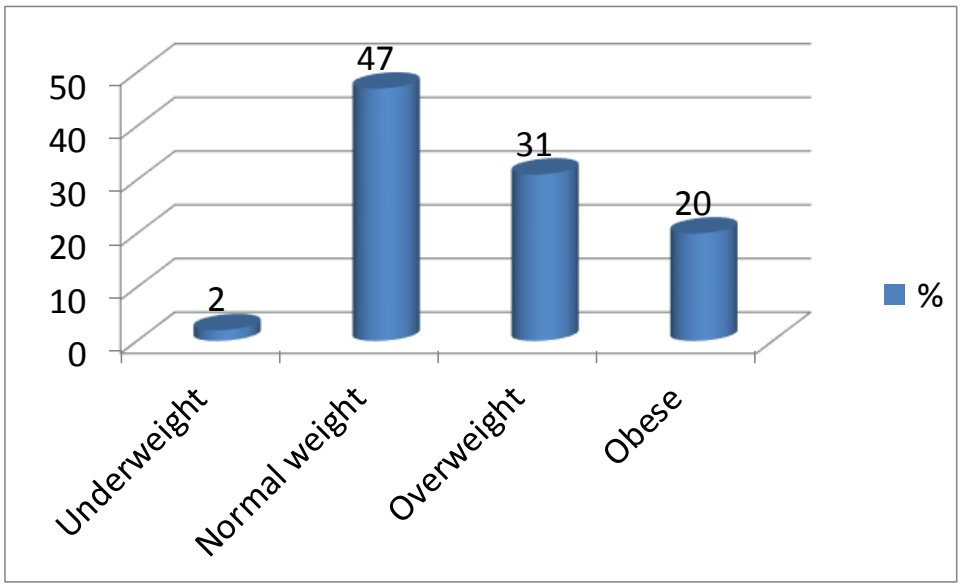
The final sample comprised 160 women aged 19–45 years, of which 95.5% were black and the rest white; 43.1% were unmarried and 56.9% were married or once married. The majority (80%) had family sizes ranging from 4–10 members. The literacy level of the subjects ranged from Grade 8–12 (51.3%) to no schooling (11.3%). Most of the participants (88.1%) were unemployed. The source of income (44.6%) for most was their husbands followed by old-age pension grants in the families, bringing the family income to under R 1 000. Most of the subjects (84%) did not own

TABLE 1: SOCIODEMOGRAPHIC AND ENVIRONMENTAL DATA OF PARTICIPANTS

Attribute	No. of responses (n = 160)	Percentage (%)
Age groups		
19–26	52	32.5
27–34	52	34.4
35–45	53	33.1
Marital status		
Single	69	43.1
Married	80	50.0
Widowed	6	3.8
Divorced	5	3.1
Education level		
Lower than Grade 4	12	7.5
Grades 4–7	21	13.1
Grades 8–12	82	51.3
Higher than Grade 12	27	16.9
Never attended school	18	11.3
Employment response		
Yes	19	11.9
No	141	88.1
Source of income		
Husband	71	44.6
Grandparents	54	33.8
Brother	10	6.3
Son/daughter	10	6.3
Self-employed	10	6.3
Other	6	3.7
Ownership of car		
Yes	25	15.6
No	135	84.4
Family size (no. of persons)		
1–3	11	6.7
4–6	66	41.8
7–10	65	41.1
11–15	16	10.4
Kind of house		
Hut	1	0.6
1–2 rooms and others	35	21.9
3–4 rooms and others	72	45.0
5–6 rooms and others	37	23.2
More than 7 rooms and others	15	9.4
Type of toilet		
Toilet in house	21	13.1
Toilet outside	12	7.5
Pit latrine	83	51.9
None	44	27.5
Source of water		
Tap in house	20	12.5
Tap outside	34	21.3
Communal tap	93	58.1
River	4	2.5
Neighbour/private borehole	9	5.6
Ownership of field for food production		
Yes	44	27.5
No	115	71.9

TABLE 1: SOCIODEMOGRAPHIC AND ENVIRONMENTAL DATA OF PARTICIPANTS (Continued)

Attribute	No. of responses (n = 160)	Percentage (%)
Place for food storage		
Refrigerator	4	2.5
Open dry area	71	44.4
Both of the above	81	50.6
Type of energy		
Firewood	83	51.9
Electricity	36	22.5
Gas	1	0.6
Firewood and electricity	33	20.6
Electricity and gas	5	3.1
Firewood, electricity and gas	2	1.3
Ownership of cattle		
Yes	15	9.4%
No	145	90.6%
Ownership of vegetable garden		
Yes	100	62.5
No	57	35.6
Missing data	3	1.9
Previous lessons about food		
Yes	23	14.4
No	137	85.6
Sources of nutrition information		
Self	120	75
Parents	27	16.9
Friends	2	1.3
TV/radio	7	1.3
Newspaper	1	4.4
Other	3	0.6



underweight: <18.5 kg/m²; normal weight: 18.5 – 24.9 kg/m²; overweight: 25 – 29.9 kg/m²; obese: >30 kg/m²

FIGURE 1: BODY MASS INDEX (BMI) CLASSIFICATION OF PARTICIPANTS

TABLE 2: DIETARY CONSUMPTION PATTERNS OF PARTICIPANTS (n = 160)

Food item	Frequency (%)				
	Daily	Weekly	Monthly	Yearly	Never
Starches					
Maize porridge	92	6.9	0.6	0	0
Bread	28.1	30	8.1	28.8	44.6
Rice	3.1	25.2	11.9	46.5	13.3
Potatoes	1.3	27.4	14.6	44.6	12.1
Macaroni	0	15.1	12.5	21.4	51
Samp	0.6	1.9	5.6	17.5	55.2
Vegetables and fruit					
Vegetables (in season)	15.6	74.4	1.9	8.1	0
Fruit (in season)	8.8	22	8.8	49.4	10.6
Legumes					
Beans	1.3	20.0	18.1	29.4	31.3
Peas	2.5	3.8	6.9	86.8	0
Soya	0.6	8.2	1.9	7.5	81.0
Lentils	0	0	0.6	3.8	95.6
Protein foods					
Chicken	10.0	65.0	13.8	9.4	1.9
Fish	0	48.1	12.5	24.4	15.0
Eggs	5.6	37.5	5.0	23.8	28.9
Milk	5.6	17.5	10.0	33.8	32.2
Red meat	1.9	14.4	21.9	38.1	23.8
Pork	0	1.3	3.1	9.4	86.3
Other					
Fat	97.6	0	0	0	2.4
Salt	97.5	0	0	0	2.5
Water	98	1.4	0	0	0.6
Alcohol	0	3.1	1.9	5.7	89.3

cars and 71.9% did not own a field or garden for food production. Most households used open dry areas and refrigerators for food storage. Firewood was the most reported source of energy for food preparation (51.9%) and 49.5% of participants had access to electricity. Most of the subjects lived in houses that had more than four rooms and were also using pit latrines as compared to the reported statistics on pit latrine utilisation in the year 2000 (Statistics South Africa, 2012:18). The majority of participants (58.1%) collected water from a communal tap and another 33.8% had taps inside or outside their houses. Some participants (8.1%) relied on a river or boreholes as water sources. Many households did not own cattle or other domestic animals. See Table 1 for information for sociodemographic and environmental data.

BMI status

A very high prevalence of overweight and obesity was observed among the participants. According to their BMI status, 31% were overweight and 20% obese. See Figure 1 for classification of BMI status.

Dietary consumption patterns

The dietary consumption patterns, as outlined by the SAFBDGs, are summarised in Table 2.

Maize meal porridge was consumed by 92% of the participating women on a daily basis and even those households that did not have maize meal in stock (52%) at the time of the interview reported daily consumption of maize meal porridge. The assumption is that they were going to purchase or borrow the maize meal before preparation. Rice was consumed by few (3.3%) on a daily basis, but for most it was mainly on Sundays (54%), corresponding to a trend previously observed (Peltzer, 2004:26). Samp was rarely consumed (21%) or never used (74%). The overall consumption pattern of vegetables was higher than that of fruit, particularly on a daily and weekly basis at 74.4%, while consumption of fruit was 39.6% on a daily, weekly and monthly basis combined. In-season vegetables and fruit were observed in

TABLE 3: TYPES OF FOOD ITEMS OBSERVED IN THE PARTICIPATING HOUSEHOLDS (DIRECT OBSERVATION)

No.	Food item	Food is available in household (n = 160)	% households
1	Maize meal (raw)	106	66.3
2	Vegetables (in season)	70	48.3
3	Tomatoes	68	45.5
4	Cooking oil	54	33.6
5	Chicken	52	32.7
6	Sugar	45	28.1
7	Onions	44	27.5
8	Salt	36	22.6
9	Cooked porridge (maize meal)	36	22.5
10	Bread	24	15.0
11	Eggs	23	14.4
12	Fruit (in season)	20	12.5
13	Potatoes	20	12.5
14	Rice	19	11.9
15	Beans	18	11.3
16	Red meat	17	10.6
17	Tea	16	10.0
18	Fish	14	8.8
19	Soy mince	13	8.2
21	Milk	13	8.19
22	Flour	12	7.5
23	Mayonnaise	11	6.9
24	Fruit juice	11	6.9
25	*Atchar*	10	6.3
26	Tomato sauce	10	6.3
27	Peanut butter	10	6.3
28	Jam	9	5.6
29	Coffee	8	5.2
30	Vegetable soup	8	5.0
31	Boerewors	6	3.8
32	Coffee creamer	6	3.8
33	Soft drinks	5	3.1
34	Polonyand sausages	5	3.1
35	Mopani worms	5	3.1
36	Green pepper	4	2.5
37	Beef offal	4	2.5
38	Pasta	3	1.9
39	Macaroni	3	1.9
40	Samp	3	1.9
41	Cereal	1	0.6
42	Dried insects	1	0.6
43	Beef stock	1	0.6
44	Giblets	1	0.6
45	Mageu	1	0.6
46	Maize grains	1	0.6

some households. Legumes were consumed by very few subjects – less than 49.3% combined – on daily to monthly basis, using beans as a standard, and the majority never used them. Only beans were observed in few households' storage confirming the above pattern.

Regarding protein intake, the participants consumed chicken, fish, eggs, milk, red meat and pork on a weekly basis interchangeably in that order. This variation could be indicative of good meal planning. A high percentage of participants (86.3%) never ate pork and 32.3%

TABLE 4: FOOD AVAILABILITY AND CONSUMPTION DATA OBTAINED BY DIRECT OBSERVATION

No. of food items available on day of visit	Number of subjects who consumed them
0	7
1	3
2	14
3	19
4	27
5	10
6	18
7	16
8	17
9	11
10	7
11	4
12	2
13	3
14	1
15	1

TABLE 5: RELATIONSHIP BETWEEN SOCIODEMOGRAPHIC, HOUSEHOLD AND ENVIRONMENTAL FACTORS, BODY MASS INDEX (BMI) STATUS AND DIETARY CONSUMPTION PATTERNS

Dietary pattern	Literacy level	Level of income	Family size	Type of house	Place of food purchase	Place of food storage	Source of energy
No. of meals						X^2=21.402 P=0.006*	
Food availability	X^2=74.35 P=0.002*				X^2=28.894 P=0.011*		
Maize meal porridge		X^2=14.330 P=0.026*	X^2=16.46 P=0.011*		X^2=6.53 P=0.038*		
Bread		X^2=59.457 P=0.000*			X^2=25.09 P=0.00*	X^2=40.392 P=0.00*	X^2=45.06 P=0.00*
Rice	X^2=31.06 P=0.002*	X^2=61.090 P=0.000*		X^2= 9.667 P=0.046*	X^2=24.78 P=0.000	X^2=35.54 P=0.000	X^2=45.746 P=0.00
Potatoes							X^2=25.505 P=0.001*
Macaroni	X^2=18.13 P=0.034*	X^2=21.300 P=0.011*		X^2= 10.65 P=0.014*		X^2=19.617 P=0.003*	X^2=15.926 P=0.015*
Samp		X^2=23.634 P=0.023*			X^2=16.494 P=0.002		X^2=20.812 P=0.008*
Fruit	X^2=24.72 P=0.016*	X^2=30.190 P=0.003*			X^2=15.981 P=0.003*	X^2=28.140 P=0.00*	X^2=28.71 P=0.00*
Vegetables						X^2=14.473 P=0.025	
Dry beans	X^2=24.10 P=0.02*						
Chicken				X^2=9.863 P=0.04*	X^2=17.287 P=0.002*	X^2=24.789 P=0.002*	X^2=16.020 P=0.042*
Red meat		X^2=23.908 P=0.021*					X^2=18.176 P=0.020*
Milk		X^2=44.8 P=0.000*					

never used milk. There was a high usage of fat mainly once daily (64.2%) and the major source was cooking oils. A reasonable percentage (32.1%) of people was found to be consuming fat twice a day. Cooking oil was among the top ten foods observed in the households (Table 3). The general pattern of salt utilisation was as follows: addition to food before cooking, addition during meals and addition while eating. The majority of the subjects (60.4%) indicated that they used salt twice a day. In contrast, direct observation showed that 22% households did not have salt on the day of the data collection.

Alcohol consumption was very low, with 89.3% of participants indicating that they did not use it, and direct observation showed that none of the households had alcohol in stock. The patterns and not the quantity of water used on a daily basis by the subjects were determined. Almost all participants (98%) reportedly used water on a daily basis. Water usage referred to drinking only and not for other purposes, such as food preparation, cleaning and washing.

Food availability and variety

Food availability and variety was determined through inventory and direct observations on the day of data collection and revealed that maize meal was the most available food item (66.3%), followed by a variety of vegetables (43.8%) and tomatoes (42.4%) (Table 3). The top ten most available food items in the households on the day of data collection were maize meal, vegetable varieties, tomatoes, cooking oil, chicken, sugar, onion, salt, cooked porridge and bread. The food types observed are illustrated in Table 3.

More than half of the participants (53.1%) reported to consume three meals per day and 44.6% consumed two meals per day. Participants were not asked specifically which meals they consumed, but it was assumed that the meals were breakfast, lunch and supper or midmorning and evening meals. The majority of participants (91.3%) grouped their foods according to starch, protein and vegetables in the meal. The education level was found not to significantly influence the grouping of food items in a meal ($p = 0.754$). Furthermore, data revealed that the majority of participants (85.6%) were never exposed to any lessons about food and most (75%) indicated that they used their own discretion to make choices for the family (Table 1).

Further probing was done to determine whether participants consumed the foods that were available in the households (Table 4). The list of available foods contained 46 items, some items being consumed by very few women, with the highest variety being 15 (Table 4). Of these 46 food items, 12 were starches, 12 proteins, six vegetable and fruit groups, three sugars, one salt, one legume and nine other foods. The vegetables and fruit were reported as groups in season and not by name, with the exception of tomato, onion, green pepper and fruit juice. No relationship was observed between total varieties and consumption of the food items. These data showed that the correlation was negative ($r = -0.526$) and insignificant ($p = 0.37$). This means that the available food items may have been for consumption by other family members.

Relationship between sociodemographic and environmental factors, BMI status and dietary consumption patterns

Relationships between the selected sociodemographic factors, household environment, BMI status and dietary patterns were explored. The paper only focuses on factors where a significant relationship was observed. BMI status was not significantly associated with any factor (Table 5).

A high level of literacy was found to improve the food availability in the household ($p = 0.002$). Women who had a higher literacy level were found to have an improved intake of a variety of food items, which included dry beans ($p = 0.02$), rice ($p = 0.002$), macaroni ($p = 0.034$) and fruit ($p = 0.016$).

Income level was found to have a significant influence on consumption of certain food items and was significantly associated with the consumption of maize meal porridge, rice, macaroni, samp, red meat and milk (Table 5). Higher income results in high purchasing power and foods less often consumed by most women were available to these households. Women who were financially dependent on their husbands showed a significantly higher fruit intake ($p = 0.044$). Those with higher levels of income had increased intake of the following starchy foods: maize meal porridge ($p = 0.026$), rice ($p < 0.0001$), samp ($p = 0.023$), macaroni ($p = 0.011$) and bread ($p < 0.0001$). High levels of income were associated with improved intake of fruit ($p = 0.003$) and was also found to improve the intake of the legumes peas ($p = 0.020$) and

soya ($p = 0.024$). Furthermore, it was revealed that a higher level of income improved the intake of protein foods, namely red meat ($p = 0.021$) and milk ($p < 0.0001$).

Larger families were found to consume significantly higher percentages of staple foods like maize meal porridge ($p = 0.011$) and soya ($p = 0.02$) than did smaller families. The type of house was significantly associated with the consumption of rice ($p = 0.046$), macaroni ($p = 0.014$) and chicken ($p = 0.04$). This trend relates to affluence since the type of house (i.e. number of rooms per house) would reflect the income level of the household.

The place of purchase was significantly associated with high consumption of maize meal porridge ($p = 0.038$). Food availability was also found to be improved by the place of purchase ($p = 0.011$) as maize meal was purchased from local shops. The consumption of some starchy foods, namely rice ($p < 0.0001$) and bread ($p < 0.0001$), were found to be significantly influenced by the place of purchase. Fruit ($p = 0.000$) and chicken ($p = 0.002$) consumption were also found to be significantly influenced by the place of purchase. The place of purchase reflects accessibility to food items in local shops.

Place of storage, such as both a dry open space and a refrigerator, were found to be associated with an improved number of meals consumed on a daily basis ($p = 0.006$). Consumption of some starches, namely rice ($p < 0.0001$), macaroni ($p = 0.003$) and bread ($p < 0.0001$), was significantly influenced by place of storage. This means households with sufficient or large houses had more space and more purchasing power than their smaller counterparts. Fruit and vegetable consumption was also improved by their place of storage ($p < 0.0001$ and $p = 0.025$ respectively). Chicken consumption by participants with improved place of storage such as a refrigerator was also high ($p = 0.002$).

The source of energy (electricity in this case) in the households had a significant influence on the consumption pattern of a variety of foods ($p = 0.003$). The consumption of starchy foods that is macaroni ($p = 0.015$), samp ($p = 0.008$), bread ($p < 0.0001$) and potatoes ($p < 0.0001$) was significantly influenced by the energy source. The improved nature of the energy source (i.e. electricity) was found to significantly affect the consumption of fruit ($p < 0.0001$). The source of energy also had a significant influence on the consumption of red meat ($p = 0.008$) and chicken ($p = 0.042$).

DISCUSSION

Dietary patterns refer to the frequency of consumption of food items that are chosen by the individual based on preference, being guided by cultural and religious factors, level of education and many more factors (Wahlqvist *et al*, 2001:10). The SAFBDGs were used to establish whether dietary patterns of the participants were compliant with healthy eating guidelines (Vorster *et al*, 2013:1-12). SAFBDGs are suggested to be a useful instrument that can be used to improve nutrition and health (Vorster *et al*, 2013:1-12) nutrition and health by using them for diagnostic purposes and nutrition education. Most of the participants reported consuming three meals per day and others consumed only two meals per day. This is in line with what is recommended and expected for healthy eating (Vorster *et al*, 2013:1-12).

Starch, protein and vegetable meal groupings were reported to be consumed most often, which is recommended and is in line with good eating habits (Labadarios *et al*, 1999:24). The study revealed that the majority of participants consumed maize meal porridge daily as a staple food, with less consumption of other starchy foods for variety as expected from the dietary guidelines (Vorster, 2013:28-35). These observations of maize meal consumption were also revealed by Steyn *et al* (2001:142). It is known that maize meal is considered to be the main staple food of the population in Limpopo province and in South Africa (Vorster, 2013:28-35). It is usually eaten in various forms of porridge, from soft to stiff porridge, or to make drinks such as 'mageu', a fermented maize meal drink. These observations were also revealed by the National Food Consumption Survey (NFCS) of 1–9 year-old children in South Africa, which indicated that maize meal was the most frequently and consistently consumed food in the country (Labadarios *et al*, 1999:24).

The consumption of other starches was found to be less frequent when compared to maize meal. The study showed that other starchy foods such as bread, potatoes, rice and macaroni were occasionally eaten, while samp was seldom eaten. Furthermore, affluence factors such as literacy and income levels significantly influenced the availability of other starches in households. Similar observations were reported in the Vaal Triangle (Gauteng) (Kesa, 2004:114) and also in Dikgale Village in Limpopo (Steyn *et*

al, 2001:143). Moreover, direct observations of food items available in participating households on the day of visit, revealed that 66% had raw maize meal and 22% cooked maize meal porridge. The inventory confirmed the consumption pattern of starchy foods reported by the participants. Household inventories in other studies conducted in rural areas (Steyn *et al*, 2001:141; Solomons & Ruz, 2001:23; Kesa, 2004:114) also revealed that most households had maize meal in store. The observations were similar to other reports where maize meal is a staple and eaten by families even when they do not have sufficient income (Steyn *et al*, 2001:142). This makes maize meal a good candidate for nutrition education and even fortification. The SAFBDGs for making starch the basis of most meals was followed by the women in this study even though most did not consume the recommended variety of starchy food in the form of whole grains, legumes and root vegetables (Vorster, 2013b:46).

Fruit and vegetables are known to contain phytochemicals that play a role in protecting against chronic lifestyle diseases (Blum, 2004:5). Fruit consumption was reported to be low, with only a third of participants reporting regular consumption. This is in contrast with the SAFBDG recommendation of eating a wide variety of at least five fruits per day, depending on seasonal availability (Naudé, 2013:46, 47). Direct observations of fruit availability on the day of visit in the households supported the reported low consumption. Only twenty households had fresh fruit and ten had fruit juice in storage. High levels of income were found to be associated with improved intake of fruit. The low consumption of fruit, therefore, reflects the low socioeconomic status of the population in the area. However, Limpopo province is one of the largest producers of fruit and prices are much lower compared to other areas of South Africa (Limpopo Provincial Government, 2012). The Greater Letaba Municipality is near the Tzaneen area, where farmers produce about 40% of avocados, 40% of mangoes and 20% of bananas in South Africa (Limpopo Provincial Government, 2012). Tzaneen also produces 90% of the country's tomatoes, making South Africa the world's 40th largest tomato producer (Limpopo Provincial Government, 2012).

Vegetable consumption was better than that of fruit, with two-thirds reportedly consuming vegetables on a weekly basis. The vegetable grouping included all kinds as well as indigenous or traditional types observed in the households. However, indigenous vegetables were not identified by name and type and this is a limitation since they contain different nutrients. The higher consumption of vegetables observed could have been influenced by a high consumption of indigenous types abundant and normally seen in rural villages (Steyn *et al*, 2001:144). On the other hand, it is known that there are traditional and cultural food preservation practices, such as sun-drying, that are used to preserve vegetables to ensure their availability throughout the year (Shisana *et al,* 2014:144). This is a beneficial practice as it complies with the recommendation of eating plenty of vegetables daily (Naude, 2013: 46 - 56. Indigenous vegetables are thought to have health benefits (Makuse & Mbhenyane, 2011:183; Mbhenyane *et al*, 2013:164) and include *Amaranthus thunbergii*, *Bidens pilosa*, *Cleome gynandra*, *Corchorus confusus* and species from the Curcubitaceae family. Several researchers (Indar-Brown *et al*, 1992:92; Sharma *et al*, 1996:1334; Onyechi *et al*, 1998:420; Makuse & Mbhenyane, 2011:183; Mbhenyane *et al*, 2013:166) have reported health benefits, including the prevention and control of hypertension and diabetes mellitus. *Bidens pilosa* is said to contain polyacetylenes, which have hypoglycaemic effects (Wehmeyer, 1996).

Direct observation revealed that most households had vegetables on the day of the visit. Other studies revealed, as is the case in this study, that most people did not achieve the recommended daily intake of five portions of fruit and vegetables (Labadarios *et al*, 1999:24; Steyn *et al*, 2001:144). The ownership of a vegetable garden did not make any significant difference as women with and without gardens had the same levels of vegetable consumption. Moreover, those with vegetable gardens responded similarly to those with fields for food production regarding vegetable consumption patterns. The above findings are not surprising as rural communities worldwide have coping strategies of dealing with hunger and among them is the sharing of available resources among family members (Mamabolo *et al*, 2004). Consumption of fruit and vegetables may be affected by the climatic conditions where households depend on home produce (Engle, 1997). Drought and seasonal variation are also known to play a role in the availability of fresh produce and the outcomes of good household food security (Limpopo Provincial Government, 2012. It should also be noted that Limpopo province has a high production of fruit and

vegetables all year round and it is likely that vegetable gardens and fields yield sufficient crops for household and communal consumption (Limpopo Provincial Government, 2012).

Fruit consumption was found to be influenced by level of income, whereas consumption of vegetables was not since vegetables are cheaper; this is to be expected due to high purchasing power associated with higher income levels. There was no recording of fruit trees planted in the household yard, which was a limitation. Many households in the area often plant guavas, avocados, mango, pawpaw, oranges, naartjies and some litchis in their yards or fields (Limpopo Provincial Government, 2012).

It was found that legumes were not consumed regularly as per the SAFBDGs (Venter *et al*, 2013:40). Dried or canned Beans were occasionally consumed in 32 households, whereas peas, soya and lentils were found to be rarely consumed over a period of a year. It is unclear whether the participants were familiar with these legume types. Direct household observations found dried beans in 18 households and peas were found in none. The common legumes used by the rural communities in Limpopo province are cowpeas (*Vigna unguiculata*) and jugo beans (*V. subterranea*) (Makuse & Mbhenyane, 2011:183; Mbhenyane *et al*, 2013:166). Legumes contain several compounds that have been traditionally considered anti-nutrients, such as protease inhibitors, phytates, saponins, plant sterols and isoflavones (Venter *et al*, 2013:41). More recent information suggests, however, that most of these compounds may actually benefit the consumers' health (Venter *et al,* 2013:42). Both the protective and therapeutic effects of the intake of legumes have been documented (Venter *et al*, 2013:42). Legumes are also excellent foods to increase dietary fibre consumption and most individuals can incorporate legumes into their diet. The carbohydrate and dietary fibre contents of legumes contribute to their low glycaemic indices, which benefit diabetic individuals and reduce the risk of developing diabetes mellitus (Salmeron *et al*, 1997:475). It is clear that poor intake of this food group might lead to the risk of developing chronic lifestyle diseases.

Higher income and a better source of energy were found to improve the intake of legumes. Soya consumption was also observed to be increased in bigger families, suggesting its accessibility to low-income households. This might be due to the affordability of soya products and larger families may find soya to be cost effective. Compliance to the SAFBDGs on the regular inclusion of legumes was not achieved by the participants and the population needs to be educated about the benefits of including legumes in their regular diet.

Chicken was found to be the protein eaten most often as it was consumed on a daily basis more often compared to the consumption of beef, which was more on a monthly basis. This could be linked to the price of chicken versus that of beef. Most of the good protein sources (chicken, fish, eggs and milk) were only consumed on a weekly basis alternatively. This consumption pattern was in line with the recommendation to include a protein-rich food in all meals but varying the sources (Schoenfeld *et al,* 2013:66). These findings are congruent with what has been reported in other rural population studies (Underwood, 2000:359). The low intake of red meat could compromise the amount of iron intake required by women of childbearing age, leading to adverse outcomes such as low birth weights and premature deliveries (Labadarios *et al*, 1999:24; Mamabolo *et al*, 2004). Such outcomes are known to predispose new-born babies to future chronic diseases such as obesity, diabetes and cardiovascular disease (Labadarios *et al*, 1999:24).

Higher income was associated with improved intake of red meat and milk. The type of house was also associated with intake of chicken. It was found that participants living in houses with more rooms had a higher intake of chicken, but the type of house did not influence the intake of other protein-rich food items. These comparisons relate to affluence, as bigger houses mean more money and higher purchasing power. The source of energy also influenced the consumption of both red meat and chicken, indicating higher purchasing power in some households.

Most participants used fat once a day, with 48 households having cooking oil and 24 margarine on the day of visit. Other studies have reported a low fat-intake in rural communities (Armstrong *et al*, 2011:838). The observations in this study confirmed this in that the practices of the participants were in line with the SAFBDGs, which state that fat should be consumed sparingly (Smuts & Wolmarans, 2013:87). This could contribute significantly to the prevention of

obesity and other chronic diseases of lifestyle. Over-consumption of dietary fat has been implicated in the aetiology of cardiovascular diseases, certain types of cancers and obesity (Tonstad *et al*, 2002:79; Smuts & Wolmarans, 2013:88). The type of fat and quantities consumed were, however, not determined, but cooking oil was observed in most households. The cause of overweight or obesity observed in the participating women might be from energy sources other than fat, related to overall energy quantity and utilisation or physiological factors. Furthermore, the level of physical activity is said to have decreased in society over the past decades without concomitant reduction in food intake (Micklesfield *et al*, 2013:369). This leads to an energy intake and output imbalance, resulting in accumulation of excess energy as body fat. Activity patterns were not determined for this group of women, most of whom were unemployed and homebound which relates to decreased levels of activity

Direct observations revealed that more than half of the subjects consumed salt twice a day. According to the SAFBDGs, salt and foods high in salt should be consumed sparingly (Wentzel-Viljoen *et al*, 2013:105). In this study, quantities and types of salt consumed were not recorded. It was unclear whether the salt consumed was iodised or not. However, direct observation showed that 36 households had iodised salt on the day of visit, while a high number of households (124) had none in stock but reported daily consumption. The women were not asked whether they would buy salt on the day, but it is a common practice in rural environments to ask for small food items such salt, tomatoes, onions or oil from neighbours during food preparation (Mbhenyane *et al*, 2013:166). A small percentage did not use salt at all, which is worrisome given the fact that salt is a good source of iodine and that children would be affected adversely by iodine deficiency (Charlton, 2001:9).

Almost all women used water on a daily basis, but the amount consumed was not determined. According to the SAFBDGs, it is recommended that people drink plenty of safe and clean water (Bourne & Wright, 2013:77). The quantity of water consumed per head per day for an adult has been estimated at 1.4 l (Bourne *et al*, 1987), whereas the recommendation is 2–3.7 l per day for adult women and men (Bourne & Wright, 2013:79). The data revealed that the main sources of water were taps inside the house, in the yard or in communal areas. A small number of the subjects found it difficult to get enough water as such they resorted to using privately-owned boreholes and some still relied on rivers as their main water source. This shows that water in some areas was not enough for people to be able to adhere to the recommendations of the SAFBDGs. The safety aspect of the water resources was not determined. However, it is clear that water from rivers is to be treated with suspicion for various contaminants. Managing the quality of drinking water is of utmost importance to ensure good health (Bourne & Wright, 2013:85).

Only nine women reported to consume alcohol occasionally. This low consumption might have been influenced by both cultural and religious beliefs, which might also have resulted in underreporting as women are culturally not expected to drink (Peltzer, 2004:26). Other studies have reported similar patterns of alcohol consumption by rural women (Parry, 2000:441). Therefore, the observation in the study seemed to indicate that women drank alcohol sensibly, as per the SAFBDGs (Jacobs & Steyn, 2013:114).

A higher level of education was found to be associated with the choice of a variety of foods such as starches, fruit, vegetables and other food items. A high educational level is generally associated with sufficient exposure to information about aspects of life, which includes nutrition (Jacobs & Steyn, 2013:116). The study revealed that 88.8% of the subjects had asome form of education. Formal classroom education can be a starting point for understanding the rationale behind good health and nutrition practices (Ghassemi, 1990). Studies in some rural populations have shown that men's dietary intake goes much further toward meeting their daily caloric requirements than that of women and children (Ghassemi, 1990:145-166; Acham *et al*, 2012:26). These findings indicated that the women, who are responsible for distributing the family food, lack the knowledge or self-confidence to appropriate their fair share. Women's access to education in developing and third world countries is usually low and this accounts for the differences between them and their male counterparts (Ghassemi, 1990:145-166; Acham *et al*, 2012:27). Nutrition education can be successfully incorporated into the school curriculum and this might aid in empowering women about nutritional knowledge, leading to better food choices and patterns that can be followed by them and their families.

Women's nutritional status and health are related to their economic status as demonstrated by macro- and regional-level analyses, as well as micro-level (household) data (Chatterjee, 1988). Some economic factors, such as participation in the labour force, inheritance of land and dowry payments, have particular relevance to women's health status and survival (Jacobs & Steyn, 2013:118). This study revealed that women with better incomes had a greater variety of food available for consumption. However, this was only true for a few participants as the majority were unemployed. It is known that women make the dietary choices in the households (Jacobs & Steyn, 2013:118) and having access to more money might result in them making better food choices. This supports efforts being made globally to invest in women's education and empowerment in general (Ghassemi, 1990).

A large family size means that more financial resources are required to feed the family members. It was also evident in this study that larger families had a lower variety of food items and hence consumed mainly maize meal and cheaper options such as soup. When women are employed it leads to an increase in the household income, with subsequent benefits to nutrition and health. Employment is said to increase women's status and power and may bolster their preference to spend their earnings on the health and nutrition of their children, but does not always guarantee their decision-making abilities when contested by their husbands (Ghassemi, 1990:145-166; Acham *et al*, 2012:36; Stupar *et al*, 2012:200). The present study showed that the majority of participating women (88%) were not employed and derived their income from husbands and/or parents or grandparents. This means that most women of childbearing age in the study area were not employed and that their dietary patterns were possibly dependent on household income from other sources.

To speed up the progress in dealing with malnutrition, adequate food and health care must be ensured throughout the lifecycle (Labadarios *et al*, 1999:24). Good nutrition during pregnancy reduces the likelihood of low birth weight and improves pregnancy outcomes. In most rural communities, the basis of malnutrition starts before birth. Mothers of low BMI on average are giving birth to babies of low birth weight. The direct relationship between maternal weight and birth weight of their children is not a new finding. However, the nutritional status of women, both before and during pregnancy, needs to be emphasised, especially by major policy makers. The women in this study had high BMIs, which might also be a risk factor for big babies and complicated pregnancies (Bopape *et al*, 2008).

Women who owned a field for food production had the same dietary patterns as those who did not and, furthermore, those who practised subsistence farming had the same high percentage of daily consumption of maize meal porridge as their non-farming counterparts. According to other surveys conducted at Sekhukhune (Limpopo Province) and elsewhere in Africa, families with a field for food production did not use production harvest savers (Department of Agriculture, 2005). This exposed such families to the same conditions of poverty, hunger and malnutrition.

The participants were exposed to a wide range of sources of dietary advice which included clinics, schools, health workers, elderly people and the media. Elders were found to be spending more time with the participants and offered advice that influenced their dietary patterns. A small number of subjects obtained their advice from both clinics and elderly people, reflecting that schools and individual health workers did not fully influence their dietary patterns. Few participants depended on the media and recipe books as sources of information, thus relating to the low levels of literacy observed. These findings revealed the need for health workers to be educated about the importance of imparting nutritional education. The same applies to educators, who need to be encouraged to include nutrition education in curriculum activities.

Women are often exhausted by the combination of reproductive demands, heavy work load and inadequate diet (Ghassemi, 1990:145-166). Maternal depletion over the course of numerous or closely-spaced pregnancies are an often hypothesised but seldom-measured phenomenon (Ghassemi, 1990:145-166). Careful, systematic analyses of women's diet and nutritional status are rare. Data from small and infrequent studies of women's anthropometrics, iron status and dietary intake suggest that they are at high nutritional risk. Better surveillance of women's nutrition is therefore needed (Ghassemi, 1990:145-166; Acham *et al*, 2012:38; Stupar *et al*, 2012:202; Jacobs & Steyn, 2013:118). A poor dietary intake of iron, folate and vitamin C has been

reported in Limpopo province (Bopape *et al*, 2008:334).

The prevalence rates of overweight (30.8%) and obesity (20.12%) were generally high, compared with 24% overweight and 32.6% obese observed elsewhere in Limpopo Province (Shisana *et al*, 2014:133). Our study was done earlier than the study of Shisana *et al*, which is more recent, and this could explain the changes. Our findings are in contrast with the reported poor nutritional status of children according to the NFCS conducted in 1999 and NFCS-Fortification Baseline (NFCS-FB-I) in 2005 (Labadarios *et al*, 1999:24). However, similar results regarding obesity were found in a rural community (33.8%) in KwaZulu-Natal, South Africa (Oelofse *et al*, 1999:14). Other studies with similar results showed an increased prevalence of overweight and obesity (51.3%) even beyond the age of 65 years (Charlton, 2001:9). Some studies reported the prevalence of obesity in South Africa to be 44% in black females and 18% in white females in 1988 and 10 years later, in 1998, 55% of black women were obese (Armstrong *et al*, 2011:838). Based on a 1996 survey, 32% of women had a BMI of 30 at the age of 25–44 years and the percentage of women with such BMIs increased to 49% at the age of 45–64 years (Armstrong *et al*, 2011:838). A rising trend in BMI was seen in adults between 1989 and 1996, followed by decline using recent data of 2014 (Armstrong *et al*, 2011:838). More recently Steyn *et al,* (2012:234) reported a 21% prevalence of obesity in South African rural women and 31% in urban women, in contrast with 10.3% in rural and 15.8% in urban Kenyan women. This trend was explained by the rural-urban transition, including electrification, reduced physical activity and increasing availability of energy-dense foods (Ghassemi, 1990:145-166; Stupar *et al*, 2012:202; Jacobs & Steyn, 2013:118) as well as the nutrition transition (Vorster, 2013b:3). Increased levels of overweight and obesity showed that the participants are at an increased risk of lifestyle diseases and some might already be manifesting chronic lifestyle diseases if the situation is not urgently addressed as a public health issue. This is speculation as chronic lifestyle diseases were not the focus of the current study, but this is based on previous reports that have associated obesity with most chronic lifestyle diseases, such as hypertension, type 2 diabetes and cardio vascular diseases (Vorster, 2013a:4).

CONCLUSION

Most of the participating women were either overweight or obese and their dietary patterns were compliant with three of the eleven SAFBDGs. Their dietary patterns revealed a diet based on starchy food, with occasional use of protein and a regular vegetable inclusion. The legumes were hardly consumed. Maize meal was the only food item observed in more than half of the households. One of the limitations of the study was that the nutrient quantities and quality were not measured and neither was activity level, thus the contribution to over-nutrition by diet was not determined. Furthermore, a larger sample of women, with confounders such as income, geographic location accounted for, is required to further probe the factors contributing to their eating patterns and the existence of overweight and obesity. Dietary patterns of rural women require further investigation to understand the contributing factors to the very high prevalence of over-nutrition often with the co-existence of child undernutrition. The South African based food based dietary guidelines must be tested and made sensitive to all cultural groups including relevance for rural women. The guidelines s it applies with health messages must also be made available in the eleven official languages to facilitate easy interpretation by users.

ACKNOWLEDGEMENTS

The authors would like to thank the University of Venda, participating women and local and traditional authorities of Greater Letaba Municipality, Limpopo, with particular thanks to local traditional authorities and the municipal managers who granted permission to conduct the study in their areas.

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