Risk factors for coronary heart disease in the black population of the Cape Peninsula

The BRISK study

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Summary

A cross-sectional study of risk factors for ischaemic heart disease (IHD) in a random sample of 986 black people aged 15 - 64 years living in the Cape Peninsula revealed a population at lower risk for IHD than other South Africans. Blood pressures of 140/95 mmHg or above were found in 14,4% of males and 13,7% of females. Fifty-two per cent of males and 8,4% of females smoked, while 16,5% of males and 25,8% of females had a total cholesterol (TC) level imparting risk for developing IHD. In this population the TC level is not a good surrogate measure for low-density lipoprotein cholesterol because of the high level of high-density lipoprotein cholesterol (HDLC) found in this population. A protective HDLC/TC ratio of 20% was found in 96% of males and 96,1% of females. When considering the three major reversible IHD risk factors at a high level of risk, 30,8% of males and 12,5% of females had at least one such a risk factor.

The population was frequently exposed to the media, with 80% listening to the radio every day and 55% watching television at least once a week. This suggests that a healthy lifestyle could be promoted successfully by means of these media. In addition, schools should promote a healthy lifestyle and the prevention of chronic degenerative diseases should be incorporated into the evolving primary health care services in South Africa.

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Reliable ischaemic heart disease (IHD) mortality data are not available for the black population of South Africa. The impressions of clinicians are (and some hospital-based morbidity studies show) that the IHD case load for blacks is increasing in urban hospitals but not in rural areas, although this trend is confounded by the recent migration of large numbers of black persons to urban areas.

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For the age group 15 - 64 years, an analysis of the computer tapes used to produce the official reports on death among blacks in South Africa[1] shows that for the period 1984 - 1986 circulatory disease accounted for 11,0% of registered mortality in males and 20,0% in females. The marked difference between sexes in deaths due to external causes (mainly violence) in this age range, 34,9% for males and 12,9% for females, biases such figures. A further confounding factor is that 18,2% of male deaths and 23,7% of female deaths (15 - 64 years) are due to ill-defined conditions, indicating that the true circulatory disease mortality could be higher than indicated above. Expressed as a percentage of natural deaths (i.e. excluding external causes), deaths from circulatory disease accounted for 16,9% of male mortality and 23,0% of female mortality in the 15 - 64-year-old age group.

For the study area of the Cape Peninsula in the same period, circulatory diseases accounted for 14,2% of total deaths for males and 19,0% for females aged 15 - 64 years. External causes of mortality accounted for 29,3% of deaths among males and 9,2% of deaths among females, while the ill-defined component was substantially lower at 6,0% for males and 8,3% for females. As a percentage of natural deaths (15 - 64 years) in the Cape Peninsula, the figure for circulatory disease was 20,1% for males and 20,9% for females.

Percentages of deaths from circulatory disease in the Cape Peninsula (15 - 64 years) were as follows: IHD — 22,5% for males and 13,3% for females; hypertensive disease — 10,8% for males and 10,3% for females; and cerebrovascular disease (CVD) — 36,4% for males and 38,5% for females. Absolute rates have not been calculated because of considerable uncertainties about the true size of the black population.

The rapid urbanisation of the black population places it at risk for several diseases.[2]

Apparent urban-rural differences in IHD and CVD morbidity and mortality patterns among blacks suggest that the process of urbanisation may increase the prevalence of risk factors for these diseases and predispose the ever-increasing urban black population to develop these diseases in the decades to come. Previous South African studies in the Asian, urban coloured and white ethnic groups of South Africa have revealed high levels of IHD risk factors, particularly among males, that could account for the high IHD mortality rates recorded from these groups.[3-5] Further studies have shown increases in IHD and its risk factors with urbanisation in several other settlings.[6-8]

The lack of data on the prevalence of risk factors among the urban black people prompted this study. This report describes the distribution and prevalence of IHD risk factors in the black population of the Cape Peninsula.

Methods

Study population and sampling procedure

The target population was the 15 - 64-year-old black population of the Cape Peninsula. A stratified proportional sample

was drawn in the black residential areas, including squatter areas, during the first quarter of 1990.

The basis for the sample design was the 1988 Human Sciences Research Council (HSRC) census done for the Cape Provincial Administration in these areas. Strata considered were area (Guguletu, Langa, Nyanga, New Crossroads, KTC, Old Crossroads and Khayelitsha), type of dwelling (houses, hostels and shacks), and sex and age groups. Formal areas were subdivided into sectors and blocks. Plots within blocks were randomly identified and the fieldworkers had to obtain a fixed quota of subjects for each sex and age category in each block. Squatter areas were sampled by starting at random points in each area and completing the sex age quota. The final sampling unit was a household, defined as a group of people who cook and eat together. Only one subject was drawn from a household.

Data collection and methods

After completion of a pilot study, a team of trained fieldworkers visited participants in their homes and completed a risk factor and dietary questionnaire. The risk factor questionnaire covered aspects of urbanisation, socio-economic items, family history of ischaemic heart disease and related diseases, smoking habits and physical activity patterns, as well as items on health actions taken and attitudes to selected risk factors. The dietary questionnaire consisted of questions on habitual intake and a 24-hour recall. Anthropometric and blood pressure measurements were recorded. A non-fasting blood sample for lipid determinations was collected with minimal stasis. The blood was placed into ethylenediamine tetra-acetic acid tubes, kept on ice and centrifuged within 6 hours at 4°C to separate the plasma.

The fieldworkers, a panel of 14 registered nursing sisters, attended a 5-day training course to ensure uniform interview techniques, standardised measuring procedures and competence at taking blood samples. Height was measured to the nearest 0,5 cm using a metal measuring tape against a wall and a flat headboard at right angles to the wall to ensure correct reading. Mass was determined on a good-quality bathroom scale with the subject in light clothing and without shoes. The bathroom scales were standardised weekly against a beam balance to determine the zero setting. Thereafter, in the field, the fieldworker's own weight was used as a reference before weighing each participant. Mid-upper-arm circumference was measured to the nearest 0,5 cm.

The blood pressure was recorded after the risk factor questionnaire had been completed to ensure that subjects had been seated for at least 5 minutes. A mercury manometer connected to a standard 12,5 × 23 cm cuff was used for participants with a mid-upper-arm circumference of less than 33 cm and a larger cuff of 15,5 × 32,5 cm for participants with an arm circumference of over 33 cm. The American Heart Association[9] guidelines for measuring blood pressure were applied. The diastolic blood pressure was taken as the point of disappearance of the Korotkoff sound (phase V). Three intermittent readings were taken and recorded. The lowest diastolic reading was used for the analyses. Training in blood pressure readings continued over a 8-week period, using a double-headed stethoscope prior to the training course. During the 5-day training the sisters were again standardised by an experienced reference person (J.F.) until their readings attained a correlation coefficient of above 0,95.

The plasma was kept at 4°C and analysed within 24 hours. The total cholesterol (TC) and high-density lipoprotein cholesterol (HDLC) levels were measured on a Gilford auto-analyser using the Boehringer Mannheim CHOD-PAP enzymatic method. HDLC was measured after precipitation of the apoprotein-B-containing lipoproteins with manganese heparin. The non-fasting triglyceride levels were determined by the Boehringer Mannheim enzymatic Peridochrom method. In each case the Gilford auto-analyser was calibrated against Preciset Cholesterol. Control sera used were Precinorm L as an external and a pooled plasma as an internal control.

Analyses

For the major risk factors — hypercholesterolaemia, hypertension and smoking — prevalence was determined by considering two levels of severity. For hypercholesterolaemia the action limits of the Heart Foundation of Southern Africa were used to classify a participant as having high or moderate risk for IHD.[10] The HDLC/TC ratio was accepted as protective at 20% or higher.[11] The World Health Organisation definition of hypertension (⩾ 160/95 mmHg and/or taking antihypertensive medication) was taken as the high-risk level[12] and mild hypertension was defined as a blood pressure above 140/90 mmHg but below 160/95 mmHg. Smoking 10 or more cigarettes per day is defined as imparting a high level of risk, while the use of any other tobacco products or less than 10 cigarettes per day is considered as imparting a moderate level of risk. The body mass index (BMI) (weight/height^2) was used with cut-off points for obesity at BMI 30 or higher and for overweight at BMI 25 or higher for men and 24 or higher for women.[13]

To consider the overall risk in the population, the three major risk factors — hypertension, hypercholesterolaemia and smoking — at high level of risk were looked at in the following combinations: all three major risk factors present, any two of the three risk factors present, any one of the risk factors present, and one or more than one risk factor present.

The prevalence rates of risk factors in the black population as well as in other South African population groups[3-5] were age-standardised against an international reference population[14] to facilitate comparisons.

Since the 55 - 64-year-old age group was proportionally over-represented in the sample by design and over- and under-sampling occurred in certain areas, a weighted analysis was done.

Results

A total of 986 persons aged 15 - 64 years participated in the study (Table I). Analyses of selected sociodemographic factors indicated that about 55% of participants lived in formal housing and the rest in shacks, hostels and tents. Electricity was available to about 45% of participants and water inside their dwelling to about 55%.

TABLE I. THE STUDY POPULATION

Age groups (yrs)	Males	Females
15 - 24	**150**	**171**
25 - 34	**110**	**147**
35 - 44	**84**	**109**
45 - 54	**56**	**64**
55 - 64	**42**	**53**
15 - 64	**442**	**544**

Participants' exposure to the media was fairly evenly distributed over the age groups, with about 83% having listened to the radio every day, 55% having watched television during the previous week and 30% having read a newspaper during the previous week.

TABLE II. DESCRIPTIVE STATISTICS OF RISK FACTORS FOR ISCHAEMIC HEART DISEASE (MEAN (SD))

	Age groups (yrs)											
	Males						Females					
	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64
TC (mmol/l)	3,6 (0,9)	4,0 (0,8)	4,2 (1,5)	4,2 (1,0)	4,7 (0,7)	4,0 (1,0)	3,8 (1,0)	4,1 (0,9)	4,4 (0,9)	4,7 (1,0)	5,1 (0,7)	4,2 (1,0)
HDLC (mmol/l)	1,3 (0,3)	1,4 (0,4)	1,4 (0,5)	1,3 (0,4)	1,4 (0,4)	1,3 (0,4)	1,3 (0,3)	1,4 (0,4)	1,4 (0,4)	1,4 (0,3)	1,5 (0,3)	1,4 (0,3)
HDLC/TC ratio	37,7 (9,5)	35,6 (11)	34,2 (11)	32,3 (11)	30,6 (10)	35,2 (10,6)	34,9 (9)	35,1 (9)	33,8 (10)	31,2 (8)	29,7 (6)	34,1 (9,2)
Diastolic BP (mmHg)	69 (10)	75 (10)	76 (12)	81 (15)	88 (13)	75 (12)	68 (8)	72 (11)	77 (11)	82 (12)	88 (12)	73 (12)
Systolic BP (mmHg)	111 (11)	116 (11)	119 (15)	124 (17)	136 (19)	117 (15)	107 (9)	113 (13)	117 (14)	127 (18)	139 (18)	114 (16)
No. of cigarettes smoked per day	8,0 (5,8)	9,9 (7,6)	10,7 (7,4)	9,2 (9,6)	10,2 (9,9)	9,6 (7,7)	5,5 (5,5)	4,0 (3,0)	8,2 (5,5)	0,4 (0,8)	3,4 (3,2)	4,3 (4,1)
BMI (weight/height^2)	21,5 (3)	23,4 (3,7)	24,4 (4,8)	24,5 (4,4)	27,4 (4,3)	23,4 (4,2)	24,8 (4,4)	27,8 (6,2)	30,3 (6,7)	31,7 (5,5)	31,9 (5,1)	27,8 (6,2)

For both males and females the lowest rate of unemployment was in the 35 - 44-year age group. Overall 41,4% of males and 59,3% of females were not working. Of those who worked 84,4% of males and 73,9% of females worked in the formal sector while the rest worked in the informal sector.

The mean TC level for males was 4,0 mmol/l and for females 4,2 mmol/l (Table II). The degree of increase in TC levels over the age deciles for both males and females was small. The HDLC levels were high in all sub-groups but the HDLC level for the females was not higher than that for the males. The mean HDLC/TC ratio for males was 35,2% and that for females 34,1%.

Both the diastolic and systolic blood pressure increased with age. The mean diastolic blood pressure for males was 75 mmHg and for females 73 mmHg. The mean systolic blood pressure for males was 117 mmHg and that for females 114 mmHg.

The prevalence of the major risk factors for IHD is shown in Table III. The prevalence is expressed at a high and a moderate level of risk. Very few participants (only 1,1% of males and 2,3% of females) had hypercholesterolaemia at a high level of risk, in contrast to 15,4% of males and 23,5% of females who had a moderate level of risk. Owing to the high level of HDLC a total of 96% of males and 96,1% of females had a HDLC/TC ratio above 20%, which imparted protection against IHD.

The prevalence of hypertension at a high level of risk increases dramatically with age. In most age deciles there were more hypertensives in the high-risk category than in the moderate-risk category. Overall 14% of participants had an increased IHD risk due to a moderately or highly elevated blood pressure as calculated from Table III.

From Table III it can also be seen that very few females reported smoking — 8,4%, compared with 52% of males. The mean smoking rate was 9,6 and 4,3 cigarettes per day for male and female smokers respectively (Table II). Smoking accounts for the bulk of IHD risk in the black males of the Cape Peninsula, with 52% of males and only 8,4% of females using any tobacco. Of the males 24,7% and of the females only 1,6% smoked 10 or more cigarettes per day. Overall more females than males were overweight or obese, with a mean BMI of 27,8 for females and 23,4 for males.

In an effort to assess the overall IHD risk in the population the prevalence of a combination of the major risk factors at a high level of risk was calculated (Table III). Overall 30,8% of males and 12,5% of females had at least one risk factor. About 50% of both the males and females who have such a risk were in the age group 55 - 64 years. For males higher prevalences of at least one risk factor occurred at much lower age deciles than for females.

Regarding the minor risk factors the high level of obesity among females is an outstanding feature, with 44,4% of females having a BMI of 30 or greater; this applied to only 7,9% of males. Of those who worked, 42,6% of males and 27,3% of females were involved in a minimum of physical activity at work; 37,8% of males and 34,5% of females participated in no exercise outside working hours.

Discussion

With rapid urbanisation of the black population there is concern over concomitant adoption of the lifestyles of typical industrialised populations, which would increase levels of risk factors for diseases such as IHD and CVD.[15-17] This in turn raises the possibility of increased mortality from IHD and CVD in the future. With the possible upward social mobility of the black population of South Africa in the decades to come, it is essential to prevent increased mortality from those

TABLE III. PREVALENCE (%) OF IHD RISK FACTORS IN THE CAPE PENINSULA BLACK POPULATION AGED 15 - 64 YEARS

	Age groups (yrs)											
	Males						Females					
	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64
Hypercholesterolaemia high-risk category*	3,1	0	0,7	0	0	1,1	4,8	0,9	0	1,7	2,1	2,3
Hypercholesterolaemia moderate-risk category	15,8	22,6	9,7	11,1	9,7	15,4	25,2	21,8	22,2	24,0	25,3	23,5
Protective HDLC/TC ratio ⩾ 20%	97,6	97,5	97,2	89,5	90,3	96,0	96,7	98,4	94,7	93,8	88,8	96,1
Hypertension (BP ⩾ 160/95 mmHg) and/or on treatment*	2,9	3,6	6,6	14,2	40,3	7,7	0	4,0	9,4	37,7	44,2	8,9
Mild hypertension (BP ⩾ 140/90 but < 160/95 mmHg)	0	4,9	4,9	27,9	11,6	6,7	0	3,6	9,2	11,2	14,9	4,8
Smoking ⩾ 10 cigarettes/d*	11,8	29,1	41,3	22,2	18,6	24,7	0,6	1,8	2,8	0	7,1	1,6
Smoking other tobacco products or < 10 cigarettes/d	23,6	31,3	26,5	27,5	31,0	27,3	2,6	10,3	3,9	14,0	15,3	6,8
Combination of risk factors at high level of risk												
One IHD risk factor	17,6	30,4	38,4	25,9	40,3	28,1	5,3	6,6	12,2	36,1	49,3	12,3
Two IHD risk factors	0	1,2	5,2	5,3	9,3	2,7	0	0	0	1,6	1,9	0,3
One or more IHD risk factors	17,6	31,6	44,0	31,2	49,6	30,8	5,3	6,6	12,2	37,7	51,3	12,5
Obesity BMI ⩾ 30	1,3	5,5	10,7	10,7	28,6	7,9	12,9	30,6	47,7	59,4	54,7	44,4
Inadequate physical activity												
Work entails sitting and standing	37,3	46,5	48,7	38,5	40,7	42,6	26,1	31,5	28,3	24,7	11,4	27,3
No exercise outside working hours	26,5	40,8	45,0	45,0	43,0	37,8	33,0	43,0	26,3	32,8	36,0	34,5

* The risk factors used to calculate the prevalence of the combination of the risk factors.

diseases while simultaneously reducing the current high mortality rates for disease of under-development.

The overall risk profile identified in this study shows that the urban male black population of the Cape Peninsula already has considerable IHD risk. About 30,8% of males aged 25 years and above have at least one risk factor. It is of particular concern that in the oldest age group (55 - 64 years) among both men and women more than half the participants had at least one IHD risk factor.

Among males the bulk of the risk is due to the smoking of cigarettes, while among females the biggest contribution to the risk profile is made by hypertension. For the determination of this overall risk factor profile only the high level of risk was considered, but from Table III it can be seen that overall many more participants were exposed to moderate levels of risk than to high levels of risk.

An outstanding feature of this population is the high level of HDLC and the high prevalence of protective HDLC/TC ratios. This suggests that in this population the TC level does not accurately reflect the true IHD risk level found in the low-density lipoprotein cholesterol (LDLC) level, as would be the case in a typical white population.[5] Furthermore, it follows that the mean LDLC level in this black population is at present still at a safe low figure.

It is encouraging that so few black women smoke. Strategies will be necessary to maintain this low rate in the decades to come, but more pressing is the need to prevent black men from smoking. Strebel *et al.*[18] found that black South African males living in cities for 5 or more years had higher smoking rates than those exposed to the urban environment for a shorter time. The promotion of tobacco products needs to be curtailed, and smoking cessation programmes are necessary for the townships. Above all, smoking prevention programmes must be incorporated in the primary school curriculum. The development of such programmes for 10-year-old black children in Guguletu, Cape Town, has been initiated by the work of Hunter *et al.*[19,20] This work needs to be extended.

The high prevalence of obesity, particularly among older black women, has partially contributed to the development of hypertension in this group. Although the obsession with thinness common in western society these days should be avoided, it will be important to address the issue of obesity in so large a number of women to prevent hypertension and its sequelae such as IHD and CVD. The high degree of obesity could possibly explain the fact that the HDLC level for females is comparable to that for males. This is not the case in populations with less obesity in females.[5] When comparing published risk profiles of the South African ethnic groups[3-5] (Fig. 1) it was found that for both males and females the black

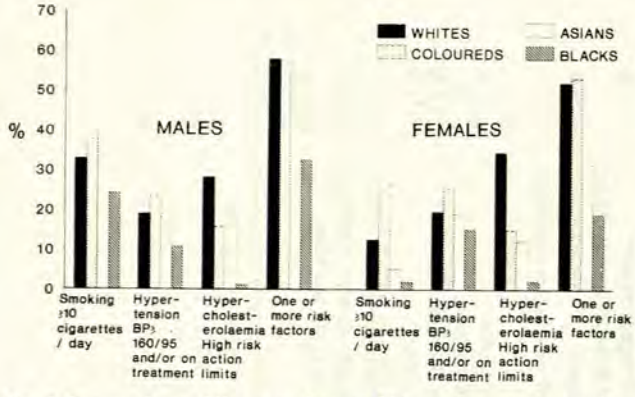

Fig. 1. Comparison of the prevalence of the major coronary artery disease risk factors in South African populations at a high level of risk.

population has lower prevalence rates for all three of the major risk factors compared with whites, Asians and coloureds. In particular the low rate of hypercholesterolaemia among blacks deserves mention. The percentage of black males who have at least one major risk factor is about half the figure for white, Asian or coloured males, and the figure for black females is less than half that for whites or coloureds.

Over 80% of the black participants listened to the radio every day and about 55% watched television at least once a week. This high level of exposure to these media suggests that these will be ideal ways to reach the black population to promote a healthy lifestyle. The tobacco industry utilises the radio extensively, with 16% of all radio advertising being dedicated to the promotion of tobacco sales.[21]

In conclusion, it needs to be stressed that epidemics of IHD and CVD as seen in white, Asian and coloured South Africans can still be prevented in the black population, but preventive measures must be rapidly instituted. Before that can happen the prevention of chronic degenerative diseases such as IHD, CVD, emphysema and lung cancer in the black population should be incorporated into evolving primary health care services. The essential aspects of such primary health care planning must include national media-based campaigns, promotion of a healthy lifestyle in the school curricula, and early detection of hypertension in a community-based setting. The latter could be based on chronic disease clinics such as those developed and tested in the CORIS study.[22] The most pressing need and possibly the most cost-effective development is for schools to teach a healthy lifestyle from an early age.

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