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**Psychosocial risk factors for coronary heart disease in
UK South Asian men and women**

Psychosocial factors and CHD in South Asians

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Psychosocial risk factors for coronary heart disease in UK South Asian men and women

Abstract

Background: South Asian people in the UK and other Western countries have elevated rates of coronary heart disease (CHD). Psychosocial factors contribute to CHD risk, but information about psychosocial risk profiles in UK South Asians is limited. This study aimed to examine the profile of conventional and novel psychosocial risk factors in South Asian compared with white men and women.

Methods- Using a cross-sectional population study design, psychosocial profiles were assessed in 1130 South Asian and 818 white European healthy men and women aged between 35 and 75 years, who had previously participated in a cardiovascular risk assessment programme in West London. Psychosocial factors potentially contributing to CHD risk were assessed using standardised questionnaires.

Results: UK South Asians reported significantly higher psychosocial adversity compared with UK whites. South Asian men and women experienced greater chronic stress in the form of financial strain, residential crowding, family conflict, social deprivation and discrimination than white Europeans. They had larger social networks, but reported lower social support and greater depression and hostility. These effects were largely independent of socioeconomic status.

Conclusion: UK South Asians experience significant psychosocial adversity compared with UK white Europeans. This is consistent with the heightened vulnerability to CHD observed in this population.

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South Asian people (originating from the Indian subcontinent) living in the United Kingdom (UK) and other Western countries suffer significantly higher rates of coronary heart disease (CHD) than other ethnic groups.^{1,2} The risk is between 40 to 60% higher in UK South Asians than the UK general population.³ Numerous biological factors may contribute to this ethnic group difference. The INTERHEART case-control study showed that South Asian myocardial infarction (MI) patients in South Asian countries have similar biological risk profiles to other ethnic groups.⁴ Conventional risk factors such as hypertension, hypercholesterolaemia, and smoking do not appear to fully account for the high rates of heart disease in UK South Asians. However, South Asians have higher rates of diabetes and insulin resistance than whites,⁵ lower high-density lipoprotein cholesterol,⁶ and a greater predisposition for central obesity.⁷ C-reactive protein, an acute phase reactant and a sensitive marker of inflammation, has been found to be higher in UK South Asians compared with white Europeans in some studies⁸ but not others.⁹

Psychosocial factors have been repeatedly shown to influence CHD risk in European white populations.¹⁰ Factors such as depression¹¹ and chronic work stress¹² are independently associated with increased risk of heart disease, while social networks and support appear to be protective.¹³ Sex differences in psychosocial experience have been observed in South Asian and other populations.^{14,15} The study of psychosocial risk factors in South Asian communities in the UK and other Western countries has been limited to individual constructs such as social networks and work stress, often in relatively small samples.¹⁵⁻¹⁸ The purpose of this study was to compare UK South Asian and white European population samples across a comprehensive range of psychosocial risk factors for CHD.

METHODS

Participants were a subsample of the London Life Sciences Prospective Population (LOLIPOP) study, an ongoing population cohort of around 30,000 South Asian and white European men and women aged 35-75 being recruited from 58 general practices in West London for the investigation of genetic and risk factors for CHD.¹⁹ The response rate was 62%. The subsample was randomly selected from the LOLIPOP database for more intensive cardiovascular screening as detailed elsewhere.²⁰ People with documented life-limiting illnesses, including CHD, were excluded. Potential participants were contacted by mail; individuals who agreed to participate were sent a standardised psychosocial questionnaire to be completed prior to their first hospital appointment. The response rate was 83%. The questionnaire was translated into Punjabi by a specialist external company, using back translation techniques and stringent verification procedures. Bilingual researchers were available to support participants experiencing difficulty completing the questionnaire. Data were collected from 1948 male and female participants between 2004 and 2006; 1130 of the sample were South Asian (69 % male) and 818 were white European (74% male). The study was approved by the Ealing Hospital Local Research Ethics Committee, and written consent was obtained.

Questionnaire measures

The psychosocial questionnaire was divided into measures of socioeconomic factors, chronic stressors, protective social factors, and psychological variables. The composite questionnaire was tested in a preliminary interview-based study with 142 participants, and was found to be comprehensible and acceptable.²¹

Socioeconomic status

The principal measure of SES was household income, grouped into tertiles; =< £20,000, £20,000-£35,000, => £35,000. Educational achievement, categorised as above or below secondary school, and age of leaving full-time education were obtained. An eleven-item scale of household consumables, designed to be sensitive to SES in ethnic minorities, was included to indicate material deprivation.²² An adaptation of the Townsend Material Deprivation Index²³ measured social deprivation, comprising car and home ownership, residential overcrowding, and unemployment. Scores ranged from 0-2, with 2 indicating elevated deprivation.

Chronic stress

Residential crowding was defined as living in a home with more than one person per room, as used in the U.S. Census and elsewhere.²⁴ Financial strain was measured with an adaptation of Pearlin's economic strain scale.²⁵ Scores were scaled from 0-100, with higher scores reflecting greater financial strain (Cronbach $\alpha = 0.91$). Social cohesion, an indicator of social capital, was measured using a five-item scale, developed for neighbourhood studies in Chicago.²⁶ Potential responses ranged from *very unlikely* to *very likely*, with scores ranging from 0-100 (Cronbach $\alpha = 0.86$). A modified version of the Issues Checklist scale assessed parental-child family conflict;²⁷ scores ranged from 0-50, with higher scores reflecting higher family conflict (Cronbach $\alpha = 0.85$).

Of the respondents, 1236 (64.3%) were in paid employment, 456 (23.7%) were retired, and 230 (12.0%) were unemployed. Work stress was assessed using the job strain and effort/reward imbalance model, with adaptations of measures used in the Whitehall II study.¹² Components of these models were each assessed with 4-9 items, and scaled to range from 0-100. Job strain was calculated by dividing demands by decision latitude (control plus skill discretion),

and effort-reward imbalance by dividing effort by reward. Cronbach's α scores ranged from 0.55 to 0.88.

Two measures assessed racial discrimination. First, participants were asked whether they had experienced any racially-motivated attack in the last 12 months, in terms of verbal abuse, physical attack, vandalism or destruction to property.²⁸ Second, they completed the perceptions of discrimination scale;²⁹ six questions measuring exposure to ethnically-motivated discrimination (e.g. treatment by the police) over the last five years. Total discrimination scores (0 to 12) were created (Cronbach $\alpha = 0.57$).

Social relationships

Quality of social support was measured using five questions from the social support inventory developed for the Enhancing Recovery in CHD study, with scores ranging from 0-25 (Cronbach $\alpha = 0.93$).³⁰ Negative aspects of social support were measured with two items derived from the MacArthur social support scales (Cronbach $\alpha = 0.68$).³¹ Scores ranged from 0-8. Social networks were assessed using the Social Network Index.³² Greater values represented more diverse social networks, ranging from 0 - 12.

Psychological factors

Depression was measured using the Center for Epidemiologic Studies of Depression Scale (CES-D), in the week preceding interview.³³ Total scores ranged 0-60; higher scores reflected greater depression (Cronbach $\alpha = .91$). Optimistic traits were assessed using the Life Orientation Test (LOT-R), with scores scaled from 0-24.³⁴ Cronbach's α scores for the LOT-R were .75 for whites but only .59 for South Asians. The Cook-Medley Hostility Scale was also administered (Cronbach $\alpha = .81$).³⁵ Total scores ranged from 0-26.

An adaptation of the Santa Clara Strength of Religious Faith scale assessed religiosity in both ethnic groups.³⁶ The four items (e.g. 'Religious faith is extremely important to me') were rated on a four-point scale from *strongly disagree* to *strongly agree*, with total scores ranging 0-12 (Cronbach $\alpha = 0.93$).

Statistical analysis

The requirement for normal distribution for the data was established prior to analyses; the distribution was satisfactory. No multi-collinearity was identified between the variables in the models. Ethnic group comparisons were performed separately for men and women because previous literature indicates sex differences in the experience of psychosocial adversity.^{14,15} Sex by ethnicity interactions observed in earlier analyses of these data support this. Comparisons between groups included analyses of covariance for continuous variables, with ethnicity as a between-subject factor, and comparisons of categorical variables were made using chi-square tests. Ethnic group comparisons were adjusted for age, with age modelled as a continuous variable. Data are presented as means with standard deviation or standard error values, or percentages. Partial Eta Squared values indicate effect sizes. In separate analyses, total household income was included as a covariate to establish whether ethnic group differences were secondary to socioeconomic differences. The significance level was set at $p < .05$ for most analyses, except for the work stress constructs, where, to avoid Type 1 errors, a more stringent significance level of $p < .001$ was used. All analyses were performed using SPSS 14.0.

RESULTS

Demographic information

The average age of the participants was 56.4 ± 10.2 years. Men were significantly older than women (57.4 vs. 54.0 years, $p < .001$), and South Asian women were significantly younger than white women ($p < .001$). The large majority of the South Asian sample (94.9%) had been born outside the UK, in India (54.8%), Pakistan (10.1%), East Africa (17.9%), Sri Lanka (4.7%) and Bangladesh, residing in the UK for an average of 29.2 ± 11.7 years. Over two-thirds of the South Asians spoke Punjabi as their mother tongue. Overall, 81.3% of the sample were married/co-habiting with partners, however, South Asians were more likely to be married ($p < .001$). They also had more children ($p < .001$) and living in larger households than white Europeans ($p < .001$), but were less likely to own a car ($p = .004$). There was no difference in employment status between South Asian and white men, but white women were more likely to be employed than South Asian women (74.7% vs. 65.6%, $p = .005$). There was no ethnic group difference in levels of self-employment.

Socioeconomic variables

Overall, South Asians fared worse on socioeconomic markers (Table 1). The mean household income ranged between £25,000 - £35,000, but was higher in white Europeans ($p < .001$), and UK South Asians had higher levels of social deprivation ($p < .001$). There was no ethnic group difference in educational attainment in men, but South Asian men finished full-time education at an older age ($p < .001$). White women had greater educational attainment than South Asian women ($p < .001$). South Asian men reported owning more household consumables than white men ($p < .001$). Home ownership was not related to ethnicity. Ethnic group differences in education, crowding, and social deprivation remained significant after the inclusion of income as a covariate.

Table 1: Demographic and socioeconomic information

		Age-adjusted					
		South Asian men n = 776	White men n = 606	Partial η^2	South Asian women n = 354	White women n = 212	Partial η^2
Age (in years)		57.2 (10.3)	57.7 (10.2)		52.9 (9.0)	55.9 (10.1)***	
Marital status-	Married	89.2%	71.4%***‡	.052	82.12%	59.9%***‡	.059
No. of children		2.55 (0.45)	2.06 (0.56)*** ‡	.037	2.58 (0.64)	1.66 (0.85)*** ‡	.121
No. of people in household		4.16 (0.06)	2.75 (0.06)*** ‡	.167	4.20 (0.09)	2.84 (0.11)*** ‡	.140
Income	< £20,000	38.0%	37.1%	.050	38.3%	36.0%	.010
	£20,000-£35,000	31.1%	21.8%		25.4%	21.3%	
	> £35,000	30.8%	41.1%**		36.3%	42.7%*	
Home ownership		81.0%	80.7%	.000	84.5%	82.9%	.000
Car ownership		81.6%	85.7%*	.003	68.5%	80.0%**‡	.016
Paid employment		63.0%	65.7%	.001	56.1%	70.9%***‡	.026
Self-employed		20.1%	24.7%	.003	7.2%	9.6%	.002
Educational attainment:	Lower	44.0%	43.6%	.000	56.6%	42.4%	.019
	Higher	56.0%	56.4%		43.4%	57.6%**‡	
Age completing education		19.8 (0.16)	17.7 (0.17)*** ‡	.060	18.1 (0.26)	18.1 (0.31)	.000
Household consumables		9.01 (0.07)	8.62 (0.07)***‡	.011	8.97 (0.09)	8.87 (0.12)	.001
Social deprivation		0.68 (0.03)	0.38 (0.03)*** ‡	.040	0.73 (0.04)	0.41 (0.05)*** ‡	.044

Values are means (SD or SE), %, and Partial η^2 . Significant ethnic group difference, * $p < .05$, ** $p < .01$, *** $p < .001$. ‡ Significant ethnic group difference remains after adjustment for SES, $p < .05$.

Chronic stressors

UK South Asians were exposed to greater chronic stress (Table 2). South Asians reported more residential crowding ($p < .001$), and were more disadvantaged in terms of financial strain ($p < .001$), social cohesion ($p < .001$), and family conflict ($p < .001$). The ethnic group difference in financial strain in women was influenced by SES, so was no longer significant after adjustment for income. Hours of paid work varied by sex ($p < .001$), but not by ethnic group. White European men reported significantly higher job demands ($p = .001$), job control ($p < .001$), effort at work ($p < .001$) and rewards ($p < .001$) than South Asian men. The pattern was different for women, with South Asian women having higher job control ($p = .001$) and marginally higher work effort ($p = .016$). White Europeans enjoyed greater social support at work than UK South Asians ($p < .001$), however there were no ethnic group differences in job strain or effort-reward imbalance in either gender, independent of socioeconomic factors. 9.5% of South Asian men and 8.4% of women had personal experience of racial harassment over the past 12 months, although after controlling for income, this ethnic group difference was no longer significant. There were, however, marked ethnic group differences in the proportion of the sample that had a strong perception of discrimination; this persisted after controlling for SES as defined by income ($p < .001$). Similar results emerged when SES was defined by the household consumables scale.

Table 2: Chronic stressors

	Age-adjusted					
	South Asian men n = 776	White men n = 606	Partial η^2	South Asian women n = 354	White women n = 212	Partial η^2
Residential crowding	34.4%	4.0%***‡	.14	29.1%	4.3%***‡	.09
Financial strain	3.82 (0.14)	2.93 (0.16)***‡	.01	4.09 (0.21)	3.24 (0.28)*	.01
Social cohesion	58.6 (0.70)	61.0 (0.79)*	.00	61.3 (1.02)	65.3 (1.33)*‡	.01
Family conflict	10.9 (0.39)	8.55 (0.50)***‡	.02	14.2 (0.58)	10.2 (1.00)**‡	.03
Work hours per week	42.1 (0.53)	41.2 (0.59)	.00	34.3 (0.79)	32.7 (0.97)	.01
Work stress (0-100)						
Demands	47.1 (1.07)	52.4 (1.25)***‡	.01	36.6 (1.53)	32.5 (1.90)	.01
Control	48.3 (1.15)	54.6 (1.35)***‡	.01	49.5 (1.56)	41.0 (1.91)	.03
Job strain	1.34 (0.10)	1.19 (0.12)	.00	0.92 (0.09)	1.11 (0.11)	.01
Skill discretion	48.7 (1.02)	53.7 (1.20)***‡	.01	45.3 (1.44)	34.7 (1.78)***‡	.06
Decision latitude	48.4 (0.99)	54.1 (1.16)***‡	.02	47.5 (1.29)	38.0 (1.60)***‡	.06
Effort	45.2 (1.22)	56.2 (1.43)***‡	.04	32.1 (1.55)	26.1 (1.92)	.02
Rewards	28.1 (0.56)	33.9 (0.65)***‡	.05	23.1 (0.72)	21.1 (0.88)	.01
Effort-reward imbalance	1.74 (0.07)	1.63 (0.08)	.00	1.55 (0.11)	1.23 (0.13)	.01
Work support	45.4 (1.06)	57.0 (1.26)***‡	.06	33.7 (1.44)	32.8 (1.79)	.00
Experience of racism	9.5%	6.3%*	.00	8.4%	3.0%*	.01
Discrimination	34.4%	19.7%***‡	.03	35.6%	11.2%***‡	.07

Values are means (SD or SE), %, and Partial η^2 . Significant ethnic group difference, * $p < .05$, ** $p < .01$, *** $p < .001$. ‡ Significant ethnic group difference remains after adjustment for SES, $p < .05$.

Table 3: Social and psychological characteristics

	Age-adjusted					
	South Asian men n = 776	White men n = 606	Partial η^2	South Asian women n = 354	White women n = 212	Partial η^2
Social support	19.0 (0.18)	20.1 (0.20)*** ‡	.01	19.7 (0.24)	20.6 (0.31)*	.01
Negative support	2.88 (0.07)	2.48 (0.07)*** ‡	.01	3.13 (0.10)	2.71 (0.13)* ‡	.01
Social network	5.30 (0.07)	4.96 (0.08)** ‡	.01	5.53 (0.09)	5.18 (0.12)* ‡	.01
Depression	14.5 (0.35)	11.7 (0.39)*** ‡+	.02	16.2 (0.57)	12.8 (0.73)*** ‡+	.03
Optimism	13.4 (0.11)	14.1 (0.13)*** ‡	.01	13.4 (0.19)	14.4 (0.24)** ‡	.03
Hostility	13.6 (0.19)	12.1 (0.21)*** ‡	.01	13.4 (0.29)	9.53 (0.37)*** ‡	.02
Strength of religious beliefs	6.99 (0.13)	5.73 (0.15)*** ‡	.03	8.38 (0.17)	5.05 (0.22)*** ‡	.20

Values are means (SD or SE), %, and Partial η^2 . Significant ethnic group difference, * $p < .05$, ** $p < .01$, *** $p < .001$. ‡ Significant ethnic group difference remains after adjustment for SES, $p < .05$.

Social and psychological factors

UK South Asians reported lower social support ($p < .001$) and greater negative support ($p < .001$, Table 3). In contrast, South Asian men and women had larger social networks than whites ($p < .001$), independently of socioeconomic variations.

Depression scores were substantially higher in UK South Asians ($p < .001$), and higher in women than men ($p = .002$). Ethnic group differences persisted after controlling for SES and medication. The South Asian group also reported lower optimism ($p < .001$) and elevated hostility ($p < .001$) compared with whites. Depression, optimism, and hostility were associated with SES, but ethnic group differences were independent of SES.

Strength of religious beliefs was significantly higher in the South Asian community ($p < .001$). These effects were not influenced by socioeconomic factors.

DISCUSSION

This study aimed to address the paucity of research into the potential psychosocial contribution to CHD risk in South Asians living in Western countries. Previous studies have involved smaller samples and have not employed comprehensive psychosocial assessments.¹⁶⁻¹⁸

UK South Asians in this study experienced significant disadvantage compared with their white counterparts across a range of psychosocial factors which have previously been related to CHD risk, including chronic stressors, psychological characteristics, and protective social factors.

SES was consistently lower in UK South Asians than UK whites in this sample, substantiating previous work.³⁷ The only SES marker not to replicate this pattern was educational attainment in men. Education fails to reflect the socioeconomic position of immigrants in part because of the discriminatory way that qualifications achieved abroad are viewed in the UK.³⁷ Although sometimes used as a marker of SES,³⁸ residential crowding, shown to be higher among South Asians, is also

culturally determined. Living in multigenerational homes helps to maintain traditional values, and share family expectations across generations,³⁹ although can also be associated with considerable stress.⁴⁰

The stress profiles of the ethnic groups were strikingly different, with the South Asians at a clear psychosocial disadvantage. They experienced significantly more chronic stress in terms of financial strain, social cohesion, family conflict and racial discrimination. Ethnic differences were generally maintained after adjustment for socioeconomic variations. Chronic stressors have been repeatedly linked with increased risk of CHD in other populations.¹⁰ The work stress results, however, were more complicated. The summary measures – job strain and effort/reward imbalance – did not differ between ethnic groups, because the lower levels of job control and job rewards in South Asians were compensated by fewer demands and less effort. Work social support was, however, lower in South Asian than white European men. Hemingway et al. previously reported that South Asians experienced higher effort-reward imbalance and lower work social support than UK whites.¹⁷ However, that sample were all employed in the British Civil Service, so are not typical of the general population. A study of the South Asian community in north-east England found no ethnic differences in work stress.¹⁶ A higher proportion of self-employed participants working in small businesses in this study may have influenced the observed pattern of work stress. In the present study, self-employment rates were comparable between ethnic groups.

Social networks and support are thought to buffer the impact of chronic stress.¹⁰ In the present study, UK South Asians had larger social networks than white Europeans, but reported lower social support and more negative social interactions. Williams et al. have previously shown that UK South Asian women report lower social support than the general population.¹⁴ The high levels of negative interactions in UK South Asians is consistent with the elevated rates of family conflict, and may be the result of increased pressures and expectations from family or community.⁴⁰ Pollard et al. investigated

social networks in UK South Asians and showed that South Asians living in north-east England lived in larger households than whites but had less contact with friends and relatives.¹⁸ However, our findings indicate more extensive and diverse social networks in South Asians in London, a pattern that may reflect geographic differences. Nevertheless, the low levels of social support indicate that the South Asian participants were not protected from greater chronic stress exposure by enhanced social relationships.

Psychological characteristics linked to CHD were also shown to disadvantage the South Asian group. On average, their depression scores were very high. Depression is an independent predictor of future heart disease, and of adverse prognosis following MI.¹¹ Hostility is a personality trait previously linked with coronary artery calcification⁴⁰ and CHD.¹⁰ South Asian men and women reported substantially elevated hostility levels compared with their white counterparts, corroborating previous findings.¹⁷ Optimism is associated with reduced risk of future heart disease and may stimulate adaptive coping with stress.⁴² The South Asian group were less optimistic than white Europeans, however the internal consistency for this scale was very low in South Asians and therefore these results should be treated with caution.

In this study, the South Asian group revealed almost double the level of religiosity of white Europeans, which supports recent national surveys in the UK.⁴³ Some studies suggest that there are protective effects of religiosity,^{44,45} although the association between religious faith and cardiovascular disease is contentious.

These results indicate that psychosocial factors related to CHD cluster together.¹⁰ South Asian participants were disadvantaged across the range of psychosocial factors, suggesting that low SES, elevated chronic stress exposure, maladaptive psychological characteristics and poor social resources are likely to be interrelated. However, the variance accounted for by ethnic group for each of the

psychosocial variables was relatively small, indicating that other social circumstances and personal factors also make important contributions.

Psychosocial risk factors may influence CHD development through effects on health behaviours such as smoking and exercise, or through direct physiological mechanisms. Psychosocial factors stimulate sympathetic nervous system activation, endothelial dysfunction, adrenocortical regulation, the release of proinflammatory cytokines, and prothrombotic responses.^{46,47} These responses may in turn promote coronary atherogenesis, and acute processes contributing to the triggering of MI.⁴⁸

The strength of this study is that a large sample of South Asians from the general population was investigated with standardised measures of psychosocial risk factors. However, there are a number of limitations. Although the response rate for the psychosocial assessment was high (83%), the parent study from which the sample was drawn had a lower response rate, primarily because it involved a time-consuming protocol with assessments in three separate hospitals. Despite no ethnic group differences in recruitment, it is likely that selection biases were operating, with responders more likely to be socioeconomically advantaged and healthier than non-responders. This study involved individuals without known CHD, and biological indicators were not included in this analysis. Associations with CHD risk have not therefore been demonstrated directly. The analyses presented in this paper consider South Asians as a single group but it is important to recognise the heterogeneity between subgroups. UK South Asians of Indian, Pakistani and Bangladeshi origin vary in terms of socioeconomic experiences,²² CHD incidence and risk profiles.^{22,49} The majority of participants in this study were Punjabi Sikhs, but future analyses will compare the experience of South Asians with different backgrounds. Data were collected by questionnaire, so are dependent on self-report. Although we were careful to administer measures in the language and format most suited to

individuals, differences in the interpretation of psychological, social and health-related questions between cultural groups cannot be ruled out.⁵⁰

Nevertheless, the study provides evidence that UK South Asian men and women suffer excessive psychosocial adversity compared with UK whites. This may be relevant to the high burden of CHD in South Asians living in the UK. Studies relating psychosocial factors with cardiovascular risk indicators are needed, together with prospective studies that will determine whether this pattern of psychosocial risk predicts objective heart disease in this population.

What is already known about this topic

Despite the high rates of coronary heart disease in UK South Asians, the role of psychosocial factors in disease risk is poorly understood.

What this study adds

South Asian men and women in the UK are exposed to significantly higher psychosocial adversity than UK whites. They experience greater chronic stress, report poorer social support, and are more depressed than comparable white Europeans. This psychosocial disadvantage may be relevant to the high burden of CHD in this population.

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COMPETING INTERESTS

All authors declare that the answer to the questions on the competing interest form are all 'No' and therefore have nothing to declare.

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