Risk profile for chronic diseases of life-style in older black South Africans. The BRISK Study

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Abstract

This paper describes the risk-factor profile for chronic diseases of life-style in the older black population of Cape Town and compares it with risk profiles in other South African ethnic groups. A hundred and sixty-eight men and women aged 60 years and over from formerly designated black areas of Cape Town were sampled in 1990. Laboratory diagnosis of hyperlipidaemia and clinical measurements of blood pressure and body mass index were carried out and reported incidences of smoking and dietary intake were recorded. A low risk profile was found in the sample: Total cholesterol (TC) and low-density lipoprotein cholesterol (LDLC) levels were low and high-density lipoprotein cholesterol/total cholesterol (HDLC/TC) ratios high, with approximately 90% of the sample having protective ratios ≥ 20%. Hypertension was found in 25.7% of men and 48.7% of women. Of the hypertensives, only 53.5% were on anti-hypertensive medication. A high prevalence of obesity was found in the women (51.3%). Smoking rates were 47.3% in men and 28.3% in women. Dietary information showed that the group consumed an essentially prudent diet. Men had higher cholesterol intakes (300mg) than women (175mg), while women consumed significantly more carbohydrates as a source of energy than men (p < 0.05). It is concluded that the study population is at lower risk for chronic diseases of life-style than other ethnic groups in South Africa, but it is uncertain whether the low rates will continue in future generations.

Introduction

The health needs of older persons in South Africa are commonly neglected as a result of a prioritization of limited health-care resources which are targeted towards young children and pregnant and lactating women. This neglect of the health care of the older population seems inappropriate, since the World Health Organisation (WHO)/World Bank has predicted that early in the 21st century, the major causes of death in developing countries will be chronic diseases of life-style (CDL), e.g. cardiovascular and respiratory diseases, and that these diseases will predominantly affect middle-aged and older people (Murray & Lopez, 1996). Population ageing will thus impact on the overall burden of disease in a country.

In South Africa 2.8 million people are aged 60 years and over and constitute 7% of the total population (Statistics South Africa, 1998). A country-wide survey conducted among 4 400 older persons in 1990/91 found that urban blacks reported higher levels of health impairment than any other ethnic group, and that the older black population was particularly disadvantaged in terms of educational and socio-economic attainment, provision for old age and perceived quality of life (Ferreira, Møller, Prinsloo & Gillis, 1992). This finding supports a need for more information regarding the life-styles and health risk profiles of older black persons.

The coronary risk factor study among blacks (BRISK) investigated the cardiovascular risk profile and dietary habits of the black population of the Cape Peninsula (Steyn, Jooste, Bourne *et al.*, 1991; Bourne, Langenhoven, Steyn *et al.*, 1993a; Oelofse, Jooste, Steyn *et al.*, 1996; Steyn, Katzenellenbogen, Lombard & Bourne, 1997). This paper describes the risk factor profile for CDL of persons in the subsample aged 60 years and older, and compares the data with studies conducted in other older ethnic populations in South Africa.

Subjects and methods

A stratified proportional sample of persons aged 60 years and older (N = 148; 74 men, 74 women) was drawn from formerly designated black residential areas of Cape Town – both squatter areas and formal settlements – during the first quarter of 1990. The sample frame was determined using data from the 1988 Human Sciences Research Council (HSRC) census conducted in these areas for the former Cape Provincial Administration. The final sampling unit was a household, defined as a group of individuals who cook and eat together. Only one subject aged 60 and over was selected from each household. A detailed description of the sampling procedure and methodology of the BRISK study has been published elsewhere (Steyn *et al.*, 1991; Bourne *et al.*, 1993a).

Data collection

Fourteen registered nursing sisters, specially trained prior to data collection to ensure uniform interview techniques, carried out standardized anthropometric and blood pressure (BP) measurements and collected blood samples. A special dietary study was conducted prior to the survey fieldwork to investigate the food culture of black residents of Cape Town, during which cooking facilities, food preparation and appor-

tionment, and food purchasing routines were observed. Based on these findings, a dietary kit was developed, which consisted of foam food models, as well as standard household utensils such as mugs, bowls and spoons, to help with the quantification of portion sizes.

After the completion of a pilot study, a risk factor and dietary questionnaire was completed in the subjects' homes. Items in the questionnaire addressed aspects of urbanization, socio-economic status and smoking habits. Dietary information was obtained through questions on habitual intakes and a 24-hour dietary recall method with the aid of the dietary kit. The questionnaires were coded according to the MRC Food Composition Tables (Langenhoven, Kruger, Gouws & Faber, 1991a) and quantities were converted to weights using the Food Quantities Manual (Langenhoven, Conradie, Wolmarans & Faber, 1991b) and by comparing them with simulated portions where necessary.

The percentage total energy from macronutrients, the poly-unsaturated/saturated fatty acid (P/S) ratio and the mean dietary fibre and cholesterol intakes were calculated. Macronutrient energy profiles were compared with the dietary recommendations of the South African Diet Consensus Panel (1989), which are in line with the American Dietetic Association (AHA) (1979) dietary guidelines.

Anthropometric and blood pressure measurements were recorded at the time of the interview. Weight was determined on a bathroom scale to the nearest 0.5 kg with the participant barefoot and in light clothes. The scales were standardized against a beam balance once a week and against a known weight on a daily basis. Standing height was measured to the nearest 0.1 cm using a metal measuring tape against a wall with a flat headboard at right angles to the wall. The body mass index (BMI) was categorized according to 1997 WHO guidelines: Obesity: BMI ≥30; overweight: BMI 25-29.9; and underweight: BMI < 20. Blood pressure (BP) was measured using a mercury sphygmomanometer, after a subject had been seated for at least five minutes. The guidelines followed for BP determination were those of the American Heart Association (1967). Mid-upper-arm circumference was measured to the nearest 0.1 cm. For subjects with mid-upper-arm circumference less than 33 cm, a standard 12.5 x 23 cm cuff was used and for those with arm circumference 33 cm, a larger cuff size of 15.5 x 32.5 cm was used. The diastolic BP was taken as the disappearance of the Korotkoff sound (phase 5). Three intermittent readings were recorded and the lowest diastolic reading with its corresponding systolic reading was used for the analyses. Hypertension was defined according to the World Health Organisation criteria (BP ≥160/95 mmHg and/or taking antihypertensive medication) (World Health Organisation Expert Committee, 1978). Moderate hypertension was defined as a blood pressure greater than or equal to 140/90 mmHg, but less than 160/95 mmHg in subjects not on treatment. Isolated hypertension was defined as systolic blood pressure greater than 160 mmHg, but diastolic blood pressure lower than 95 mmHg.

A non-fasting blood sample for lipid determination was also taken at the time of the interview. Blood samples were collected in EDTA tubes, kept on ice and centrifuged within six hours at 4°C to separate the plasma which was analysed within 24 hours. Biochemical analyses included TC, HDLC, LDLC and triglyceride (TG) levels. Cholesterol levels were measured using the Boehringer Mannheim CHOD-PAP enzymatic method on a Gilford auto-analyser, which was calibrated against Preciset Cholesterol. Precinorm L was used as an external control serum and a pooled plasma was used as an internal control serum. HDLC was measured after precipitation of the apoprotein-B-containing lipoproteins with manga-

nese heparin. The non-fasting triglyceride levels were determined by the Boehringer Mannheim enzymatic Peridochrom method.

The prevalence of hypercholesterolaemia was assessed according to the action limits of the South African Heart Foundation (Rossouw, Steyn, Berger *et al.*, 1988). The HDLC/TC ratio was accepted as protective at 20% or higher (Gordon, Catelli, Hjortland *et al.*, 1977) and LDLC was calculated according to the Friedewald equation (Friedewald, Levy & Fredrickson, 1972).

Statistical analyses

Risk factors (smoking, hypertension, hypercholesterolaemia and BMI) were categorized according to levels of severity into low, moderate or high risk for ischaemic heart diseases (IHD). Non-parametric analyses were performed for skewed data. The Chi-square test and the Fisher's exact test (where cell frequencies were less than 5) were used to determine sex differences between categorical variables and Wilcoxon's 2-sample test was used for continuous variables. P-values less than 0.05 were used to indicate statistical significance.

Results

The sampling procedure yielded a study population of 148, with 74 men and 74 women. The mean age (standard deviation (SD)) for men and women was 68.3 (5.8) and 70.5 (7.4) years, respectively, and the age range was 60 - 89 years. Blood samples were successfully collected from 64 men and 64 women.

Descriptive statistics and prevalence rates for the risk factors are shown in Table 1, according to moderate and high levels of risk for CDL. Both men and women had low mean TC and LDLC levels, which are reflected in the low prevalence of dyslipidaemias. In contrast, high levels of HDLC were found, resulting in high HDLC/TC ratios; approximately 90% of the sample had protective levels of HDLC/TC ratios.

The mean diastolic BP for men and women was similar. According to WHO criteria (World Health Organisation Expert Committee, 1978), about half of the women and a quarter of the men were hypertensive. Of the hypertensives, 53.5% reported taking anti-hypertensive medication and of these, only 21.7% had a BP below 160/95 mmHg. Isolated hypertension was uncommon in these persons.

Daily cigarette smoking was reported by 47.3% of the men and 28.3% of the women; most of the men reported smoking ten or more cigarettes a day.

Anthropometrical measurements showed that over half of the women (51.3%) and 18% of the men were obese. Few men (12.2%) and women (8.1%) fell into the underweight category. The percentage energy distribution of the dietary intake of the group is shown in Table 2 and is essentially in line with the prudent dietary guidelines (Diet Consensus Panel, 1989). Exceptions are a low dietary P:S ratio and an inadequate fibre intake. Women consumed a significantly higher proportion of energy from carbohydrates than men, but had a lower cholesterol intake. Mean energy intakes were reported to be low; 27% of men and 36% of women had energy intakes below 67% of the RDA (National Research Council, 1989).

The cardiovascular risk factor profile of the sample is compared with data from other population groups in South Africa (Mollentze, Moore, Steyn *et al.*, 1995; Charlton, Fourie, Steyn & Lombard, 1997a; Charlton, Wolmarans, Marais & Lombard, 1997b; Seedat, Mayet, Khan *et al.*, 1990; Seedat, Mayet & Gouws, 1994) in Table 3. Differences in sample sizes and age cut-off points are unavoidable due to the scar-

city of literature in this area. However, to accommodate for this, age and sex adjusted prevalence figures (using 1991 population census figures for South African men and women aged 60 years and older (Central Statistical Service, 1992)) have been calculated.

Table 1

Descriptive statistics (mean (SD)) and prevalence (%) of cardiovascular risk factors in the Cape Peninsula black population aged 60 years and older

	Men (N = 74)	Women (N = 74)	p-value
Lipid profile			
Total cholesterol (TC) in mmol/l[a]	4.7 (1.1)	5.0 (0.9)	0.209
Low density lipoprotein cholesterol (LDL) in mmol/l[ab]	2.5 (1.0)	2.8 (0.8)	0.154
High density lipoprotein cholesterol (HDLC) in mmol/l[a]	1.5 (0.5)	1.5 (0.5)	0.989
HDLC/TC ratio (%)[a]	33.2 (13.2)	29.7 (9.0)	0.427
Triglyceride (TG) in mmol/l[a]	1.6 (1.0)	1.9 (1.3)	0.142
% Moderate-risk hypercholesterolaemia (TC ≥ 5.7 < 6.5 mmol/l)	7.3	12.9	0.316
% High-risk hypercholesterolaemia (TC ≥ 6.5 mmol/l)	7.3	11.3	0.457
% Moderately raised LDL (≥3.4 < 5.2 mmol/l)	17.0	18.0	0.883
% High-risk LDL (≥5.2 mmol/l)	0.0	0.0	
% Low HDLC (≤0.9 mmol/l)	3.6	3.2	1.000
% Protective HDLC/TC ratio (≥ 20%)	92.7	88.7	0.457
% High-risk hypertriglyceridaemia (> 2.3 mmol/l)	18.2	21.0	0.145
Blood pressure profile			
Diastolic blood pressure (DBP) in mmHg	84.3 (12.4)	85.8 (12.9)	0.349
Systolic blood pressure (SBP) in mmHg	133.4 (20.2)	138.9 (24.3)	0.175
% Hypertension (≥ 160/95 mmHg and/or on treatment)	25.7	48.7	0.046
% Moderate-risk hypertension (≥ 140/90 < 160/95 mHg)	21.6	10.8	0.074
% Isolated hypertension (SBP ≥ 160 mmHg, DBP < 95 mmHg)	1.3	4.0	0.311
Smoking profile			
% who smoked ≥ 1 cigarette per day	47.3	28.3	0.018
Anthropometric profile			
Weight (kg)	70.6 (14.3)	72.5 (16.2)	0.330
Height (m)	165.9 (6.7)	154.9 (6.3)	0.0001
Body mass index (BMI) = weight (kg) / height (m)²	25.7 (5.1)	30.3 (7.0)	0.0001
% Underweight individuals (BMI < 20)	12.2	8.1	0.261
% Normal weight individuals (BMI 20 - 24.9)	39.2	18.9	0.001
% Overweight individuals (BMI 25 - 29.9)	31.1	21.6	0.587
% Obese individuals (BMI ≥ 30)	17.6	51.3	0.001

[a] Sample sizes for lipid profiles are smaller due to incomplete blood sample collection (n = 64 men, n = 64 women).

[b] Calculated according to the Friedewald equation (Friedewald, 1972).

Table 2

Mean dietary intake (SD) of the subjects: energy distribution, cholesterol intake and P:S ratio

	Recommended [a]	Men (N = 74)	Women (N = 74)	p-value
Energy (kcal/day)	2300 (M) 1900 (W)[b]	1725 (692)	1254 (498)	0.0001[d]
% E protein	15 - 20 %	15.7 (5.2)	14.2 (4.5)	0.115
% Animal/ total protein		57.6 (21.9)	52.4 (22.5)	0.233
% E fat	< 30 %	25.9 (10.4)	25.1 (10.8)	0.470
% E saturated fat	< 10 %	9.0 (4.2)	8.5 (3.9)	0.998
% E polyunsaturated fat		5.2 (3.4)	4.9 (3.2)	0.419
% E monounsaturated fat		8.7 (4.5)	8.4 (4.7)	0.849
P:S ratio	≥ 1	0.69 (0.47)	0.68 (0.48)	0.467
% E carbohydrate	> 50 %	57.9 (15.8)	64.8 (14.4)	0.027[c]
% E sugar	< 10 %	12.1 (9.4)	15.9 (10.5)	0.110
Dietary fibre (g)	20 - 30 g	16.0 (11)	11.0 (7)	0.012[c]
Cholesterol	≤ 300 mg	300 (344)	175 (162)	0.008[c]

[a] Diet Consensus Panel (1989).
[b] Recommended Dietary Allowance (National Research Council, 1989).
[c] p <0.05.
[d] p <0.001; differences between men and women.

Discussion

The data demonstrate that the older black population of the Cape Peninsula has an overall low risk for CDL. This finding is consistent with the low number of deaths attributed to IHD and cerebrovascular diseases (CVD) in the urban older black population, compared to other ethnic populations in the country (Bradshaw, Bourne, Schneider & Sayed, 1995).

Desirable levels of both LDL and HDL cholesterol were found, but levels were less favourable in women than in men. Women also had significantly higher rates of hypertension. This sex difference may be explained, in part, by the higher prevalence of obesity in women. In this regard, Levitt, Katzenellenbogen, Bradshaw *et al.* (1993) found that obesity was a predictor of diabetes in the same community. The high rates of obesity in this population appear to manifest at a young age, as shown by Steyn *et al.* (1991), and the extent to which obesity appears to be increasing is a matter of serious public health concern.

The subjects consumed a diet that was in line with prudent dietary recommendations; the proportion of energy provided by fat was low (25%E) and carbohydrate intake was relatively high (58-65%E). The low reported energy intakes of the women, in light of the finding that over half were obese, questions the validity of the 24-hour recall dietary assessment method. However, a previous verification study on 50 adult black men and women from the same population, which involved in-depth probing on snacking and nibbling habits, resulted in only a 7% lower reported energy intake compared with the baseline estimations (Bourne, Langenhoven, Steyn *et al.*, 1993b).

Smoking rates were reported to be higher in older black women in this study than in any other age group of black women in the country. Traditionally, it is not socially acceptable for black women of child-bearing age to smoke, but the practice is more acceptable in post-menopausal black women. This phenomenon is strongly influenced by the degree of urbanization of the older women, as shown by

Steyn, Bourne, Jooste *et al.* (1994). The less urbanized the women, the more that this traditional smoking pattern is adhered to, while women who live in urban areas tend to start smoking at a much younger age. Other forms of tobacco used by women in the present study were snuff (21%) and pipe tobacco (6%).

Differences are seen in the prevalence of risk factors for CDL, when the results of this study are compared with other studies on older South Africans. For example, the lipid profile of a sample of older white subjects in Durban is markedly less favourable than that of all other groups, while the present sample of older black subjects in Cape Town (Xhosa-speaking) had a more protective lipid profile than Sesotho-speaking black people of similar age in either Mangaung (urban) or Qwaqwa (non-urban). Unexpectedly, the black sample from Cape Town had markedly lower rates of hypertension than reported for other groups, including other samples of older blacks. Similar findings have been reported for younger Xhosa-speaking black people in both Cape Town (Steyn *et al.*, 1991) and lead factory workers in the Eastern Cape (Moodley, Steyn, Ehrlich *et al.*, 1997). This finding suggests that differences may exist in the cardiovascular disease risk profiles of various black South African populations, even given comparable living conditions and life-styles. Black older women in both Cape Town and Mangaung had the highest rates of obesity, about three- or fourfold higher than white women in Durban. However, the association between obesity, body composition, hypertension and hyperlipidaemia in older populations is complex and cannot be demonstrated using cross-sectional comparative data of the type reported in this paper.

The prognostic significance of risk factors for IHD in older individuals is still contentious. Several studies have suggested that older individuals share the same major risk factors as younger individuals (Harris, Cook, Kannel & Goldman,

1988; Benfante, Reed & Frank, 1992) and many studies have shown that preventive efforts may have considerable potential benefit even in older persons (Kannel & Vokonas, 1992; Stamler, 1988). Therefore, it does not appear warranted for older persons to be targeted separately from their younger counterparts for risk-factor interventions. The poor level of hypertension control found in this older group of hypertensives suggests that even if the risk factors are diagnosed, they are inadequately treated at the primary health-care services which these individuals attend.

The findings of this study and others (Mollentze *et al.*, 1995) suggest that older black South Africans have experienced a low life-time exposure to conventional cardiovascular risk factors. However, younger black South Africans have been shown to have much higher levels of IHD risk than was found in the present study (Mollentze *et al.*, 1995). Further, the increasing urbanization trend of black South Africans is likely to be accompanied by increasing atherogenic dietary and life-style changes. In this regard, seminal data in the early 80s on Kenyans demonstrated an increase in BP associated with duration of urban residence among migrating farmers (Poulter, Khaw, Hopwood *et al.*, 1984).

Data from the most recent (1996) population census indicate that 52% of the population aged 60 years and over now lives in urban areas, and that this trend is similar to that of the total population, of which 54% live in urban areas (Statistics South Africa, 1998). Following the repeal of the Group Areas Act in 1988, which permitted only male migrant labourers to relocate to urban areas, South Africa has seen a massive movement of persons from non-urban to urban areas and a resulting proliferation of informal settlements on urban fringes.

Already, evidence suggests that future cohorts of black South Africans will be at increasing risk for hypertension, as well as other cardiovascular risk factors. Preliminary data

Table 3

Comparison of prevalence (%) of cardiovascular risk factors in older men and women in South African populations

	Cape Blacks Age ≥ 60			Mangaung Blacks Mollentze *et al.* (1995) Age ≥ 65			Qwaqwa Blacks Mollentze *et al.* (1995) Age > 65			Cape Coloureds Charlton *et al.* (1997a,b) Age ≥ 65			Durban Indians Seedat *et al.* (1990) Age 55-69			Durban Whites Seedat *et al.* (1994) Age 55-69		
Men (M) and Women (W)	M	W	All[a]	M	W	All[a]	M	W	All[a]	M	W	All[a]	M	W	All[a]	M	W	All[a]
Number (N)	74[b]	74[b]	148	38	64	102	83	121	204	96[c]	102[c]	198	45	44	89	54	52	106
High-risk hypercholesterolaemia (total cholesterol ≥ 6,5 mmol/l)	7.3	11.3	9.6	13.2	20.3	17.4	1.2	5.8	3.9	10.0	34.4	24.3	20.0	29.5	25.6	42.3	61.2	53.4
Moderate-risk hypercholesterolaemia (total cholesterol ≥ 5,7 < 6,5 mmol/l)	7.3	12.9	10.6	13.2	29.7	22.9	14.6	20.7	18.2	25.0	21.6	23.0	24.4	39.9	33.5	30.8	30.6	30.7
Protective HDLC/TC ratio (HDLC/TC ratio ≥ 20 %)	92.7	88.7	90.4	63.2	65.1	64.3	74.4	68.3	70.8	55.4	56.7	56.2	48.9	43.2	45.6	38.5	38.8	38.7
Hypertriglyceridaemia (triglyceride > 2,3 mmol/l)	18.2	21.0	19.8	23.7	14.1	18.1	9.8	7.5	8.5	5.4	14.4	10.7	N/A	N/A	N/A	38.5[d]	46.9[d]	43.4
WHO definition of hypertension (BP ≥ 160/95 mmHg and/or on treatment)	25.7	48.7	38.8	60.0	78.1	70.6	43.4	66.0	56.7	66.7	76.5	72.3	60.0	59.1	59.5	57.4	40.4	47.4
Moderate hypertension (BP ≥ 140/90 mmHg but < 160/95 mmHg)	21.6	10.8	15.4	22.5	12.5	16.6	31.3	14.1	21.2	N/A	N/A	N/A	8.9	9.1	9.0	18.5	23.1	21.2
Smoking (≥ 1 cigarette per day)	47.3	28.3	36.2	46.2	6.3	22.8	48.2	5.1	23.0	43.6	20.2	29.8	42.2	6.8	21.4	18.5	30.8	25.7
Obesity (Body mass index ≥ 30)	17.6	51.4	36.9	17.5	42.2	32.0	7.4	31.4	21.5	14.0	38.0	28.1	4.4	34.1	21.8	9.4	13.5	11.8

[a] Age and sex-adjusted using 1991 population census figures for South African men and women aged 60 years or older.

[b] Sample size for lipid profiles are smaller due to incomplete blood sample collection (n = 62 men, n = 62 women).

[c] Sample size for lipid profiles are smaller (n = 92 men, n = 97 women).

[d] Hypertriglyceridaemia TG > 2.0 mmol/l.

N/A Data not available.

from a birth cohort study being conducted in the greater Johannesburg area (the Birth-to-Ten study) has shown that black children aged five years have significantly higher blood pressure levels than Indian and white children of the same age (unpublished data, K. Steyn, MRC).

In summary, the data reported here indicate that the older black population of the Cape Peninsula is still at low cardio-vascular risk. However, opportunities for effective life-style interventions early in life need to be sought in order to prevent the predicted chronic diseases of life-style epidemic in future generations.

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