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Dietary intake and barriers to dietary compliance in black type 2 diabetic patients attending primary health-care services

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Abstract

Objective: To determine the dietary intake, practices, knowledge and barriers to dietary compliance of black South African type 2 diabetic patients attending primary health-care services in urban and rural areas.

Design: A cross-sectional survey. Dietary intake was assessed by three 24-hour recalls, and knowledge and practices by means of a structured questionnaire ($n = 133$ men, 155 women). In-depth interviews were then conducted with 25 of the patients to explore their underlying beliefs and feelings with respect to their disease. Trained interviewers measured weight, height and blood pressure. A fasting venous blood sample was collected from each participant in order to evaluate glycaemic control.

Setting: An urban area (Sheshego) and rural areas near Pietersburg in the Northern Province of South Africa.

Subjects: The sample comprised 59 men and 75 women from urban areas and 74 men and 80 women from rural areas. All were over 40 years of age, diagnosed with type 2 diabetes for at least one year, and attended primary health-care services in the study area over a 3-month period in 1998.

Results: Reported dietary results indicate that mean energy intakes were low (<70% of Recommended Dietary Allowance), 8086–8450 kJ day^{-1} and 6967–7382 kJ day^{-1} in men and women, respectively. Urban subjects had higher ($P < 0.05$) intakes of animal protein and lower ratios of polyunsaturated fat to saturated fat than rural subjects. The energy distribution of macronutrients was in line with the recommendations for a prudent diet, with fat intake less than 30%, saturated fat less than 10% and carbohydrate intake greater than 55% of total energy intake. In most respects, nutrient intakes resembled a traditional African diet, although fibre intake was low in terms of the recommended 3–6 g/1000 kJ. More than 90% of patients ate three meals a day, yet only 32–47% had a morning snack and 19–27% had a late evening snack. The majority of patients indicated that they followed a special diet, which had been given to them by a doctor or a nurse. Only 3.4–6.1% were treated by diet alone. Poor glycaemic control was found in both urban and rural participants, with more than half of subjects having fasting plasma glucose above 8 mmol l^{-1} and more than 35% having plasma glycosylated haemoglobin level above 8.6%. High triglyceride levels were found in 24 to 25% of men and in 17 to 18% of women. Obesity (body mass index ≥30 kg m^{-2}) was prevalent in 15 to 16% of men compared with 35 to 47% of women; elevated blood pressure (≥160/95 mmHg) was least prevalent in rural women (25.9%) and most prevalent in urban men (42.4%).

Conclusions: The majority of black, type 2 diabetic patients studied showed poor glycaemic control. Additionally, many had dyslipidaemia, were obese and/or had an elevated blood pressure. Quantitative and qualitative findings indicated that these patients frequently received incorrect and inappropriate dietary advice from health educators.

Keywords
Black South Africans
Diabetes mellitus
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Recent studies have indicated that the prevalence of type 2 diabetes mellitus is an increasing health concern in black South Africans. The age-adjusted prevalence of diabetes in urban settings was found to be 8% in Cape Town[1]and 5.3% in Durban[2]. In peri-urban Xhosa speakers, the age-adjusted prevalence was found to be 4.5%[3] and in rural settings of Kwa-Zulu Natal, 4.2%[4]. Numerous studies have demonstrated poor glycaemic control[5], obesity[6] and hypertension[7] in the majority of black diabetic patients in South Africa.

The main goal of therapy for patients with type 2 diabetes is to optimise quality of life and to prevent acute metabolic and long-term complications with reduction of premature morbidity and mortality[8]. In managing the disease, dietary therapy should form an essential component of treatment. In this respect the Association for Dietetics in South Africa have published a position paper on the dietary management of type 2 diabetes[9]. These recommendations focus on energy intake for optimal weight control, a high intake of dietary fibre (3–6 g/1000 kJ) and complex carbohydrates (50–65% of total energy), a low fat intake (<30% energy) and a low saturated fat intake (<10%). Additionally regular meals and snacks are prescribed, with a limited alcohol intake and regular exercise as part of the lifestyle[9].

It is not known to what extent poor dietary compliance is a problem in black South African type 2 diabetic patients. One of the few studies that examined this question indicated that when dietary advice was the sole treatment, it appeared to have no effect on the metabolic control of the patients[10]. It has been suggested that nutrition therapy for black patients is unsuccessful when the diet prescription does not relate to the patient's cultural environment and economic situation, and is presented in ways that are difficult for low-literacy patients to understand and implement[11].

To date there is a paucity of data on dietary intake and practices and dietary advice given to black type 2 diabetic patients who attend primary health-care services in South Africa. Due to the limited number of dietitians, particularly dietitians conversant in indigenous languages and culture, doctors and nurses currently give much of the dietary advice. The aim of this study was to evaluate the dietary intake and practices, the knowledge and barriers associated with dietary compliance, as well as metabolic control and associated disorders, in a group of urban and rural, black, type 2 diabetic patients. The results will assist in planning culturally appropriate dietary guidelines for black patients in a primary heath-care setting.

Methods

Subjects and ethics

The study was undertaken in the central region of the Northern Province of South Africa, in Sheshego, a suburb of the city of Pietersburg, and in surrounding rural areas (40–100 km from Pietersburg). The Northern Province borders on Zimbabwe in the north and on Mozambique in the east. It is one of the most poverty-stricken provinces of the country due to its high unemployment rate[12].

The sample comprised 59 men and 75 women from urban areas and 74 men and 80 women from rural areas, over 40 years of age, diagnosed with type 2 diabetes for at least one year and without renal failure. The participants were consecutive patients who attended primary health-care services in the study area over a 3-month period in 1998. All patients visiting the clinics were willing to participate in the study.

Ethical approval for the study was obtained from the Ethics Committee of the University of the North. Informed consent was received from subjects prior to their inclusion in the study.

Dietary intake

The repeated 24-hour recall method was selected to assess the dietary intake of the participants as it is easy to administer, gives valid information on groups, and is practical to use with illiterate populations when the interviews are conducted by well-trained fieldworkers[13]. Participants were required to recall their entire previous day's food consumption. Interviews were conducted according to a training manual drawn up for the purpose of the survey. Interviews included two weekdays and a weekend recall for each participant. There was a period of at least 7 days between repetitions of the dietary questionnaire. The patients did not know in advance that their consumption on a specific day was to be studied. One interview was conducted at the home of each participant and the others at the clinics/hospital attended by the participant.

Four fieldworkers were trained by an experienced dietitian to conduct the dietary interviews. They were selected according to their practical experience in fieldwork as well as their ability to communicate in the local language (Pedi). Dietary aids (food models) were used by the fieldworkers to obtain detailed information on portion sizes consumed. The food models were selected based on average food portions and types of local foods commonly consumed in the northern areas of South Africa, as published in the literature[14–17]. Dietary data were analysed using SAS[18] and local food composition tables[19]. Mean nutrient intakes were compared with the Recommended Dietary Allowances (RDAs)[20].

Dietary practices, knowledge and treatment of the disease

Questions on dietary practices and knowledge and treatment of the disease were incorporated into a general questionnaire developed for the purpose of the survey. The same fieldworkers who conducted the dietary interviews completed this questionnaire. Content validity[21]

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was ensured by having the questionnaire evaluated by five experts in the field of type 2 diabetes and diet.

In order to explore the quantitative dietary data of these patients in more depth, in-depth interviews were conducted with 25 purposefully selected participants. The in-depth interview is regarded as one of the best qualitative research techniques to use in probing underlying meanings and values[22]. A Northern Sotho-speaking woman, experienced in using qualitative methods, was further trained to do the in-depth interviews. Each interview was audio taped, then transcribed, translated into English and prepared for content analysis.

Biochemical tests and anthropometry

Fasting venous blood samples were collected from patients into tubes containing ethylenediaminetetraacetic acid (EDTA) for glycosylated haemoglobin (HbA1c) analysis, into tubes containing fluoride for glucose analysis and into plain tubes for lipid analyses. Blood samples were centrifuged within 6 h on a Beckman GF-15 centrifuge at 3000 rev min^{-1} for 15 min, and supernatant stored at −70°C until analysed. The analyses were done within 6 months from the day of collection. Glucose was measured with a Tecknicon RA-XT autoanalyser and a glucose oxidase kit. Glycosylated haemoglobin was measured using the IMX system, with a reference range of 4.3–6.6%. Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TG) were measured using a Dimension ES autoanalyser with kits supplied by Dade Behring. Low-density lipoprotein cholesterol (LDL-C) values were estimated using the Friedewald formula[23]: LDL-C = TC-(HDL-C+TG/2.2). Reference values for glucose, HbA1c and lipids are shown in Table 6[8,24–26].

Trained fieldworkers measured weight, height and blood pressure of each patient according to standard procedures[27]. Weight was measured on a digital scale to the nearest 0.01 kg; height on an anthropometer to the nearest 0.1 cm; and body mass index (BMI) was calculated (weight/height squared). The blood pressure was measured with the person seated and rested for at least 5 minutes, using a mercury manometer (sphygmomanometer) that had been calibrated to the nearest 0.01 mmHg[28]. Consecutive measurements were taken on the right arm. The mean of three readings was used for analysis.

Pilot study

A pilot study was undertaken on 20 diabetics (10 men and 10 women) at a clinic in the Northern Province that was not included in the sample area. The general questionnaire, as well as the 24-hour recall recording form, were tested and adapted accordingly.

Statistical analyses

To test for differences between urban and rural subjects, the Wilcoxon two-sample test was used for continuous variables and either the Chi-square test or Fisher's exact test was used for categorical variables. The 95% confidence interval was used to test for significance.

Results

The mean age of the participants in the urban and rural areas was 62.2 (standard deviation (SD) 10.1) and 61.9 (9.8) years, respectively. The percentage of illiteracy was 18.6 and 22.7 for urban men and women and 29.7 and 24.4 for rural men and women, respectively. More than 70% of all the patients studied lived on a state pension (social security) or disability grant. Hypertension had been diagnosed in 53–63% of men and in 55–61% of women. The majority of men (66–68%) and women (93–96%) reported that they were taking oral hypoglycaemic agents, and 27% of men and 3–5% of women were using insulin.

Dietary intake

The reported energy and macronutrient intakes of the patients are presented in Table 1. Mean energy intakes of all groups were less than 70% of the RDA's minimum range (RDA for men, 9660 kJ day^{-1}; for women, 7980 kJ day^{-1})[20]. Mean protein intakes were above the RDA for men and women (63 and 50 g day^{-1}, respectively). Total mean fibre intakes were low compared with the minimum recommended amounts of 29 g for men and 24 g for women, based on 3–6 g fibre per 1000 kJ per day[9]. Mean fat and animal protein intakes were low and resulted in mean cholesterol intakes below the recommended maximum (300 mg day^{-1})[29]. The main differences between mean intakes of urban versus rural subjects were found in animal protein, saturated fat (not significant) and in the polyunsaturated to saturated fat (P/S) ratio. Urban subjects had higher intakes of animal protein and saturated fat and lower P/S ratios than their rural counterparts. Mean reported alcohol intakes were low (<5 g day^{-1}) in all groups.

Energy distribution of subjects in the present study complies well with the distribution of macronutrients recommended by the South African Dietetic Association[9] for the dietary management of type 2 diabetes (Table 1). Total mean fat intakes were far below the recommended maximum of 30% and mean saturated fat intakes lay below 10% of energy intake. Carbohydrate intakes were far above the recommended minimum of 55% of energy intake. The high carbohydrate intake can be explained by the finding that the most commonly consumed foods were refined maize porridge, brown bread and/or sorghum, which were consumed in large quantities (Table 2). Chicken, beef and milk were the most frequently consumed sources of protein, and cabbage and spinach the most commonly consumed vegetables.

Dietary practices and knowledge

In both urban and rural areas, the majority of patients

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Table 1 Mean energy (SD) and macronutrient intakes in type 2 diabetic patients in the study

Nutrients	Urban men ($n = 59$)	Rural men ($n = 74$)	Urban/rural Wilcoxon *P*-value	Urban women ($n = 75$)	Rural women ($n = 82$)	Urban/rural Wilcoxon *P*-value
Energy (kJ)	8449 (1881)	8086 (1906)	0.29	7381 (1894)	6967 (1816)	0.19
Protein (g)	75 (18.1)	70 (21.6)	0.07	65 (22.3)	59 (17.5)	0.15
Plant protein (g)	44 (12.6)	43 (11.2)	0.80	39 (12.6)	39 (12.4)	0.85
Animal protein (g)	31 (14.0)	26 (18.4)	0.018*	26 (18.6)	20 (13.4)	0.09
Total fibre (g)	21 (6.3)	21 (6.8)	0.47	21 (8.6)	19 (6.7)	0.50
Insoluble fibre (g)	2.5 (1.6)	2.7 (2.1)	0.95	2.6 (1.6)	3.1 (1.7)	0.07
Soluble fibre (g)	2.0 (1.3)	2.3 (2.5)	0.54	2.2 (1.6)	2.3 (1.7)	0.54
Total carbohydrate (g)	336 (83.7)	322 (79.5)	0.31	288 (74.3)	274 (81.5)	0.24
Total sugar (g)	15 (10.6)	12 (12.0)	0.10	16 (10.8)	14 (11.8)	0.13
Added sugar (g)	2.6 (5.2)	3.8 (11.0)	0.79	4.0 (7.2)	2.1 (5.1)	0.18
Cholesterol (mg)	118 (77.9)	114 (102.5)	0.27	126 (118.7)	105 (92.6)	0.38
Fat (g)	30 (11.3)	29 (12.9)	0.33	28 (12.8)	27 (11.3)	0.82
Saturated fat (g)	7.6 (4.0)	7.1 (4.4)	0.27	7.2 (5.1)	6.1 (3.4)	0.36
Monounsaturated fat (g)	10.2 (5.1)	9.3 (5.1)	0.22	9.0 (5.0)	8.9 (4.7)	0.93
Polyunsaturated fat (g)	8.1 (4.0)	8.1 (4.0)	0.60	7.4 (3.2)	8.2 (3.6)	0.12
P/S ratio†	1.2 (0.5)	1.4 (0.7)	0.27	1.3 (0.6)	1.5 (0.6)	0.019*
Alcohol (g)	1.9 (9.0)	0.4 (2.3)	0.45	0.9 (4.4)	0.9 (4.5)	0.76
Total protein as % energy	15.1 (2.6)	14.4 (2.7)	0.12	14.7 (2.9)	14.3 (2.6)	0.73
Plant protein as % energy	8.6 (1.2)	9.0 (1.2)	0.07	8.9 (1.4)	9.2 (1.2)	0.037*
Animal protein as % energy	6.4 (4.4)	5.3 (3.3)	0.046*	5.8 (3.7)	4.9 (3.1)	0.29
Total fat as % energy	13.6 (4.6)	13.3 (4.5)	0.72	14.0 (4.3)	14.8 (5.6)	0.60
Saturated fat as % energy	3.4 (1.8)	3.3 (1.7)	0.46	3.6 (2.1)	3.4 (1.8)	0.57
Monounsaturated fat as % energy	4.7 (2.3)	4.3 (1.8)	0.57	4.5 (1.8)	4.9 (2.4)	0.43
Polyunsaturated fat as % energy	3.7 (1.2)	3.8 (1.7)	0.71	3.8 (1.1)	4.5 (1.8)	0.015*
Carbohydrate as % energy	66.4 (5.4)	67.0 (5.7)	0.39	65.9 (5.8)	65.7 (6.3)	0.84
Added sugar as % energy	3.1 (2.4)	2.6 (2.7)	0.08	3.8 (2.9)	3.5 (3.3)	0.37
Alcohol as % energy	1.1 (5.0)	0.3 (1.9)	0.45	0.8 (5.7)	0.8 (4.1)	0.77

*, $P < 0.05$.
† P/S: ratio of polyunsaturated fats to saturated fats.

Table 2 Food items most commonly consumed by type 2 diabetics in the study, as derived from three 24-hour recalls

Food	Urban men ($n = 59$)			Rural men ($n = 74$)			Chi-square *P*-value	Urban women ($n = 75$)			Rural women ($n = 80$)			Chi-square *P*-value
	%	Mean (g)	SD	%	Mean (g)	SD		%	Mean (g)	SD	%	Mean (g)	SD	
Brown bread	92	145	66	86	152	56	0.507	93	128	58	90	135	56	0.317
Maize porridge	75	721	138	82	723	218	0.782	87	597	174	76	584	195	0.811
Tea (Ceylon)	66	303	136	81	278	87	0.914	59	284	81	75	337	167	0.390
Sorghum porridge	66	671	159	76	616	184	0.097	69	560	203	79	596	146	0.143
Chicken	76	94	31	76	99	33	0.784	72	96	38	69	100	45	0.783
Beef	36	80	40	22	96	41	0.155	24	70	43	16	108	114	0.155
Milk	28	165	100	30	99	23	0.174	25	171	139	23	133	105	0.180
Apple	31	163	51	23	137	26	0.121	40	136	31	30	146	24	0.203
Cabbage	25	109	52	50	114	79	0.815	27	86	32	38	101	61	0.598
Tea (herbal)	22	281	93	18	242	35	0.332	47	314	103	30	310	107	0.883
Spinach	20	208	77	39	116	48	0.000*	31	136	84	29	130	53	0.602
Oranges	20	174	59	27	205	52	0.193	47	184	62	35	168	64	0.317

*, $P < 0.05$.

Table 3 Practices related to dietary regimes of patients in the study

Dietary advice given	Urban men ($n = 59$) (%)	Rural men ($n = 74$) (%)	*P*-value	Urban women ($n = 75$) (%)	Rural women ($n = 80$) (%)	*P*-value
1. Diet was explained by	78	83.8	0.39	78.7	79.3	0.92
Doctor	56.1	71.6	0.06	63.5	57	0.4
Dietitian	15.8	8.1	0.17	4.1	14.3	0.03*
Nurse	22.8	12.2	0.11	18.9	27.3	0.22
Others	3.5	1.4	0.58	1.4	3.9	0.62
2. Diet explained to family	0	0	0.71	0	1.2	0.69
3. Exchange lists provided	32.7	41.9	0.22	34	39	0.24
4. Years following the diet						
<1 year	8.7	16.2	0.34	18.7	13.4	0.83
1–5 years	55.9	55.4		56	59.8	
≥5 years	35.6	28.4		25.3	26.8	
5. Comments on the diet						
Expensive	64.4	60.8	0.67	52	47.6	0.57
Unfamiliar foods	8.5	2.7	0.13	14.7	11	0.48
Not tasty	44.1	43.2	0.92	40	36.6	0.66
Not explained	30.5	10.8	0.004*	24	20.8	0.62
Not traditional	27.1	23	0.58	21.3	7.3	0.011*
Foods unavailable	20.3	20.3	0.99	22.7	26.7	0.62
Other reasons	5.1	4.1	0.77	6.7	2.4	0.21
Knowledge and practices						
1. What is diabetes?			0.144			0.581
Correct	27.1	39.2		25.3	29.3	
Incorrect	15.6	6.8		14.7	11	
Unsure	57.6	54.1		58.7	59.8	
2. What changes in blood?			0.007*			0.007*
Correct	6.9	24.3		12	17.1	
Incorrect	8.5	9.5		9.3	18.3	
Unsure	84.8	63.9		77.3	64.6	
3. Action taken when they believe they are hyperglycaemic?						
Take medication	59.3	63.5	0.62	56	56.1	0.99
Eat	54.2	50	0.62	41.3	28.1	0.08
Sleep	30.5	28.4	0.78	25.3	24.4	0.89
Visit clinic	8.5	14.9	0.26	16	18.3	0.71
Nothing/other	3.4	4.1	0.42	5.3	10.9	0.24
4. Action taken when they believe they are hypoglycaemic?						
Take medication	56	54.1	0.829	52	31.7	0.010*
Eat	54.2	46	0.342	48	22	0.001*
Sleep	13.6	23	0.167	21.3	6.1	0.005*
Visit clinic	3.4	5.4	0.578	9.3	9.8	0.92
Nothing/other	3.4	0	0.697	5.3	6.1	0.55

*, $P < 0.05$.

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Table 4 Foods diabetic patients had been advised to eat and/or not to eat, as obtained from a questionnaire ($n = 288$) and by in-depth interviews ($n = 25$)

Foods recommended		Foods to be avoided		Foods in both categories*	
From questionnaires	From in-depth interviews	From questionnaires	From in-depth interviews	From questionnaires	From in-depth interviews
Sorghum porridge	Sorghum porridge	White bread	White bread	Bananas	Weet Bix
Brown rice	Brown rice	Maize porridge	Maize porridge	Oranges	Oranges
Brown bread	Brown bread	Mashed potatoes	White rice	Green apples	
Vegetables without sugar (except potatoes)	Cabbage	Sweet potatoes	Foods with starch	Whole milk	
Fruit (except specified fruits)	Peaches – one per day	Red apples	Red apples	White rice	
Red meat cooked without fat	Oranges – one per day	Sweet fruits (e.g. grapes)	Grapes	Whiskey	
Chicken without skin	Green apples	Mangoes	Mangoes		
Fish cooked without fat	Low-fat milk	Watermelon	Bananas		
Boiled eggs	Diet cold drinks	Papaw	Papaw		
Tinned fish	Saccharine	Beer	Potatoes		
Peanut butter		Carbonated cold drinks	Sweet potatoes		
Low-fat milk		*Mageu* (fermented maize beverage)	Whole milk		
Cheese		Alcohol	Alcohol		
Yoghurt		Sweets and confectionery	Sweets and confectionery		
Fruit juice		Salty foods	Salt		
Diet cold drinks		Tripe and intestines	Tripe and intestines		
Artificially sweetened tea		Sugar	Sugar and jam		
			Fried eggs		

* Some patients had been told to eat the foods and some not to eat them.

(78–84%) had had a 'diabetic' diet explained to them by either a doctor (56–72%) or a nurse (12–27%) (Table 3). Only 4–16% had been counselled by a dietitian. Most of the patients (84–92%) stated that they followed the diet explained to them. However, less than 7% of men and women were using diet alone as a means of treatment for their diabetes. Apart from one rural woman, no diet had been explained to family members and less than half of the patients had received exchange lists, namely the recommended portion sizes within different food groups. Patients had many complaints about the dietary advice they had received: notably, that the diet was expensive, not tasty, not traditional and that foods were not available. Less than 40% of patients were able to give an explanation of their disease. Their practices also reflected poor knowledge, since more than 50% of participants indicated that they take medication when hypoglycaemic and, conversely, eat when they are hyperglycaemic.

Table 4 presents a list of foods that patients had been counselled to eat, and those which were to be avoided. Generally, those foods recommended were healthy choices, being – with the exception of cheese – low in fat and in refined carbohydrates. Foods to be avoided included the main staple and traditional foods, namely maize porridge, tripe and intestines, and *mageu*, a fermented maize beverage. Also not recommended were red apples, sweet potatoes and mashed potatoes. Some food items fell into both categories, namely some educators told the patients to avoid them and some recommended their consumption. Bananas, oranges, green apples, whole milk, white rice and whiskey fell into this category.

More than 90% of patients ate breakfast, lunch and dinner (Table 5). Yet only 32–47% had a mid-morning snack, 44–65% a mid-afternoon snack and only 19–27% had a late-evening snack. It is also significant to note that although low alcohol consumption was reported in the 24-hour recalls, 16–25% of men indicated that they regularly consumed alcohol. Alcohol consumption was more common among men than women, and over weekends compared with weekdays.

Qualitative data

The in-depth interviews highlighted the confusion that patients experienced regarding the quantity and types of foods they were told to eat. Many patients had been told not to eat maize meal (a local staple food), white rice and white bread by health-care workers. In some cases they were told to avoid all starchy foods. Additional foods patients had been told to avoid which emerged from the in-depth interviews included: tripe and intestines, full-cream milk, fried eggs, red apples, oranges, bananas, grapes, mangoes, papaw (papaya), potatoes, sweet potatoes, salt, and all sweets and confectionery.

Participants were concerned and confused about the

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Table 5 Meal patterns and alcohol consumption of type 2 diabetic patients studied

Meals	Urban men ($n = 59$)	Rural men ($n = 74$)	Chi-square *P*-value	Urban women ($n = 75$)	Rural women ($n = 80$)	Chi-square *P*-value
Breakfast, % (number)	100 (59)	97.3 (72)	0.50	100 (75)	98.8 (79)	–
Morning snack, % (number)	42.4 (25)	37.8 (28)	0.59	46.7 (35)	32.1 (26)	0.07
Lunch, % (number)	100 (59)	93.2 (69)	0.06	100 (75)	92.6 (75)	0.06
Afternoon snack, % (number)	55.9 (33)	48.6 (36)	0.40	65.3 (49)	44.4 (36)	0.01*
Dinner, % (number)	100 (59)	100 (74)	–	100 (75)	98.8 (79)	–
Evening snack, % (number)	27.1 (16)	21.6 (16)	0.46	24.0 (18)	18.5 (15)	0.42
Number of meals, mean (SD)	4.3 (1.0)	4.0 (1.1)	0.16	4.4 (1)	3.9 (0.9)	0.001*
Number of foods per snack period						
Morning snack, mean (SD)	2.5 (1.6)	2.0 (1.4)	0.22	2.5 (1.6)	2.0 (1.5)	0.20
Afternoon snack, mean (SD)	1.8 (1.0)	1.8 (1.2)	0.62	2.2 (1.7)	1.5 (0.8)	0.03*
Evening snack, mean (SD)	0.6 (1.9)	1.4 (0.7)	0.73	1.2 (0.5)	1.9 (1.9)	0.21
Regular alcohol consumption						
On weekdays, % (number)	17.0 (10)	16.2 (12)	0.91	1.3 (1)	4.9 (4)	0.36
On weekends, % (number)	25.4 (15)	17.6 (13)	0.26	4.0 (3)	6.1 (5)	0.72

*, $P < 0.05$.

amounts and portion sizes they were allowed to eat. This is illustrated by the following direct quotations:

> 'No, the doctor did not give me measurements, he just told me about the drink that we must drink'.
> 'Many doctors said you just eat porridge up to this limit' [showing the palm of the hand].
> 'I just eat like any other person'.

From the interviews it became apparent that these patients were receiving dietary advice from many sources. Apart from the health-care staff, the following were also consulted: relatives, other type 2 diabetic patients, traditional healers, Christian faith healers and herbalists.

Many of the participants indicated that they are 'forced' to eat certain foods they do not like. For example, 'We are forced to eat this dirty porridge' was said, referring to sorghum. Few of the patients knew or acknowledged that type 2 diabetes is a chronic condition that cannot be cured. Patients generally had a poor knowledge regarding their disease and treatment. This is illustrated by the following two statements:

> 'Sugar, they even surprised me because they said I must not eat sugar, but they say I must take a teaspoon of sugar when I feel dizzy'.
> 'Don't you understand me when I say that sometimes I just feel dizzy, I don't know what it is'.

The belief that their condition is curable has led many patients to try alternative treatments, including: raw chicken gallbladder, aloes (plant species), concoctions from the herbalist, *nngu* (indigenous vegetable), boiled *litchi* leaves, mopani worms (larvae of *Imbrasia belina* moth), salt water, prayer water and a dance by a traditional healer. Some also believe that the disease is the result of being bewitched, namely: 'Maybe it is not diabetes, maybe we are bewitched how will we know?' and 'Do you want to tell me that you don't know there are witches? If they hate you, they can hate you and do something, yes'.

Although some patients had been advised on what to eat, few had changed their eating habits. One reason given for this may be that the dietary advice was not culturally appropriate. This is illustrated by the following quotes:

> 'You know that in the Sotho, in our culture, I can't say I no longer eat it [maize meal], there are occasions where I am forced to be available, let me say funerals…when they put food on the corrugated iron, I also carry on eating. I just lie to myself and say after all it is one day it does not matter'.
> '…It seems all doctors say the same thing that the beef tripe, goat, sheep and so on, don't eat, so I am used to them so much that I cannot stop eating them completely'.
> 'I don't like it when they say everything [all food] is not good for us'.

Indicators of poor glycaemic control, dyslipidaemia, obesity and hypertension

Poor glycaemic control was found in a large proportion of participants based on the South African guidelines for the management of type 2 diabetes at the primary care level[8] (Table 6). This was the case for fasting serum glucose above 8 mmol l^{-1} (59–67%) and for plasma HbA1c above 8.6% (37–43%).

Hypertriglyceridaemia, as defined in the South African guidelines, was found in 24–25% of males and in 17–18% of women. No subjects had abnormal HDL-C values according to the original South African guidelines. More recent and stricter criteria[24] indicate that higher percentages had poor glycaemic control and dyslipidaemia, with 25 to 38% having low HDL-C values and more than 35% having abnormal LDL-C values. Obesity prevalence ranged from 15 to 16% in men and from 35 to 47% of women. A blood pressure ≥160/95 mmHg was found in 33 to 42% of men and in 26 to 33% of women. Hypertension had been diagnosed in 53 to 63% of males

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Table 6 Percentage of type 2 diabetic patients with abnormal blood values, obesity and hypertension, and their medication usage

Blood variable	Urban men ($n = 57$)	Rural men ($n = 73$)	Chi-square *P*-value	Urban women ($n = 74$)	Rural women ($n = 80$)	Chi-square *P*- value
Glucose						
>7 mmol l^{-1}*	62.1	74.0	0.14	72.2	67.1	0.49
>8 mmol l^{-1}†	60.8	59.2	0.22	67.1	65.4	0.88
HbA1c						
>7%*	56.9	69.9	0.12	59.7	66.7	0.37
>8.6%†	39.7	42.5	0.05	38.9	37.0	0.39
Triglycerides						
≥2 mmol l^{-1}*	25.9	28.4	0.79	18.9	23.2	0.45
≥2.2 mmol l^{-1}†	24.1	24.7	0.95	17.5	17.0	0.94
Total cholesterol						
≥5 mmol l^{-1}*	39.0	41.1	0.81	30.0	54.9	0.52
≥6.5 mmol l^{-1}†	5.2	11.0	0.49	14.9	9.8	0.25
HDL-C						
≤1.2 mmol l^{-1}*	35.6	30.1	0.51	37.8	25.0	0.09
<0.9 mmol l^{-1}†	0	0	0	0	0	0
LDL-C						
≥3 mmol l^{-1}	35.1	41.7	0.45	63.5	56.8	0.39
BMI≥30 kg m^{-2}	15.3	16.2	0.85	46.7	35.4	0.15
Blood pressure						
≥140/90 mmHg*	76.3	64.9	0.32	62.7	54.9	0.34
≥160/95 mmHg†	42.4	33.3	0.24	33.0	25.9	0.37
Medication						
OHGA‡	67.8	66.2	0.99	96.0	92.7	0.68
Insulin	27.1	27.0		2.7	4.9	
Other	5.1	6.8		6.7	2.4	

Reference values: *, Working Group of the National Diabetes Advisory Board (SEMDSA)[8]; †, Society for Endocrinal Metabolism and Diabetes of Southern Africa[24].
‡OHGA – oral hypoglycaemic agents.

and in 55 to 61% of females prior to the study. No significant differences were noted between urban and rural participants for biochemistry, blood pressure and anthropometry.

Discussion

This study has used a combination of quantitative and qualitative methods in order to gain a better understanding of the dietary intake, practices and beliefs of black type 2 diabetic patients in a particularly poor part of South Africa. When examining the diet from a nutritional point of view, it generally appears to follow the recommended guidelines[9], even when taking the probability of dietary underreporting into consideration. The diet is high in carbohydrate (maize, sorghum and brown bread), and low in fat, particularly saturated fats. In this respect it reflects the traditional African diet. The low energy intake is very similar to that found in two recent studies in the Northern Province in black adults[30,31], and possibly reflects some underreporting[32]. This is probably due to the difficulty in establishing accurate portion sizes for maize porridge, which is eaten in large quantities by hand. A shortcoming of the nutritional intake of the patients is the finding that their fibre intake was below that recommended to bring about a reduction in LDL-C[33], one of the benefits associated with a high dietary fibre intake.

The meal pattern described by patients did not conform to the recommendation of small frequent meals spaced throughout the day[34,35]. Major barriers to dietary compliance observed were related to foods allowed and to the patients' understanding of portion sizes. Patients were given conflicting advice with respect to the types of foods they were allowed to eat and they generally appeared to have little understanding of portion sizes, as illustrated by reports that they were not provided with exchange lists. A major concern is the finding that patients were told to avoid maize porridge and to eat sorghum instead. This does not make sense both culturally and scientifically, since maize is the traditional staple food of the region and additionally maize has been found to have a lower glycaemic index than sorghum, especially when eaten cold[36]. The finding that patients had a high intake of maize indicates that they were disregarding this recommendation in any event. Some fruits had also been contraindicated (e.g. red apples) without sound nutritional reason. At most health-care centres attended by black patients in South Africa, doctors and nurses counsel with respect to dietary treatment. Unfortunately, they have little training in nutrition and, additionally, may have poor knowledge with respect to foods that are traditionally eaten. Consequently, the dietary advice given is frequently inconsistent, sometimes incorrect and often confusing to patients[37].

The finding that a large proportion of these patients had poor glycaemic control, were hypertensive and overweight comes as no surprise, and echoes that of similar studies in black diabetic patients where it has been found

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that 76% of women were hypertensive and 54% were obese[7].

The finding that patients in the present study were poorly controlled and overweight cannot be ascribed to their diet alone, since type 2 diabetes is known to be associated with several adverse cardiovascular risk factors, namely hypertension, increased serum triglycerides and decreased HDL-C[38,39]. Lifestyle factors such as lack of exercise, alcohol consumption and cigarette smoking could also have contributed to the poor glycaemic control and dyslipidaemia found in these patients, as well as poor compliance with medication.

Conclusions

The majority of black, type 2 diabetic patients studied showed poor glycaemic control. Additionally, many had dyslipidaemia, were obese and/or had an elevated blood pressure. Although it is difficult to determine the extent to which dietary compliance contributed to this, the following factors were identified as contributors: lack of knowledge regarding the disease; inadequate and inaccurate dietary counselling; and poor compliance with dietary advice given.

Recommendations

It is recommended that a culturally appropriate dietary intervention programme be developed for black type 2 diabetic patients. This should include a diet plan that is based on the traditional staple foods – maize and/or sorghum, and be spaced throughout the day in well-balanced portion sizes. Patients should be encouraged to increase their fibre intake, e.g. by including legumes, which are culturally acceptable and have a low glycaemic index[40]. Additionally, patients need to be given accurate dietary and lifestyle information on their disease from doctors and nurses since they are the main nutrition educators. This may require that health professionals be retrained in the concepts of an optimal diabetic diet which is culturally and economically acceptable to black patients.

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