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Cardiac Risk Factors and Psychosocial Variables in Coronary Artery Disease: A Case-Control Study of the Younger Population of United Arab Emirates

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Abstract

Background: Various psychosocial factors are known to contribute to the development of coronary artery diseases (CAD). However, most of these studies are done in the West and little is known about the contribution of such variables in the younger population of the Arabian Gulf region. **Objectives:** This study investigated the association of various physical and psychological variables with the development of coronary artery disease among young adults (≤ 45 years old) in the United Arab Emirates. **Patients and Methods:** A case-control study was conducted with 90 CAD patients who underwent catheterization due to heart attack and 90 control subjects selected within public setting during 2011-2012. Patient demographics, personality types, emotional intelligence and stress handling skills were also studied. **Results:** Eighty eight percent of the CAD patients were expatriates [88% South Asian, 20% Middle Eastern and 1% South East Asian]. Ninety five percent were men and 71% were in their 30s. Ninety two percent came from

low socio-economic backgrounds; only 12 % had above high school education and 92% were classified as non-professional workers. Majority were married. Patients were more likely to have family history of CAD, diabetes, hypertension, and smoking when compared to controls. Diabetes, hypertension, smoking, and sedentary lifestyle were significantly more frequent among patients. type A personality was more in CAD patients than controls (61% vs 36%; $p < 0.01$). Patients and controls were significantly different in terms of emotional self-management ($p < 0.001$). All control subjects were classified as emotionally unhealthy whereas 64% of patients were reported being in this category. Only 27% of patients indicated themselves as type D, which did not significantly differ from 29% of the control subjects. There was no significant difference between the two groups in stress handling abilities. **Conclusions:** This study revealed new findings on the prevalence of psychosocial variables in CAD in this region. Of interest that personality type D, stress handling abilities,

and emotional intelligence were not significantly evident as cardiac risk factors in this population. More culturally sensitive measurements are needed to elucidate these findings further.

Key Words: Cardiovascular disease, Psychosocial factors, Coronary disease, UAE Youth, Heart illnesses in UAE, Prevention of coronary artery diseases.

Introduction

Research literature reveals a number of factors influencing human health conditions. Besides genetic influences and the lifestyle of a person, emotional resilience and personality style may contribute significantly to heart-related ailments (1-3). In fact, a meta-analytic study of factors influencing coronary artery disease CAD report that half of US heart disease victims showed acceptable cholesterol levels and more than 25% had none of the biological risk factors commonly associated with heart illnesses (4). The INTERHEART study on 15,000 patients, demonstrated important effects of psychosocial factors on myocardial infarction (5). Aggressive behaviors were attributed as a factor in heart illness as early as the 1930s (6) and were supported in 1960's (7). Studies reveal that coronary heart disease is common in individuals prone to chronic stress and those who learn stress management have a significant reduction in cardiac-related events than those who undergo standard cardiac rehabilitation care (8). Growing body of research suggests that in many instances, we create our own stress that contributes to coronary heart disease, for example, smoking or because of dangerous traits like excessive anger, hostility, time urgency, inappropriate competitiveness and preoccupation with work (9,10). These are characteristics of "Type A" coronary prone behavior. While type A behavior can also increase the likelihood of standard risk factors like cigarette consumption, elevated cholesterol and high blood pressure, its strong correlation with coronary heart disease persists even when these influences have been excluded. The first meta-analysis of type A and CAD found significant associations between the two (11) and personality types as important determinants in cardiac conditions (12,13). However, more recent meta-analytic studies show insignificant association between type A and CAD and some association between CHD and the hostility component of type A behavior (14). Type A and type B personality theories describe the two common and contrasting personality types (the high-strung type A and the easy going type B) as patterns of behavior that could either increase or decrease respectively, one's

chances of developing a coronary artery/heart disease. Studies have also come up with a type D or "distressed" personality that may also influence heart illness (15-17). It was proposed that psychosocial factors in CAD are evident in at least three ways (17). Firstly, they directly promote the growth (pathogens) of CAD. Secondly, they contribute to maintenance of unhealthy lifestyle behaviors, like smoking and poor diet; and thirdly, after the development of CAD, when reduction of unhealthy lifestyle behaviors becomes increasingly important, psychological stresses act as barriers to positive change in these lifestyle behaviors. Literature review indicates more than 4000 studies on the effects of psychosocial factors on cardiac illnesses conducted and published in the West but none from this region (1). There is no data to identify the specific risk factors for the sample population of this country and no study done to see the effects of CAD on patient, family, and society as a whole. Although the medical aspects of this disease are addressed during hospital admission and follow up clinic visits, the psychosocial aspects are overlooked mainly due to the lack of support services for these patients, cost factors, and the stigma of young patients labeled as suffering from psychological issues. Given that not much information is available on prevalence and psychosocial variables of this illness in UAE, this exploratory study was conducted with the following objectives: a) To examine the demographics of the ethnically diverse group of CAD patients in UAE, b) To explore the prevalence of cardiac risk factors in the target population, and c) To identify the most common psychosocial variables, stress-handling abilities and state of emotional well-being in CAD patients. Additionally, we aimed to explore relationships between demographics, personality types, stress-handling abilities, emotional intelligence, and smoking habits. Early recognition and risk factor modification can go a long way in preventing heart related illnesses in this population and similar populations.

Patients and Methods

Setting and Subjects

The sample for this case-control study consisted of 180 participants. The case group consisted of 90 patients with CAD and the control group consisted of 90 individuals without history of CAD. Patient with CAD were recruited from Tawam Hospital who underwent catheterization due to a heart attack in the last one year. This facility is a full-range ministry of health hospital that serves as a referral and acute care center for residents of the UAE. Traditionally, expatriate residents were admitted only when referred from area hospitals but with new insurance programs

in place, anyone carrying the needed health insurance policy can be treated at Tawam. The hospital is affiliated with the faculty of medicine of the UAE University and with the Johns Hopkins University and Medical Center, US. Most staff are expatriates including doctors and consultants trained and board certified largely from the USA. The data were collected in 2011. We interviewed 100 discharged patients under age 45, and retrieved patient demographics from records available in the department of medicine, cardiology division. Emirati patients included in the sample had received the treatment in the last one year and expatriates had undergone the treatment in the last 6 months. The main reason for an overall small sample size was that we could not locate the expat patients and believe that they apparently left the country after CAD treatments. It was therefore difficult to go back more than one year and seek a larger sample. Additionally, the number of Emirati patients was much lower and this also contributed to an overall smaller sample. Control subjects were recruited from Abu Dhabi and Al Ain. A control subject was defined as an individual without prior history of CAD according to self-report indication and matched to the case group with respect to age, gender, and ethnicity.

Instruments and Procedures

Questionnaires used for the study were: a) Basic Demographics Survey, b) Coronary Artery Disease (CAD) Assessment, c) Type 'A' Personality Test, d) Stress-handling test, e) Emotional IQ Test, and f) type D (DS-14) Personality Test. Demographics information included in the study were gender, age, nationality, marital status, education level, and occupation. For analyzing the effect of occupation on CAD, occupations were classified into professional and non-professional categories. Occupations that require specialized knowledge and advanced skills were classified as professional. "*The CAD Assessment*" was developed by Health-line Networks, a US-based health media company that markets health-related products for self use and is endorsed by major health insurance and health educational institutions in North America. It consists of nine items that assess cardiac risk factors in terms of smoking habit, life style, family history of CAD, level of cholesterol, and presence of high blood pressure and diabetes. "*Personality Type A*" and "*Stress Maintenance Questionnaires*" were developed by "Stressdoctors.Com", a private group of health professionals categorized as under Seminary (Stress Doctors.Com; 1757 Robson Street Vancouver, British Columbia Canada). "*Personality Type A Questionnaire*" consists of 25 items with dichotomous

format designed to identify type A and type B individuals. The score range is zero to 25. Respondents with score of 14 or above are type A whereas those with score below 14 are type B. "*Stress Maintenance Questionnaire*" consists of 14 items designed to measure how stress is handled. The score range of this instrument is +160 to -160. The respondents with scores below 60 are vulnerable, 60-90 are moderate resistant, and above 90 are fending off stress. "*The Emotional Intelligence Test*" is also an internet-based assessment tool. It consists of 20 items with dichotomous (true/false) format that categorizes respondents into two groups, emotionally healthy and emotionally unhealthy. All these tests have sub-scales due to which, the authors did not calculate the reliability for the entire scale. "*Type D questionnaire*" or "*D Scale14 (DS14)*" was used to assess negative affectivity (NA), social inhibition (SI), and type D personality. In this test, 14 items are rated using a 5-point Likert scale ranging from 0=false to 4=true. A cutoff of 10 on NA and SI scales is used to classify subjects as type D ($NA \geq 10$ and $SI \geq 10$). DS14 is a well-recognized personality test for measuring the impact of 'Distressed' type on the heart. Factor analysis provided evidence for its 2 factor structure (NA and SI). The correlation of NA with neuroticism ($r = 0.68$), SI with extraversion ($r = -0.59 / -0.65$), and scale-level factor analysis confirmed the construct validity of the DS14 against the NEO-FFI. The NA and SI scales were found to be internally consistent ($\alpha = 0.88 / 0.86$) and stable over a 3-month period (test-retest $r = 0.72 / 0.82$) (18). However, its results are yet to be seen in non-Western cultures. All questionnaires were translated and back translated by qualified research assistants into several locally spoken languages (Arabic, Urdu, and Hindi) and then checked for accuracy by the authors. Three multilingual research assistants with educational qualifications of at least a bachelor's degree worked on this project doing patient phone interviews and data collection from hospital records. Data collection for control group was performed by the researchers in 2012. Individuals without history of CAD were approached in public settings in Al Ain and Abu Dhabi. After obtaining their consent, individuals were administered the questionnaires included in the study.

Data Analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS) 18.0. To investigate the prevalence of psychosocial risk factors, descriptive statistics were used for all psychological tests and all variables. In addition, chi-square test of association was employed to assess

Table 1. Demographic characteristics of participants in patient and control groups (n=180)			
	Patients (n=90) n (%)	Controls (n=90) n (%)	Statistics
Gender			p=0.23
Male	86 (95)	82 (91)	
Female	4 (4)	8 (9)	
Age group			p=0.18
20-29	7 (8)	15 (17)	
30-39	64 (71)	57 (63)	
40-44	19 (21)	18 (20)	
Nationality			p=0.19
Middle East	20 (22)	30 (33)	
South Asia	69 (77)	58 (64)	
South East Asia	1 (1)	2 (2)	
Marital Status			p=0.001 $X^2=19.47$
Married	86 (96)	67 (74)	
Single	3 (3)	14 (16)	
Divorced	1 (1)	0 (0)	
Not Reported	0 (0)	9 (10)	
Education			p=0.00 $X^2=30.45$
≤High School	79 (88)	45 (50)	
>High School	11 (12)	42 (47)	
Not Reported	0 (0)	3 (3)	
Occupation			p=0.04 $X^2=6.24$
Professional	6 (7)	10 (11)	
Non-professional	82 (91)	71 (79)	
Not Reported	2 (2)	9 (10)	

relationship among variables.

Results

Demographic Characteristics

The main demographic features of cardiac patients and controls are summarized in table 1. 95 % of patients were men; 71% belonged in the 30-39 age group; 88% were South Asian, followed by 20% Middle Eastern, and

1% South East Asian. 96% were married, only 12 % had education above high school, and 92% were classified as non-professionals (Table 1).

Conventional risk factors in patients and controls:

Patients and controls were similar in gender, age, and nationality but single individuals with higher educational level were overrepresented in the control group. Chi-square

Table 2. Percentages of cardiac risk factors and Chi-Square statistics of patient and control groups

	Patients Number (%)	Controls Number (%)	Statistics
Family history of coronary artery disease:			
Yes	39 (43)	10 (11)	p=0.000 $X^2=23.58$
No	49 (55)	77 (86)	
Don't know	2 (2)	3 (3)	
History of diabetes:			
Yes	40 (44)	9 (10)	p=0.000 $X^2=28.13$
No	50 (56)	79 (88)	
Don't know	0 (0)	2 (2)	
Serum total cholesterol above 200 mg/dl:			
Yes	4 (4)	10 (11)	p=0.000 $X^2=108.99$
No	13 (15)	76 (85)	
Don't know	73 (81)	4 (4)	
History of hypertension:			
Yes	34 (38)	12 (13)	p=0.001 $X^2=14.59$
No	55 (61)	75 (84)	
Don't know	1 (1)	3 (3)	
Cigarette smoking:			
Yes	65 (72)	16 (18)	p=0.000 $X^2=53.89$
No	25 (28)	74 (82)	
Reported sedentary life:			
Yes	38 (42)	21 (23)	p=0.002 $X^2=12.77$
No	52 (58)	62 (69)	
Not reported	0 (0)	7 (8)	

test of association indicated that patients were more likely to have family history of CAD. In addition, prevalence of diabetes, hypertension, smoking, and sedentary lifestyle was significantly higher among patients. No conclusion regarding level of cholesterol could be made since the majority of patients did not know their cholesterol level (Table 2).

Psychological characteristics and associations

Results of Chi square test of association indicated that there was a significant relationship between type A personality and CAD ($p < 0.01$). As presented in table 3, type A personality was significantly more prevalent among patients (61%) compared to control subjects (36%). Further analysis indicated that age and occupation have significant interaction effect. 70% of patients at age 30-40 were type A compared to 31% of controls (p -value for interaction < 0.001). Likewise, 62% of non-professional patients were type A compared to 40% of controls (p -value for interaction < 0.01). The two groups were found to be significantly

different in terms of emotional self-management ($p < 0.001$). 100% of control subjects were classified as emotionally unhealthy whereas 64% of patients were reported being in this category. Only 27% of patients indicated themselves as type D, which did not significantly differ from 29% of control subjects. There was no significant difference between the two groups in stress handling abilities (table 3).

Discussion

This case-control study gives new and interesting information on an ethnically diverse population revealing unique CAD phenomena in this country that indicate further research. The demographics of patients indicate higher CAD incidents in males who smoked tobacco, were diabetic and unaware of their medical condition, and had a family history of heart illnesses. The very high incidence in expats (88%) and people with lower educational levels (88%) is remarkable. Not only the incidence of CAD is higher among the foreigners; it is also much higher in people from low socio-economic background. Population

Table 3. Frequency and percentage of psychosocial variables of patient and control groups			
Variables	Patients n (%)	Controls n (%)	Statistics
Personality type A & B			p=0.001 $\chi^2 \chi^2 = 11.769$
Type A	55 (61)	32 (36)	
Type B	35 (39)	58 (64)	
Personality type D			p=0.866 $\chi^2 \chi^2 = 0.28$
Type D	23 (27)	22 (29)	
Not type D	61 (73)	55 (71)	
Emotional intelligence:			p=0.000 $\chi^2 \chi^2 = 38.14$
Emotionally healthy	32 (36)	0 (0)	
Emotionally unhealthy	58 (64)	88 (100)	
Stress handling:			p=0.361 $\chi^2 \chi^2 = 3.203$
Under 60: you are vulnerable	51 (57)	51 (58)	
60-90: moderate resistance	35 (39)	30 (34)	
90+: you are fending off stress	4 (4)	7 (8)	

statistics of UAE indicate that foreigners constitute more than 80%, of which 54% are from the Indian subcontinent. While the incidence in Emiratis is generally consistent with their overall population, CAD is much higher for the expats coming from the subcontinent. This increasing trend of cardiac illnesses, their early onset, and the number of patient deaths in developing countries (9 versus 5.3 million in developed countries) and a lack of consistent biological markers present an investigative challenge to the researchers (19,20). Significantly alarming, is the data that 79% of patients were less than 39 years of age: 91% worked in low-paid jobs and most lived without families. "Low paid" is defined as income below AED 4,000 (\$ 1,089) per month but most labor class workers in the region earn less than this amount per month. This category of workers live without family and such a health challenge could lead to increased psychosocial stress affecting worker health and quality of life. Studies show that the incidence of CAD in the subcontinent population living abroad is higher for reasons other than traditional cardiac factors and the CAD strike South Asians fourfold compared to other ethnic population (21,22). Also, young Asian Indians tend to have more complex myocardial infarction at a disproportionately younger age (23,24). Besides low HDL or high-density lipoprotein levels, Asian Indians show increased levels

of lipoprotein (Lp), metabolic syndrome, homocysteine fibrinogen, and C-reactive protein, often associated with improper dietary habits and cooking practices. Studies indicate that routine screenings prior to cardiac events are rare among South Asians (25). Our study shows that majority of patients were laborers involved in hard physical work, so sedentary lifestyle was ruled out as a major causative factor. Family history, diabetes, high cholesterol and blood pressure levels are all cardiac risk factors and were exacerbated by low education level of our sample. Personality type studies in the West suggest positive link between type A and CAD, and positive association between stress and CAD (26,27). In line with these findings, the current study also showed that the prevalence of type A is significantly higher among CAD patients when compared to control subjects. Anger and hostility are among the main features of type A behavior pattern and their underlying mechanisms have a detrimental influence on the cardiovascular system through biological mechanisms like endothelial damage, and increased heart rate and blood pressure. People with hostile behavior also exhibit increased homocysteine (28). Work stress is known to cause accelerated blood coagulation with an increase in fibrinogen and a decrease in fibrinolytic capacity. Low socio-economic status has also been shown to be related to

fibrinogen levels (29).

One interesting finding of this study is that stress handling abilities was not found to be a risk factor for development of CAD. This result may suggest that coping styles is not the only indicator of the magnitude of physiologic responses to stressors, but other individual difference factors may play a role (30). Among these are temperament, health habit, genetic and environmental factors that influence autonomic, neuroendocrine, and cardiovascular systems. The effect of these factors should be examined in future studies. In the present study, no significant association between type D personality and CAD was found. A similar study on Chinese patients showed that type D were at increased risk of anxiety and depression that may eventually lead to CAD but type D by itself was not an indicator or predictor of CAD prone personality (31). In the case of non-western samples, it is possible that such patients perceive distress differently making DS-14 Scale culturally inappropriate. Although studies associate emotional intelligence as a factor in heart illness (32), it was not confirmed in this study. In study by (33), no direct link between emotional intelligence and the presence of cardiac illness were found. However, it was suggested that effect of emotional intelligence on heart illness may be indirectly operated by mental health factors such as depression. This explanation is plausible given that emotional intelligence were consistently found to be associated with mental health (34) especially depression (33) which consequently lead to CAD (35). This could be an interesting area for future research. Interestingly, majority of participants in control group were emotionally unhealthy. One possible explanation for this result is that the sample may not be representative or the questionnaire was not culturally appropriate for this population. Given the current scenario, it is important to discuss the steps that are needed for prevention. Three main areas that need attention are medical, social, and educational. Besides asking patients to follow their prescribed regimen, it is important to look for drugs that may have an impact on patient's psychological conditions. If the patient is taking antidepressants like the TAOs and MAOIs, these meds can negatively affect the heart rate, blood pressure and EEG results. A psychiatric or psychological examination using the Diagnostic and Statistical Manual (DSM IV-TR) criteria may help in ruling out psychiatric comorbidity and tailoring an individualized treatment plan. Patients need to be encouraged to self-monitor their conditions, do prescribed exercises, and if desired, follow certain remedies prevalent in local cultures. This is because beliefs in traditional remedies are common in this part of the world. An annual physical exam is not

common practice here but should be highly recommended. Major biological risk factors, such as hyperlipidemia, high blood pressure, diabetes, cigarette smoking, etc. should be regularly monitored and modified through changes in patient lifestyle. This would be easier with an interdisciplinary approach (36). Research shows that in the social realm, strong social support clearly improves coping abilities in heart patients. However, arguably expats without a family base in gulf countries present a unique challenge to the system. In such circumstances, supportive cross-cultural communication and culturally competent care have shown to be highly effective ways of preventing and treating CAD. For patients with families, social support has shown clear benefits (37). Literature is replete with studies showing benefits of health awareness programs on heart-related illnesses showing that except for non-controllable risk factors (family history, sex, and age), patients can modify their controllable risk factors (like smoking, level of cholesterol, obesity, sedentary lifestyle, hypertension, diabetes, metabolic syndrome, and psychological stress) through counseling, education, and effective drug treatment (38,39). Awareness and coping skills programs, lifestyle modification, mood changes and changes in self-perception can help patients gain control of their health. Also, an awareness of different personality types and their influences on heart diseases, emotional factors, effects of different types of coping skills, and learning how to manage stress can go a long way in the total health care management program of CAD patients. A national campaign on smoking cessation, dietary advice, weight management, and regular medical check-ups is highly recommended. Free-of-charge health awareness and monitoring programs by trained nurses, social workers and health counselors can be offered in public places like the shopping malls and parks. Studies in the US show that up to 60 % of the cardiac patients suffer from some degree of depression and 50% suffer from panic disorders, and therefore, psychological factors in cardiac illnesses constitute important precipitants and consequences (14,40). Psychological research on CAD is almost non-existent in this part of the world, making such investigations valuable. The decision to establish and implement a comprehensive treatment plan should be taken by a panel of medical experts, researchers and academics, and members of the general public as well as high risk individuals, former patients, members of families of patients who have undergone heart-related treatment, and government representatives. In future studies, more established scales, such as the Bortner type A Scale, the Framingham type A Scale and the Multidimensional type

A Behavior Scale may yield more detailed and meaningful information. Qualitative study in the form of personal in-depth interviews may also yield information on beliefs about illness and coping mechanisms prevalent in the ethnic mix of people living in this country. The incidence of CAD variations within subcontinent patients needs investigation on larger sample and may lead to interesting findings. The Framingham model longitudinal research identifying potential risk factors among Emirati samples is recommended.

This study also raised some questions that may be addressed in follow-up investigations on a larger national sample: 1) Does culture have significant influence in the way cardiac heart patients interpret distress? 2) Can replication studies in the region confirm incidence of CAD in people from lower socio-economic background? 3) What specific rehab programs and social support services are available for patients; how they can be improved, and what coping mechanisms do patients use in the absence of such services? 4) What psychosocial factors are specific to the region for the younger “local” patients and 5) Why is the incidence of CAD higher in people from certain ethnic backgrounds? Only through concerted efforts, researchers can appreciate and address the complex nature of CAD in this part of the world.

In conclusion, this study revealed new findings on the prevalence and psychosocial variables in this country. It is interesting to see that personality type D, stress handling abilities, and emotional intelligence are not significant cardiac risk factors. More culturally sensitive measurements are needed to build on these preliminary findings. Making patients modify their behaviors is seen as a challenge here and needs practical steps to address the growth of CAD. Development of locally standardized measures and qualitative research are indicated, and may lead to the identification of psychosocial factors specific to ethnic cultures. An interdisciplinary approach in prevention and treatment of CAD is imperative to deal with such illnesses in the region.

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