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For further information about this article or if you need reprints, please contact:

Daryoush Savadi Oskouei
Faculty of Medicine,
Tabriz University of Medical
Sciences, Golgasht Street,
Postal Code 5166614766,
Tabriz, Iran

Tel: +984113364672
Fax: +984113373741

Can Experiencing Stressful Life Events Be a Risk Factor of Stroke?

¹D. Savadi-Oskouei, ²H. Sadeghi-bazargani and ³L. Mohammadzadeh

Present study was aimed to check if stressful life events can play a role in developing stroke and to estimate its magnitude. In a hospital based case-control study in 2003-2004, a total of 150 stroke cases along with 150 controls were enrolled. Study participants were selected from those patients hospitalized in Alavi, Bouali and Fatemi university hospitals located in Ardabil, North-west of Iran. Participants were interviewed and a questionnaire containing demographic information, known stroke risk factors and validated questions of stressful life events (Holmes Rahe scale) was filled out for them. Data were analyzed by SPSS version 13 statistical package. Logistic regression was the main method of data analysis. Demographic characteristics in case and control groups were not statistically different. Patients had a higher score of stressful life events than controls. Mean score of family problems was 11.2 for stroke patients compared to 8.2 among control group patients. The difference was statistically significant. Fifty one percent of patients in case group had life changes compared to 27.8% in control group. Odds of disease for those having stress through life changes was 2.7 (95% CI: 1.5-4.8). There was a graded association between degree of psychological stress and risk of stroke. The findings of this case control study showed that experiencing stressful life events can be a risk factor of stroke.

Key words: Holms Rahe scale, stress, stressful life events, stroke

¹Faculty of Medicine, Tabriz University of Medical Sciences, Golgasht Street, Postal Code 5166614766, Tabriz, Iran

²Research Development and Coordination Center, Faculty of Medicine, Golgasht Ave., 5166614766, Tabriz, Iran

³Raheh Daneshgah, Ardabil University of Medical Sciences, Ardabil, Iran

INTRODUCTION

Stroke is a leading cause of death among elderly in many countries and the burden of stroke world wide is steadily increasing (Donnan, 2003). In a noticeable proportion of stroke patients the exact etiology of disease may not be defined. Psychological considerations in development of stroke has always been the matter of discussion and debate specially in case of depression (Oskouei *et al.*, 2007).

Considering what is known about the association between stress and cardiovascular accidents as well as the idea that stressed persons maybe behaviorally different from other healthy people and have an unsuitable profile of known stroke risk factors, it is quite logical to think of its possible role in stroke. Although the public knowledge is indicative of an important role for stress in causing stroke, but its role remains controversial and inconclusive in scientific literature (Pettersson *et al.*, 2001; Harmsen *et al.*, 1990; Macko *et al.*, 1996; Truelsen *et al.*, 2003). Due to scanty number of published articles specifically focusing on this association as well as the methodological limitations of the available ones, further studies in different settings are needed to further clarify the existence of possible independent association between stress preceding stroke.

A review article published recently states the hypertension, diabetes mellitus, coronary heart disease, age, sex and race as well known risk factors of stroke and other are mentioned as less-well documented. So it recommends further studies to clarify the role and interplay of the risk factors which may provide a more comprehensive understanding of stroke (Allen and Bayraktutan, 2008).

Present study was aimed to check if the stressful life events can play a role in developing stroke and to estimate its magnitude.

MATERIALS AND METHODS

In a hospital based case-control study a total of 150 stroke cases along with 150 controls were enrolled in 2003-2004. Study participants were selected from those patients hospitalized in Alavi, Bouali and Fatemi University hospitals located in Ardabil, North-West of Iran. Cases were selected from neurology specialty ward of Alavi University hospital which is the provincial referral neurology center. Controls were chosen from other provincial referral wards located in any of the above mentioned University hospitals. This selection strategy was taken to make sure that the reference community

becomes similar both for cases and controls. Cases were those with a definite diagnosis of stroke and controls were patients hospitalized without a known cerebrovascular, TIA and hypercoagulopathic disease history. Computerized Tomographic scanning of the brain was accomplished for all cases having stroke to make out a differential diagnosis. Controls were matched with cases for sex and age in a three years acceptable age variation range. A frequency matching method was applied.

Participants were interviewed and a questionnaire containing demographic information, known stroke risk factors and validated questions of stressful life events was filled out for them. This scale is originally developed by Holmes and Rahe (1967). Holmes and Rahe (1967) published a checklist of 43 events, such as death of a spouse, divorce, fired at work and sex difficulties, called the Schedule of Recent Experiences (SRE). Its purpose was to inventory fundamentally important environmental incidents that were found (in analyses of patients' charts) to frequently precede illness onsets. Stressful events were defined as occurrences that were likely to bring about readjustment-requiring changes in people's usual activities. A magnitude estimation procedure was used by panels of judges to assign Life Change Unit (LCU) scores to each of the 43 events on the list. A summation of these scores on events occurring in a given, usually quite recent, period of time was taken as the indicator of amount of stress. The checklist can be answered in either a self-administered questionnaire or an interview (Dohrenwend, 2006).

Data were entered into a computer and were analyzed by SPSS version 13 statistical software package. Other than logistic regression, Chi-square test was used for comparing the proportions between groups and t test was used to compare means. A p-value less than 0.05 was considered as statistical significance level. The study was approved by high degree committee of research and ethics. Verbal consent was taken from all participants who were let to know that there is no obligation in participating.

RESULTS

Demographic characteristics in case and control groups were not statistically different. Twenty (14%) of patients were under fifties; 33 (22%) were in 50-59 years age group; 51 (34%) were in 60-69 years age group and 30% of the participants were above 70 years of age. Other demographic variables are compared in Table 1.

Distribution of stroke risk factors among case group patients was as follows: current or life time history of diagnosed hypertension in 56%, diabetes in 24%,

Table 1: Demographic features compared between case and control groups

Demographic feature	Case		Control		Stat. Sig*
	Frequency	Percent	Frequency	Percent	
Sex					
Male	72	48.0	72	48.0	Matched
Female	78	52.0	78	52.0	
Urbanity					
Urban	101	67.3	97	64.7	NS†
Rural	46	30.7	51	34.0	
Indefinite	3	2.0	2	1.3	
Marital status					
Married	114	76.0	117	78.0	NS
Single	32	21.3	33	22.0	
Indefinite	4	2.7	0	0.0	
Income independence					
Independent	91	60.7	97	64.7	NS
Dependent	57	36.0	51	34.0	
Indefinite	2	1.3	2	1.3	

*Statistical significance, †Statistically non-significant (p>0.05)

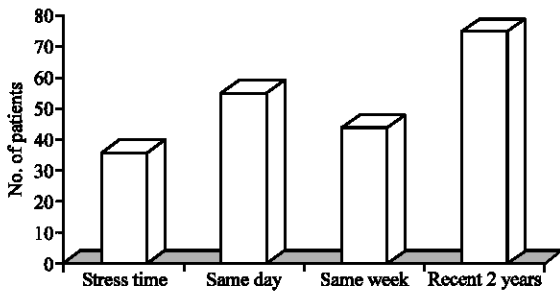


Fig. 1: Stress time before stroke

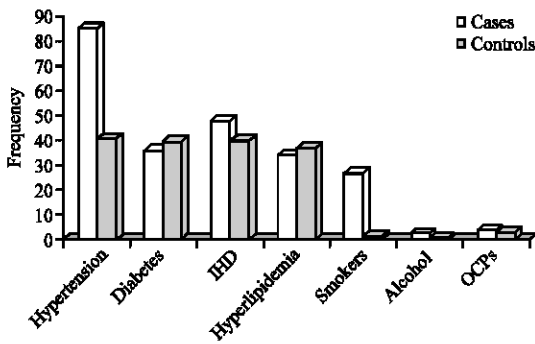


Fig. 2: The distribution of some stroke risk factors compared between case and control groups

ischemic heart diseases in 32%, hyperlipidemia in 22.6%, smoking in 16%, OCP use in 2.7% and alcohol consumption in 2%.

Stroke patients had a higher score of stressful life events than controls. Mean score of family problems was 11.2 for stroke patients compared to 8.2 among control group patients. The difference was statistically significant. Fifty one percent of patients in case group had stressful life events compared to 27.8% in control group. Odds of disease for those having stress through

life events was 2.7 (95% CI: 1.5-4.8). Timing pattern of stress and stroke is given in Fig. 1.

The distribution of some stroke risk factors are shown in Fig. 2. There was a graded association between degree of psychological stress and risk of stroke.

DISCUSSION

We found that stress was significantly associated with stroke and there was a graded association between degree of psychological stress and risk of stroke. A Swedish cohort study on hypertensive men, showed that poor adaptation to stress measured with a psychological stressor was associated with a 3 times higher risk of stroke (Pettersson *et al.*, 2001).

While Truelsen *et al.* (2003) and colleagues in Denmark found that self-reported weekly stress and high stress intensity were significantly associated with an increased risk of fatal stroke, whereas for the remaining stress categories, there were no significant associations. They also found no significant trends between level of stress and risk of stroke (Truelsen *et al.*, 2003). Another Scandinavian study showed that subjects with excessive Stress-induced blood pressure reactivity had nearly doubled risk of stroke and the risk increased inversely with educational level (Everson *et al.*, 2001). An Iraqi study showed also that hypertension plus a major life event preceding the stroke was more significantly associated with hypertension alone (Al-heeti, 2003).

To make a conclusion based on accepting a role for stress on developing stress there maybe a biological plausibility to explain the observed association. Mental stress-induced pulse pressure changes may influence the development of early atherosclerosis in the carotid artery of women. Widening of pulse pressure during stress and at rest, may be a marker of compromised compliance in the vessel wall. Stress-induced sympathetic responses may be more important in men, who develop atherosclerosis earlier than women (Matthews *et al.*, 1998).

About 10 to 20% of atherosclerotic ischemic strokes can probably be attributed to recently established, causal risk factors for ischemic heart disease: raised apoB/apoA 1 ratio, obesity, physical inactivity, psychosocial stress and low fruit and vegetable intake (Hankey, 2006).

The method of measuring stress differs widely upon different studies, that may lead to different findings and finally different conclusions. This must be taken into account when comparing the findings of different studies. The validity and reliability of self-reported stress has always been a matter of debate. The problem may be less pronounced regarding Holmes and Rahe scale which is the scale we have used. Another problem with self

reporting or self evaluation of stress is that using this method of measurement during case-control studies may lead to exposure-outcome temporality ambiguity. That is to say if we try to measure stress after development of stroke it may not be possible to distinguish if it was present before the stroke or initiated by the disease. Gathering information about stressful life events instead of self reporting stress as appropriately done in our study, removes the temporality problem helping to take advantage of case-control studies and considering the pitfalls of self reported stress level measurement, measuring stressful life events as an acceptable surrogate variable of stress is quite reasonable. So based on what was said, the association between stressful life events and stroke found in this study seems to be a real one.

CONCLUSION

The findings of this case control study showed that experiencing stressful life events can be a risk factor of stroke.

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