Relationship of Psychosocial Risk Factors, Certain Personality Traits and Myocardial Infarction in Indians: A Case–control Study

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ABSTRACT

Objective: To investigate the relationship of psychosocial factors (lack of social support, stress and subjective well-being) and personality traits with myocardial infarction (MI). Materials and Methods: A case–control study involving 100 cases and 100 matched controls was conducted in Lok Nayak Hospital, New Delhi. Results: Stress over 1 year was significantly higher in cases ($P < 0.001$). However, difference was not significant when scores of social support ($P = 0.2$), Presumptive Stressful Life Event (PSLE) over lifetime ($P = 0.058$) and subjective well-being ($P = 0.987$) were compared. MI was significantly associated with hyperactive ($P < 0.001$), dominant ($P = 0.03$), egoistic ($P < 0.001$) and introvert ($P < 0.001$) personalities. Conclusion: Certain personality traits and recent stress may be important risk factors of MI, especially in Indians. The finding may have implications on the preventive strategies planned for MI patients.

Keywords: Myocardial infarction, New Delhi, personality, psychosocial risk

Introduction

Cardiovascular diseases have almost reached to epidemic proportions in India.¹ Reason for the high risk of coronary artery disease (CAD) among Indians is still unclear but could be attributed to their genetic predisposition and unhealthy lifestyle.¹,² However, there may be other variables which may not be thoroughly investigated among Indians, such as psychosocial factors and personality. Debates over the impact of psychosocial risk factors on the occurrence of cardiovascular disease have been raging in the West over past 30 years, and yet literature investigating this relationship is limited in India. Behavioral traits and relationship of stress linked to CAD may differ among Indians and should be investigated using the scales validated among the Indian Population. Therefore, a hospital-based case–control study was conducted to assess the relationship of psychosocial risk factors (lack of social support, subjective well-being, recent stress and stress over lifetime) and certain personality traits with myocardial infarction (MI) among Indians.

Materials and Methods

Cases

One hundred patients admitted to the coronary care unit of Lok Nayak Hospital, one of the largest teaching hospitals of India, with acute myocardial infarction (AMI) were prospectively recruited as cases. AMI was defined as presence of two out of three criteria; typical symptoms (crushing or squeezing type of chest pain radiating to left arm or diaphoresis with feeling of impending doom) and an electrocardiogram (ECG) showing ST elevation in two contiguous leads (at least 2 mm in chest leads and 1 mm in limb leads) and diagnostic
enzyme changes (doubling of creatinine kinase with at least 10% MB fraction). Patients with previous history of heart disease were excluded.

Controls
One hundred age- and sex-matched controls were prospectively selected from ENT and Ophthalmology Wards for the conditions unlikely to confound a comparative analysis and to match the stress resulting from hospital admission. ENT and Ophthalmology Wards had relatively non-serious patients who were able to provide consent and the time required to collect the information. Individuals with previous diagnosis of heart disease and those who scored positive on WHO questionnaire to elicit history of heart disease were excluded.

Variables
Data were prospectively recorded with standard forms. In all participants, age, sex, religion, marital status and socioeconomic status were recorded along with details of diet, smoking, alcohol use, physical inactivity, body mass index (BMI), waist hip ratio (WHR), blood pressure and personal and family history of hypertension (HT), diabetes mellitus (DM) and hypercholesterolemia. Weight was measured using bathroom weighing scale after adjustment of zero mark and height (to the nearest 0.01 cm) was measured using vertical wall chart for all the subjects without shoes. Waist circumferences (to the nearest 0.01 cm) were measured at the midway between the lower rib margin and the iliac crest using measuring tape.

Stress was assessed using Presumptive Stressful Life Event scale comprising 51 items. Each individual item had been assigned weights varying from 0 to 100 and then they were ranked according to the perceived stress. Weighted scores of number of events experienced by each subject in lifetime and past 1 year were summed up separately, and from these, mean score and standard deviation were worked out for cases as well as for controls.

To assess the social support, a Social Support questionnaire consisting of 18 items was used. Each item had a minimum score of 1 and maximum score of 4. From the total score, mean score of each individual was computed.

Subjective Well-being Inventory was used to measure the feeling of well-being or ill-being as experienced by an individual in various day-to-day life concerns. It consisted of 40 items. Each item was scored with a maximum score of 1 and minimum score of 3, and each item had direction according to which the score was reversed for the negative items. Total score for the items was summed and mean score of each individual was computed.

A type of Personality Trait Inventory consisting of 90 items depicting nine personality traits was used to detect the personality trait of the subjects. Measurement of each trait was based on the assessment of 10 items assigned for that particular trait.

Statistical methods
Data were analyzed using SPSS 11.0. Mann-Whitney U test was used to compare median values of various psychosocial risk factors among cases and controls. Multivariate logistic regression was conducted to assess the effect of psychosocial variables after adjusting for the other risk factors, such as socioeconomic status, family history of CAD, HT, DM, BMI, diet, type of fat consumed, physical activity, alcohol and smoking. In logistic regression analysis, the factors having more than two categories were regrouped into two categories due to the limited number of subjects in our study (e.g. smoking was re-categorized i.e. occasional and regular smokers were combined into a single group of smokers which was compared against non-smokers).

Results
The demographic characteristics were not significantly different among cases and controls [Table 1]. Although there was no significant difference between socioeconomic status of cases and controls, cases had significantly lower monthly income than controls (P = 0.025). However, overall socioeconomic status, as determined by Kuppuswamy Scale, was not found to be significantly different in cases and controls.

As shown in Table 2, compared with controls, cases of AMI presented significantly higher scores of stress experienced over lifetime and over past 1 year. Cases also showed significantly higher median scores of certain personality traits representing type A personality such as activity (P = 0.000), superego (P = 0.027), dominance (P = 0.000), paranoid (P = 0.000), introversion (P = 0.000) and social desirability (P = 0.013). AMI patients reported low level of social support (P = 0.027) and subjective well-being (P = 0.028).

The known risk factors associated with AMI [Table 3] were significantly different among cases of AMI when compared with the controls. Tobacco use was a significant predictor of MI (P = 0.038). Association of MI with smoking showed a clear dose–response effect. Social intake of alcohol was protective (P = 0.034), but regular intake of alcohol and physical activity did not show significant association with MI (P = 0.608; P = 0.471). Obesity (P = 0.016), abdominal obesity
Recently perceived stress was the most significant predictor ($P < 0.001$) while stress perceived during lifetime was not associated with MI (0.058). Patients of MI were significantly more hyperactive ($P < 0.001$), dominant ($P = 0.03$), egotistic ($P < 0.001$) and introvert ($P < 0.001$). However, depression ($P = 0.01$) and emotional instability ($P = 0.002$) was negatively associated with MI.

Discussion

Our study, probably the first case-control study, aimed at identifying the relationship between psychosocial risk factors, personality and AMI in north Asians in India, and showed that recently perceived stress and hyperactive, dominant, super-egoistic, emotionally unstable persons and introvert personality types are independent risk factors for AMI.

The study was conducted in a hospital catering to the urban population. Since the cases are confirmed cases of AMI not known to have had previous heart disease, the study avoids the problem of misdiagnosis associated with the sole use of ECG diagnostic criteria and of modification of risk factors by treatment of Ischemic Heart Disease. The study allows the comparison of risk factors within relatively similar ethnic and geographical region. As the study investigates stress as a risk factor of AMI, stress due to hospital admission could have confounded our results; however, selection of controls from the patients admitted in other wards of the same hospital tends to decrease the effect of this confounder.

The present investigation showed that recently perceived stress is a significant predictor of AMI. Previous studies have shown that conventional risk factors of AMI like smoking and HT are associated with different types of personality.

Stepwise logistic regression [Table 4] was carried out for continuous variables (income, waist hip ratio, BMI) and categorical variables (smoking, physical activity, alcohol intake, diet, type of fat consumed, past history of HT and diabetes and family history of cardiovascular disease). Recently perceived stress was the most significant

#### Table 1: Socio-demographic profile of cases and controls

| Characteristics | Cases (n=100) | Controls (n=100) | $P$ value |
|-----------------|-------------|----------------|-----------|
| Age (years)     |             |                |           |
| $<35$           | 5           | 4              | 0.935     |
| 35–44           | 20          | 24             | ($t = 0.082$) |
| 45–54           | 33          | 32             |           |
| 55–64           | 27          | 25             |           |
| $\geq 65$       | 15          | 15             |           |
| Mean age        | 51.46       | 51.33          |           |
| Sex             |             |                |           |
| Male            | 94          | 94             | 0.523     |
| Female          | 6           | 6              |           |
| Religion        |             |                |           |
| Hindu           | 50          | 52             | 0.117     |
| Muslim          | 41          | 44             |           |
| Sikh            | 9           | 4              |           |
| Marital status  |             |                |           |
| Married         | 90          | 87             | 0.846     |
| Single          | 2           | 6              |           |
| Divorced/widow/ widower | 8 | 7 | |
| Occupation      |             |                |           |
| Unemployed      | 26          | 13             | 0.150     |
| Unskilled       | 20          | 12             |           |
| Semiskilled     | 15          | 11             |           |
| Skilled         | 2           | 17             |           |
| Clerks/Shop owners | 13 | 42 | |
| Semiprofessional| 3           | 2              |           |
| Professional    | 0           | 3              |           |
| Educational status |         |                |           |
| Illiterate      | 28          | 16             | 0.213     |
| Primary         | 26          | 15             |           |
| Secondary       | 29          | 24             |           |
| Hr. Secondary   | 16          | 16             |           |
| Intermediate    | 0           | 06             |           |
| Graduate        | 09          | 22             |           |
| Post Graduate   | 0           | 0              |           |
| Monthly family income (Rs.) | | | |
| $<849$          | 0           | 0              | 0.025* ($t = 2.27$) |
| 850–2519        | 22          | 07             |           |
| 2520–4199       | 15          | 19             |           |
| 4200–6299       | 25          | 15             |           |
| 6300–8499       | 12          | 24             |           |
| 8500–16,799     | 22          | 25             |           |
| $>16,800$       | 04          | 09             |           |
| Average income  | 6432.50     | 8315.00        |           |
| Socioeconomic status | | | |
| Lower           | 1           | 0              | 0.072     |
| Upper lower     | 47          | 35             |           |
| Lower middle    | 32          | 36             |           |
| Upper middle    | 20          | 26             |           |
| Upper           | 0           | 3              |           |

* $P < 0.05$

$\chi^2$ (unadjusted analysis)

#### Table 2: Psychological status of cases and controls

| Characteristics | Median score (Min-Max) | Cases (n=100) | Controls (n=100) | $P$ value |
|-----------------|-----------------------|-------------|----------------|-----------|
| Social support  | 48 (21–64)            | 48 (23–62)  | 0.027*         |           |
| Subjective well-being | 81 (55–105) | 82 (52–109) | 0.028*         |           |
| Presumptive stressful life event | | | | |
| Score over lifetime | 476 (217–887) | 437 (156–789) | 0.021* |           |
| Score over past 1 year | 261 (67–650) | 138 (40–289) | <0.001** | |
| Type of personality | | | | |
| Activity | 16 (2–20) | 10 (2–20) | <0.001** |       |
| Cyclothymia | 10 (0–20) | 8 (0–20) | 0.94 |           |
| Superego | 15 (8–18) | 12 (6–18) | <0.001** |       |
| Dominance | 8 (2–20) | 6 (0–20) | <0.001** |       |
| Paranoid | 12 (2–20) | 10 (0–16) | <0.001** |       |
| Depression | 10 (2–20) | 10 (0–18) | 0.520 |           |
| Emotional inst. | 13 (0–20) | 12 (2–20) | 0.217 |           |
| Introversion | 8 (0–18) | 6 (0–18) | <0.001** |       |
| Social desirability | 8 (2–14) | 6 (2–12) | 0.013* |           |

* $P < 0.05$, ** $P < 0.001$
Gupta, et al.: Psychological factors, personality and myocardial infarction

Table 3: Distribution of risk factors in cases and controls (unadjusted analysis)

| Risk factors          | Cases (n=100) | Controls (n=100) | Odds ratio (95% CI) | Significance (P) |
|-----------------------|---------------|------------------|---------------------|------------------|
| Smoking               |               |                  |                     |                  |
| Current smoker        | 72            | 57               | 1.94 (1.03–3.65)    | 0.038*           |
| Never smoker          | 28            | 43               | 1                   |                  |
| Alcohol               |               |                  |                     |                  |
| Never                | 72            | 61               | 1                   |                  |
| Occasional           | 20            | 34               | 0.50 (0.25–1.00)    | 0.034*           |
| Regular              | 1             | 5                | 1.36 (0.38–5.07)    | 0.608            |
| Diet                  |               |                  |                     |                  |
| Vegetarian            | 38            | 54               | 1                   |                  |
| Non-vegetarian        | 62            | 46               | 1.92 (1.05–3.50)    | 0.023*           |
| Type of fat           |               |                  |                     |                  |
| Saturated            | 17            | 4                | 4.92 (1.47–18.05)   | 0.002*           |
| Unsaturated           | 83            | 96               | 1                   |                  |
| Body mass index       |               |                  |                     |                  |
| <18.5                | 4             | 7                | 0.65 (0.15–2.64)    | 0.509            |
| 18.5–24.9             | 63            | 72               | 1                   |                  |
| 25–29.9              | 25            | 20               | 1.43 (0.69–2.98)    | 0.301            |
| ≥30.0                | 8             | 1                | 1.65 (1.1–2.5)      | 0.017*           |
| Waist hip ratio       |               |                  |                     |                  |
| Normal               | 56            | 73               | 1                   | 0.012*           |
| Abnormal             | 44            | 27               | 2.12 (1.13–4.02)    |                  |
| Hypertension          |               |                  |                     |                  |
| Yes                  | 50            | 27               | 2.33 (1.23–4.44)    | 0.005*           |
| No                   | 50            | 63               | 1                   |                  |
| Past history of diabetes |         |                  |                     |                  |
| Yes                  | 22            | 0                |                    | <0.001*          |
| No                   | 78            | 100              |                    |                  |
| Family history of CAD |               |                  |                     |                  |
| Yes                  | 44            | 17               | 3.84 (1.90–7.80)    | <0.001**         |
| No                   | 56            | 83               | 1                   |                  |
| Physical activity     |               |                  |                     |                  |
| Yes                  | 57            | 62               | 1                   | 0.471            |
| No                   | 43            | 38               | 1.23 (0.67–2.25)    |                  |

*P < 0.05; **P < 0.001

Table 4: Effect of psychosocial risk factors in cases versus controls (adjusted analysis)

| Psychosocial variable | Odds ratio (95% CI) | Significance (P value) |
|-----------------------|---------------------|------------------------|
| Social support        | 0.928 (0.82–1.05)   | 0.243                  |
| Subjective well-being | 0.998 (0.90–1.11)   | 0.964                  |
| Presumptive stressful life event | 1.004 (1.09–1.01) | 0.219                  |
| Score over lifetime   |                     |                        |
| Score over past year  |                     |                        |
| Type of personality   |                     |                        |
| Activity              | 1.65 (1.1–2.5)      | 0.017*                 |
| Cyclothymia           | 0.95 (0.70–1.28)    | 0.74                   |
| Superego              | 1.92 (1.30–2.83)    | 0.001*                 |
| Dominance             | 1.59 (1.07–2.38)    | 0.021*                 |
| Paranoid              | 0.98 (0.74–1.30)    | 0.867                  |
| Depression            | 0.56 (0.37–0.88)    | 0.01*                  |
| Emotional Inst.       | 0.58 (0.40–0.82)    | 0.002*                 |
| Introversion          | 3.2 (1.7–6.02)      | <0.001**               |
| Social desirability†  | -                   | -                      |

*P < 0.05; **P < 0.001 – Results from logistic regression after adjusting for income, socioeconomic status, family history of CAD, BMI, type of fat consumed, smoking, physical activity, diet and alcohol. †Social desirability was excluded as it showed multiple co-linearity with introversion

of psychological patterns, change in depression or quality of life scores. Thus, psychosocial differences found in the cases and controls could be ascribed to the confounding effect of other cardiovascular risk factors. However, the present study, by controlling other risk factors, supports the hypothesis that stress may have an independent effect on the occurrence of AMI. Various researchers explained biological plausibility of this relationship. Emotional stress can precipitate cardiac events either through a chronic state of vigilance that alters the lipids thereby contributing to atherogenesis or through an acute severe emotional stress leading to catecholamine excess that increases the platelet count, makes the platelets more adherent and precipitates rupture of atherogenic plaque.

There has been a great deal of controversy over the association of type A personality and cardiovascular disease. In fact, several studies like Multiple Risk Factor Intervention trial and the Multicenter Postinfarction Program reported negative finding on the subjects. However, several studies proved the association also. Manuck et al. reported that type A personality does not define a homogenous entity, rather it includes several behavioral characteristics among which anger, impatience and competitiveness seem to play a major role. After this revelation, various studies
investigated the effect of individual personality traits on cardiovascular disease. Cole et al. showed the significant association between personality traits like time urgency/impatience and MI (OR 3.99, 95% CI 1.32–12). This trait in the present study was represented by the trait activity. The same trait (factor S measures speed and impatience) was also found to be high in Indian MI patients in a study conducted by Gupta et al. in Delhi. In Edinburgh artery study, submissiveness was inversely associated with MI (RR 0.59, 95% CI 0.40–0.851). In our study, score of dominance trait, which is just the opposite of submissiveness, is found to be high in MI patients. Bonguidi et al. reported that the infarcted males had significantly high scores on superego ($P < 0.001$) and low scores on extroversion ($P < 0.05$). Similarly in our study, MI patients got significantly higher scores on superego and introversion.

In the present investigation, depressive and emotionally unstable personality traits had a protective effect on AMI. This should not be confused with depression per se which has been reported to be positively associated with AMI. Depressive personalities are less aggressive or, in a way, this trait is opposite of hyperactive personality trait. The finding doubly confirms the association of activity with AMI.

The study has limitations inherent to case–control design. Although community-based controls would have been ideal, hospital-based controls were easy to recruit and they belonged to the same population as hospital-based cases. The cases were defined prospectively and controls were screened for the presence of heart disease with WHO questionnaire, although ECG of controls would have been ideal. Without a prospective cohort study, it would be difficult to find out the impact on risk factors, if any, of treatment of diabetes or HT that the patients might have received. Finally, study participants in the present investigation were predominantly males and any extrapolations to women should be done cautiously.

In conclusion, the present investigation adds further evidence that AMI patients present a less healthy psychological profile independent of the influence of other common cardiovascular risk factors. These findings support the notion that psychosocial evaluation may be needed in AMI patients and such factors deserve special attention in the prognostic work-up of the patient.

**Ethical consideration**

The study was approved by the ethical committee of the Maulana Azad Medical College. Informed consent had been taken from all study participants, and those cases and controls who did not give consent were excluded from the study.

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