Short Communication: Relation between stress and other lifestyle factors

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Contract/grant sponsor: Iranian Budget and Programming Organization, Deputy for Research of the Ministry of Health and Medical Education.
Contract/grant number: 31309304.

Summary

Objective: To describe and evaluate the relationship between stress and other lifestyle behaviors.

Methods: A cross-sectional study within the context of an Isfahan Healthy Heart Program (IHHP). Demographic details (age, gender, marital status and educational level) and lifestyle variables including diet (fruit and vegetable consumption), smoking status, daily physical activity and psychological distress were recorded. Data were analyzed by t-test, χ² and logistic regression.

Setting: Central Iranian country of Isfahan, Najaf-Abad and Arak.

Participants: Five thousand and eight hundred and ninety-two adults over 19 years of age.

Results: Mean age of all participants was 40.5 (15.4) years and 36 per cent of them had high stress levels. High stress levels were negatively associated with fruit and vegetable consumption, non-smoking and marriage. Conversely, the female gender and less than 6 years of education were positively associated with stress levels. Physical activity was not found to be associated with stress.

Conclusion: This study demonstrated an association between high stress levels and other unhealthy lifestyle factors. Hence, special attention must be paid to intervention programs aimed at modifying lifestyle and providing education on stress management techniques. Copyright © 2006 John Wiley & Sons, Ltd.
Introduction

Many epidemiological and experimental studies have discussed the relationship between non-communicable diseases and unhealthy lifestyle factors such as smoking, unhealthy diet, inadequate physical activity and high stress levels. Hence, modification of lifestyle behaviors gains much importance (Fukuda & Morimoto, 2001).

The lifestyle of the Iranian population has become westernized during the past decades. With the improvement of health conditions, the principal causes of Iranian deaths such as pneumonia, pulmonary tuberculosis, and other communicable diseases have decreased and have been replaced by cerebrovascular diseases and cancer (Azizi, 2002).

Psychological stresses are also associated with a 1.5–2.5 times increase of mortality in the general population, which cannot be wholly explained by unnatural causes of death, such as suicide (Huppert & Whittington, 1995; Kouzis, Eaton, & Leaf, 1995). This excess mortality due to natural causes in people with psychological stresses could be partly explained by the association between psychological stresses and unhealthy lifestyles (Neeleman, Wessely, & Wadsworth, 1998).

There is no evidence relating stress to other lifestyle factors in the Iranian population. Thus, the aim of the present analysis was to describe and evaluate the relationship between stress and lifestyle behaviors in a community-based study in Central Iran as part of the Isfahan Healthy Heart Program (IHHP) (Sarraf-Zadegan et al., 2003). If diet, smoking status, and physical activity are also shown to be related to stress levels in a community-based study, it may be that public education on stress management strategies can become an effective contributor to efforts aimed at reducing the prevalence of non-communicable diseases.

Participants

Adults aged over 19 years living in three Central Iranian counties of Isfahan, Najaf-Abad and Arak were surveyed. These counties have homogenous populations and lower immigration than the capital and/or other cities, and are made up of middle-income families. Participants had been living in these counties for at least 10 years and were excluded if they were pregnant, mentally retarded or physically disabled. The total number of subjects for this study was determined according to their gender, age and area of residence relative to the entire population. The selected study regions included rural and urban areas in middle-sized and large towns.

Multistage cluster random sampling was conducted to stratify the study population by their living area (urban versus rural) according to the regional population distribution as per national population census in 1999. Approximately 5–10 per cent of households within these clusters were randomly selected for inclusion. One individual aged over 19 years of age per household was randomly selected. The sample size was calculated as 1207 of each gender then distributed into different age groups according to distribution in the community.

Written informed consent was obtained from subjects after full explanation of the procedure involved. Eligible individuals underwent a 30-min home interview by trained health professionals to determine characteristics such as smoking behavior, physical activity and stress level, and to fill out the Food Frequency Questionnaire (FFQ).

Demographic factors

Questions regarding age, gender, marital status (married/single, divorced and widowed as unmarried) and education were asked to characterize the sample. Educational level was determined by asking “What is the highest grade or number of
school years you have completed?’ Self-reported educational level was divided into three categories: 0–6 years (less than elementary school education), 7–12 years (middle to high school education) and 13 years or more (higher than college education).

**Lifestyle factors**

Lifestyle variables included dietary fruit and vegetable intake, smoking status, daily physical activity and psychological distress.

**Frequency of fruit and vegetable consumption.** To obtain information on dietary fruit and vegetable intake each individual completed a FFQ (Dwyer, 1994). This instrument was designed according to the World Health Organization (WHO) FFQ; however some additions were made. The validity of this questionnaire was confirmed by the Medical Education Development Center affiliated to the Isfahan University of Medical Sciences before being used (Sarraf-Zadegan et al., 2003).

**Smoking.** People were considered to be ‘smokers’ if they reported smoking at least one cigarette per day and were otherwise defined as ‘non-smokers’ (Abolfotuh, Abdel Aziz, & Alkija, 1998).

**Physical activity.** Daily physical activity was determined with regard to four types of physical activity, i.e. leisure time activity, work activity, commuting activity and home activity. Physical activity was measured according to the duration of all four types of physical activity per day as metabolic equivalents (METs). One MET is equal to 3.5 ml/kg/min O$_2$ uptake.

**Stress.** The 12-item General Health Questionnaire (GHQ-12), a self-administered questionnaire assessing psychological distress was used (Goldberg, 1992). There is evidence that the GHQ-12 is a consistent and reliable instrument when used in samples of the general population (Montazeri et al., 2003). Each item is rated on a four-point scale (less than usual, no more than usual, fairly more than usual, or much more than usual). The system used to score the GHQ-12 questionnaires in this study was the GHQ score method (0–0–1–1 method). Using this method, a participant could score between 0 and 12. A GHQ score of 4 or above indicates a high level of psychological distress.

**Statistical analysis**

Statistical analysis included $t$-test and $\chi^2$ for comparison between the two sexes. A Binary Logistic Regression model was also used. Continuous variables are presented as mean (one standard deviation) while qualitative variables are presented as absolute and relative frequencies. Unconditional logistic regression was used for assessment of the relationship of some lifestyle factors with stress level adjusted for gender, age, marriage and educational level. In using Binary Logistic Regression, this study split the GHQ score (previously calculated) into two parts. The low stress level group included people with scores 0–3 and the high stress level group included people with scores 4–12. This new binary variable was used as a dependent variable.

Other variables included categorical variables: educational year (0–6/7–12 and 13 years or more as reference value), smoking (smoker/non-smoker), gender (female/male), marriage (married/unmarried) and continuous variables: age, frequency of fruit and vegetable consumption (times per day) and physical activity (METs) were used as independent variables (covariate or fixed factor corresponding to their type) which were chosen based on earlier research. SPSS11.0 (statistical package for the social sciences, SPSS Inc, Illinois, USA) software was used for all the statistical calculations. All reported $p$-values were based on two-sided tests and were compared to a significance level of 5 per cent.

**Results**

During this study, 5892 subjects were evaluated, 35 per cent of whom were in Isfahan, 50.1 per cent were in Arak and 14.9 per cent were in Najaf-Abad, proportionate to the population of these areas. The mean age of men and women was 40.47 ± 15.68 and 40.25 ± 15.15 years, respectively. Subjects were selected in nearly equal proportions from both sexes (49.5 per cent men and 50.5 per cent women).

Table I shows the distribution of participants’ demographic and lifestyle characteristics based on gender. Educational level and daily physical activity were higher in males, while females had...
higher fruit and vegetable intake and higher stress levels.

Multivariate logistic regression analysis adjusted for gender, age, marriage and education level showed that self-reports of high stress are associated with low fruit and vegetable consumption and with smoking. No relationship was seen between physical activity and stress level. After adjusting factors, an association between self reports of high stress and female gender was observed \( \text{OR} = 1.71; \text{CI} = 1.47–1.99; p < 0.001 \) but age could not be added to the model significantly \( \text{OR} = 0.99; \text{CI} = 0.99–1.003; p = 0.73 \). Self report of high stress are associated with fewest years of education (0–6 years when more than 13 years was used as reference value, OR, 1.46; 95%CI, 1.20–1.79; \( p = 0.002 \)); while intermediate years of education (7–12 years) does not show significant association \( \text{OR} = 1.18; \text{CI} = 0.96–1.45; p = 0.09 \). Being married showed association with high stress level \( \text{OR} = 0.72; \text{CI} = 0.61–0.85; p = 0.001 \). Considering adjustment for main factors, stress levels were negatively associated with fruit and vegetable consumption, non-smoking and marriage; conversely, stress levels were positively associated with the female gender and less than 6 years of education (Table II).

Discussion

According to the findings of this study, 36 percent of the Iranian population suffers from high stress level as measured by the GHQ-12. High stress levels were negatively associated with fruit and vegetable consumption, non-smoking and marriage. Conversely, the female gender and less than 6 years of education were positively associated with stress level. Physical activity was not associated with stress.
Rohrer, Pierce, & Blackburn (2005) reported that poor mental health was associated with daily smoking, physical activity, being female and unmarried. Strine et al. (2004) revealed that persons reporting frequent mental distress are at higher risk of chronic disease because they had a high prevalence of smoking and physical inactivity than persons without mental distress. A study in adolescents demonstrated that smokers reported more life events and felt more stress than non-smokers (Pederson, Koval, & O’Connor, 1997). The relationship between smoking and life stress may be bi-directional: life stress may increase the risk for initiation of smoking, because smoking is one of the simple and mal-adaptive ways for coping with stress; conversely smoking can cause a high stress level in subjects by changing secretion of neurotransmitters in the brain (Parrott, 1999).

This study, like earlier studies showed that smokers had high stress levels. Although, confounding factors which were not measured (e.g. low self-esteem and mastery and poor social support) may cause the person to follow mal-adaptive behaviors (such as smoking) to not resolve stress, must be considered (Liu, 2003).

Given the relationship between physical activity and stress, most studies have only evaluated leisure time physical activity and mental health. Bhui and Fletcher (2000) have completed a nested case-control study using data from the Health and Lifestyle Survey. GHQ was the outcome measure. They demonstrated a protective effect for men engaged in at least 92 min of exercise a day, although no such effect was demonstrated in women who were generally younger and from households with lower incomes. Thus, one might propose that physical activity is of benefit only if women have adequate income and leisure time. Working adults participating in moderate amounts of leisure time physical activities have about half the rate of perceived stress as non-participants (Aldana, Sutton, Jacobson, & Quirk, 1996). In the behavioral risk factor surveillance system (BRFSS) survey which was conducted on 175,850 adults and published in 2003, the proportion of adults reporting unhealthy days was significantly lower among those who attained recommended levels of physical activity than physically inactive adults of all ages (Brown et al., 2003). A randomized clinical trial determined that exercise is an effective way for improving stress symptoms and quality of life (Atlantis, Chow, Kirby, & Singh, 2004). Unlike studies mentioned earlier, this study did not observe any relationship between physical activity and stress level in any of the sexes. It must be stated that leisure time physical activity as a separate variable was not measured in this study and the physical activity of the Iranian population had a lower intensity and duration than in other communities (Sarraf-Zadegan, Boshtam, & Rafiei, 1999).

Several expert reports have reviewed the role of fruit and vegetables in health promotion and prevention of unhealthy lifestyle-related diseases such as some types of cancer, cardiovascular diseases, hypertension, diabetes and obesity (Hyson, 2002). A most striking finding among those reporting high stress was the lower daily consumption of fresh fruit among both women and men, and the lower daily consumption of vegetables among women but not men (Roos, Lahelma, Virtanen, Prättala, & Pietinen, 1998). Moreover, low consumption of fruit or vegetables has also been reported among women with poor mental health (Allgöwer, Wardle, & Steptoe, 2001; Cohen, Kristal, Neumark-Sztainer, Rock, & Neuhouser, 2002). This study relates infrequent intake of fruit and vegetables in both sexes with high stress. There are some who hypothesize that the association between distress and diet are reciprocal, because unhealthy diet could cause symptoms of stress and stress could make it difficult to sustain a healthy dietary pattern (Cohen et al., 2002). Components in fruit and vegetables thought to be associated with the reduction of lifestyle diseases include soluble and insoluble dietary fiber, antioxidant nutrients (vitamins C, E, selenium, β-carotene) and phytoneutrients including polyphenols, flavonoids, anthocyanins and carotenoids (Feeney, 2004).

A sociodemographic study in Pakistan reported that those who were married and received good social support, experienced lower levels of stress than those who were single or divorced (Mumford, Saeed, Ahmad, Latif, & Mabbashar, 1997). Also, groups with lower education are hypothesized to experience more chronic environmental stress due to lack of skills to cope with stress (Carroll, Smith, Sheffield, Shipley, & Marmot, 1997). In this study too, marriage and high educational level were good predictors of lower stress level.

This study had some limitations. The first was that data such as lifestyle pattern, stress, and demographic characteristics were all obtained via self-reports. Secondly, as is true for all cross-sectional designs, we could not demonstrate...
causal directions among stress, and lifestyle variables. In addition, this study did not examine the role of personal and environmental variables (e.g. self esteem, coping styles, income and social support) which could mediate or moderate the relationship between stress, and lifestyle.

Conclusion

The results of this study demonstrated that individuals in the Iranian community who had experienced high stress levels also had unhealthy lifestyles. In view of these findings, it seems reasonable that health policy-makers lay special focus on defining stress and providing education on adaptive ways of coping with stress alongside educational and environmental interventions on healthy lifestyle (physical activity, tobacco control and healthy diet). In addition to programs designed to improve healthy lifestyles, public health agencies may also contribute to the promotion of community programs targeted at unmarried individuals and those with low levels of education.

Therefore interventions aimed at reducing stress through providing education on stress management techniques might lead to improvements in lifestyle. Given the likely reciprocal relationship between lifestyle and stress, both conclusions could be valid. The results of this study demonstrated that persons who had high stress levels also had unhealthy lifestyles in the community. These findings encourage the belief that public health programs designed to encourage healthy lifestyles will also reduce the prevalence of high stress levels.

Acknowledgments

This study was supported by the grant number 31309304 of the Iranian Budget and Programming Organization, Deputy for Research of the Ministry of Health and Medical Education, the Cardiovascular Research Center and Provincial Health Office of Isfahan University of Medical Sciences. The authors wish to thank Dr H. Malek-Afzali, Dr N. Sarraf-Zadegan and Dr G.H. Sadri, directors of the Isfahan Healthy Heart Program (IHHP).

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