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Original articles

Factors affecting one year mortality and functional outcome after first ever ischemic stroke in the region of Antalya, Turkey (A Hospital-based study)

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Abstract

In order to establish good health politics for stroke survivors, regional differences in factors affecting the outcome of patients have to be known. For this purpose we investigated factors affecting 1 year mortality and functional outcome in patients with first-ever-in a lifetime stroke in the region of Antalya, Turkey.

One-hundred and forty-seven patients with a first ever stroke were included and followed up for at least one year. The modified Rankin Scale was used for evaluation of handicap. Several factors known to affect prognosis such as demographic features, socioeconomic status, stroke subtype, neurological findings and stroke risk factors were compared between patients who died during follow-up and survivors.

Of the 147 patients 35 (23.8%) died during the course of the study. Multivariate logistic regression analysis showed that only illiteracy, being single or widowed and presence of urinary incontinence were significant predictors of being dead at the end of 1 year. In the survivors factors independently affecting dependence at the end of one year were age, presence of coma on admission and urinary incontinence.

Our results suggest that not only stroke severity but also socioeconomic variables are important in determining the prognosis of stroke patients.

Key words : Stroke ; mortality ; handicap ; socioeconomic variables ; Turkey.

Introduction

Assessment of prognosis in stroke patients is an important factor in the management of stroke patients, not only for limiting the expectations of relatives but also for defining proper treatment goals and plans, deciding when and where the patient should be discharged to, especially in countries with limited resources which have to be used thriftily.

Little is known about long term predictors of mortality in stroke patients. Advanced age, intracranial hemorrhage, ischemic heart disease, atrial fibrillation and recurrent stroke have been reported to predict long term mortality (Kojima *et al.*, 1990 ; Vemmos *et al.*, 1999 and 2000). Besides there have been some studies investigating the impact of the socioeconomic status on the prognosis of patients with ischemic stroke which reported socioeconomic status to be an important factor influencing stroke prognosis (Broderick *et al.*, 1992 ; Kunst *et al.*, 1998 ; Petty *et al.*, 1998 ; Jakovljevic *et al.*, 2001). Most studies on this topic are made in countries with a good health documentation system in which data can be recorded reliably and easily but data about factors influencing stroke prognosis in countries of the eastern mediterranean region and the middle east are sparse (van Rossum *et al.*, 1999 ; Spieler *et al.*, 2002).

In this study we assessed factors influencing mortality and functional outcome in patients with first-ever-in a life time ischemic stroke who were addressed to the Akdeniz University hospital, the only university hospital of the city of Antalya in the western mediterranean part of Turkey. Although this study is not population based, it is the first hospital-based prospective study assessing factors influencing mortality and functional outcome in first-ever-in a life time ischemic stroke in our country.

Subjects and methods

Two-hundred and one consecutive patients with first-ever ischemic stroke who were addressed to the department of neurology of the Akdeniz University hospital between October 1995 and July 2001 were included into the study. Exclusion criteria were : patients younger than 18 years, stroke due to subarachnoid hemorrhage or aneurism rupture, transient ischemic attacks only, cerebellar lesions, bilateral hemispheric lesions, history or CT finding of a previous symptomatic or asymptomatic stroke, and patients previously handicapped due to any other cause.

A detailed history was obtained and neurological examination was noted for all patients. Demographic and socioeconomic variables, stroke risk factors, stroke subtype and neurological findings were noted. Patients were divided into 3 categories according to their profession : 1) Manual (laborers, clerks, service workers, farmers and farm laborers) ; 2) Nonmanual (professionals, administrators, managers, employers, higher-grade technicians) ; 3) Housewives (Erikson *et al.*, 1992). Educational level was categorised in 2 groups : 1) illiterate : No primary school diploma ; 2) Literate : Primary school graduate or higher. Presence of medical health insurance was noted as 1) No medical health insurance or 2) Either official or private medical health insurance.

Cerebral infarction was defined as rapidly developing clinical signs of focal disturbance of cerebral function, lasting longer than 24 hours or leading to death, and a CT scan showing a hypodense area corresponding to the clinical picture. An MRI scan was only performed for confirmation of infarct areas when no lesion was seen on CT. Level of consciousness was defined as comatose or not. Urinary incontinence was diagnosed if patients did wet his or her bed or clothes or needed an indwelling catheter during hospitalisation. Speech disorder was defined as presence of aphasia, or not. For the cathegorisation of stroke subtypes we did not use international classification systems (like for example the TOAST classification) because at our patient numbers more cathegories would give insignificant results. Instead stroke subtype was classified as lacunar or nonlacunar which is also a widely accepted classification system (Sacco *et al.* 1991 ; Landi *et al.* 1992).

History of hypertension was defined as documented treatment of hypertension or systolic blood pressure > 140 mm Hg, or diastolic blood pressure > 90 mm Hg, or both, measured at least twice prior to the stroke. Diabetes mellitus was defined as usage of blood sugar lowering drugs prior to the stroke or a documented fasting blood glucose concentration exceeding 110 mg/dl. Hypercholesterolaemia was considered if one plasma cholesterol value was 240 mg/dl or higher prior to the stroke or at the time of admission. History of coronary heart disease was assessed by a questionnaire without medical confirmation if it was diagnosed by a cardiologist and the patient had been given a revelant treatment. Atrial fibrilation was diagnosed by ECG or considered as present if it was documented in the year before the event. Smoking was considered present when the patient smoked daily prior to the stroke and was considered absent when the patient had never smoked or stopped smoking at least 5 years before the stroke.

Functional disability was measured by the modified Rankin scale which was applied on the day of attendance and at the end of one year by the same physician (van Swieten *et al.*, 1988). All patients were followed up for 1 year after their stroke or until death.

Statistical Analysis

Long term case fatality was defined as death within 1 year of the stroke. Continuous data were analysed using the independent samples t tests, categorical data using the chi-square tests. Independent variables which were significant at the 0.05 level were entered into the multivariate logistic regression analysis. Dependent variables were analysed as dichotomous and independent variables were analysed as categoric. The modified Rankin scale was dichotomised according to independence for taking care of their own needs (score $\leq$ 2) or dependence on others for personal needs (score 3-5). Associations were presented as hazard ratios with their corresponding 95% confidence interval (95% CI). SPSS 10.0 for Windows software program was used for statistical analysis.

Results

Of the 201 patients enrolled, 54 (26.8%) were lost to follow up. Of the remaining 147 patients 122 (83%) had nonlacunar and 25 (17%) had lacunar infarction. Seventy-eight (53%) were male and 69 (47%) female. Demographic variables, stroke risk factors and neurological findings according to gender are given in Table 1. When demographic variables were compared according to gender there was no difference between age but there were significantly more widows/singles and illiterates among the female patients and coronary heart disease and smoking was more common in the male patients ($p < 0.05$).

During one year follow-up 35 (23.8%) patients died. Demographic variables, stroke risk factors and neurological findings according to survival are given in Table 2. The mean age of the patients who had died was significantly higher than the survivors ($p < 0.05$). There were significantly more widowed/single, illiterate and patients with no medical health insurance among the non survivors ($p < 0.05$). Presence of coma, left sided stroke, hemianopia and urinary incontinence were significantly more frequent in the non survivors ($p < 0.05$).

The most common stroke risk factors were hypertension (78.9%), hypercholesterolemia (38.8%) and diabetes mellitus (34.7%). Hypercholesterolemia, coronary heart disease and smoking were significantly more common in the non survivors. The percentage of functionally dependent patients on admission according to the modified Rankin scale was significantly higher in the non survivors.

When factors which were significant on univariate analysis were investigated with regression

Table 1

Baseline characteristics of patients according to gender (percentages are indicated in brackets)

	Male (n = 78, 53%)	Female (n = 69, 47%)	Total (n = 147)
Age (years)	63.26 ± 9.96	61.86 ± 11.31	
Marital status			
Married	63 (80.8)	43 (62.3)	106 (72.1)
Single/widowed	15 (19.2)	26 (37.7)†	41 (27.9)
Educational level			
Literate	52 (66.7)	25 (36.2)	77 (52.4)
İlliterate	26 (33.3)	44 (63.8)†	70 (47.6)
Occupation			
Manual	38 (48.7)	2 (2.9)	40 (27.2)
Nonmanual	40 (51.3)	1 (1.4)	41 (27.9)
Housewife		66 (95.7)	66 (44.9)
Presence of medical health insurance	61 (78.2)	57 (82.6)	118 (80.3)
Stroke subtype			
Nonlacunar	63 (80.8)	59 (85.5)	122 (83.0)
Lacunar	15 (19.2)	10 (14.5)	25 (17.0)
Presence of coma	16 (20.5)	23 (33.3)	39 (26.5)
Hemianopia	24 (30.8)	18 (26.1)	42 (28.6)
Aphasia	15 (19.2)	17 (24.6)	32 (21.8)
Urinary incontinence	19 (24.4)	18 (26.1)	37 (25.2)
Hypertension	62 (79.5)	54 (78.3)	116 (78.9)
Hypercholesterolemia	34 (43.6)	23 (33.3)	57 (38.8)
Diabetes mellitus	29 (37.2)	22 (31.9)	51 (34.7)
Atrial fibrillation	23 (29.5)	16 (23.2)	39 (26.5)
Coronary heart disease	24 (30.8)†	12 (17.4)	36 (24.5)
Smoking	34 (43.6)†	16 (23.2)	50 (34.0)
Dependence (on admission)	53 (67.9)	41 (59.4)	94 (63.9)

† $p < 0.05$
(Females compared to males).

analysis only marital status (OR, 2.03 ; 95% Cl, 1.22 to 8.51), educational level (OR, 3.56 ; 95% Cl, 1.71 to 10.26) and urinary incontinence (OR, 5.36 ; 95% Cl, 1.83 to 16.35) were left as significant predictors of mortality (Table 3).

Data on functional outcome 1 year after the stroke were available for 112 patients (35 patients died, 54 patients were lost to follow-up). Seventy-four percent of all patients, 77.4% of male patients and 70% of female patients were functionally independent at the end of 1 year and there was no difference between the two genders according to functional independence. In the univariate analysis dependence was related to age, educational level, presence of coma, hemianopia and urinary incontinence (Table 4). In a multivariable logistic regression model age (OR, 1.54 ; 95% Cl, 1.47 to 5.03), presence of coma on admission (OR, 1.69 ; 95% Cl, 1.53 to 5.85) and urinary incontinence (OR,3.8 ; 95% Cl, 1.00 to 14.88) remained associated with dependency after stroke (Table 5).

Discussion

In this study the factors affecting mortality and functional outcome within the first year after a first-ever ischemic stroke were investigated. This is the first hospital-based study in Turkey assessing multiple factors affecting stroke outcome and following up patients for one year.

After one year of follow-up 23% of our patients had died. This mortality rate is lower than those reported in other studies. In the Arcadia Stroke Registry, a prognostic study done in Greece which included also hemorrhagic strokes, the one-year mortality rate was found to be 36,8% (Vemmos *et al.*, 2000). The Danish MONICA study reported a one year mortality rate of 41% (Brønnum-Hansen *et al.*, 2002). This difference in mortality rates compared to these studies might result from the fact that we included only ischemic strokes and excluded patients with recurrent stroke. Williams et al reported a similar mortality rate of 24% in their study which had patient inclusion criteria similar to ours (Williams *et al.*, 2000).

Our findings are in agreement with previous studies, which found that age, urinary incontinence and level of consciousness on admission are the major factors affecting stroke prognosis (Howard *et al.*, 1986 ; Gelber *et al.*, 1993 ; Taub *et al.*, 1994 ; Hankey *et al.*, 2000). Advanced age can lead to recurrent stroke, osteoarthrosis, disorders of sight or hearing unrelated to a stroke and other degenerative diseases. Lack of motivation, caring difficulties, psychological problems and dementia also negatively influence outcome in the elderly

Table 2

Baseline characteristics of patients according to 1 year survival (percentages are indicated in brackets)

	Died (n = 35, 23.8%)	Survived (n = 112, 76.2%)
Age (years)	67.09 ± 11.54†	61.20 ± 9.93
Gender		
Female	19 (45.7)	50 (55.4)
Male	16 (54.3)	62(44.6)
Marital status		
Married	15 (42.9)	91 (81.2)
Single/widowed	20 (57.1)†	21 (18.8)
Educational level		
Literate	11 (31.4)	66 (58.9)
İlliterate	24 (68.6)†	46 (41.1)
Occupation		
Manual	9 (25.7)	31 (27.6)
Nonmanual	7 (20.0)	34 (30.4)
Housewife	19 (54.3)	47 (42.0)
Presence of medical health insurance	22 (62.9)†	96 (85.7)
Side of involvement		
Right	11 (31.4)	60 (53.6)
Left	24 (68.6)†	52 (46.4)
Stroke subtype		
Nonlacunar	27 (77.1)	95 (84.8)
Lacunar	8 (22.9)	17 (15.2)
Presence of coma	16 (45.7)†	23 (20.5)
Hemianopia	15 (42.9)†	27 (24.1)
Aphasia	11 (31.4)	21 (18.7)
Urinary incontinence	21 (60.0)†	16 (14.3)
Hypertension	29 (82.9)	87 (77.7)
Hypercholesterolemia	19 (54.3)†	38 (33.9)
Diabetes mellitus	16 (45.7)	35 (31.3)
Atrial fibrillation	13 (37.1)	26 (23.2)
Coronary heart disease	13 (37.1)†	23 (20.5)
Smoking	18 (51.4)†	32 (28.6)
Dependence (on admission)	25 (71.4)†	69 (61.6)

† $p < 0.05$
(Died compared to survived).

Table 3

Logistic regression analysis of factors affecting 1 year mortality

	OR	Cl% 95
Age	1.33	0.61-4.03
Marital status	2.03	1.22-8.51
Educational level	3.56	1.71-10.26
Presence of medical health insurance	1.01	0.55-2.63
Side of involvement	0.92	0.41-3.57
Presence of coma	1.42	0.71-4.32
Hemianopia	0.89	0.39-1.93
Urinary incontinence	5.36	1.83-16.35
Hypercholesterolemia	0.93	0.23-1.58
Coronary heart disease	1.14	0.47-2.59
Smoking	1.35	0.63-3.88
Dependence (on admission)	1.61	0.67-5.31

(Ferrucci *et al.*, 1996 ; Singh *et al.*, 2000 ; Krishman *et al.*, 2002). Urinary incontinence and a low level of consciousness on admission probably reflect the severity of brain damage which is not only the major factor contributing to early mortality, but also predisposes to the dependence of the survivors.

Socioeconomic status has been linked to overall mortality as well as cardiovascular disease morbidity and mortality in numerous studies (Marmot *et al.*, 1984 ; Pappas *et al.*, 1993 ; Sorlie *et al.*, 1995 ; Lynch *et al.*, 1996 ; Lantz *et al.*, 1998 ; Howard *et al.*, 2000). In our study we chose to take educational level, occupation and presence of medical health insurance as an indicator of socioeconomic status. From these indicators of socioeconomic status only educational level was shown to be an independent factor affecting mortality after one year of follow-up. In a study investigating the effect of socioeconomic status on poststroke mortality, Kapral et al reported that low socioeconomic status affects both mortality and conveyance to medical facilities even in a country with a universal health insurance program (Kapral *et al.*, 2002). In an international overview Kunts et al compared the effect of socioeconomic inequalities on stroke mortality and reported that the mortality rate was higher in the manual classes compared to nonmanual classes (Kunst *et al.*, 1998). Occupational differences did not affect mortality and functional outcome in our study. This might result from the fact that housewives were the largest group in our study population and this group is not homogenous either educationally or economically.

The contribution of formal education deserves most attention since it typically precedes work and income. In a study done in 50 US states, Muller concluded that the relation between income inequality and age adjusted mortality was due to differences in high school educational attainment and suggested that education absorbs the income inequality effect and is a more powerful predictor of variation in mortality among US states (Muller 2002). In that study lack of high school education was related to lack of health insurance, belonging to economically depressed groups, working in jobs with high risk of injury, and smoking. Because of lack of material resources, occupational exposure to risk, and certain learnt health risk behaviour might be reflected in the mortality effect education. It has been suggested that these communities may lack of sufficient investment in health related infrastructure such as access to health care, proper police protection and healthy housing (Kawachi *et al.*, 1997).

Kilander *et al.* investigated the relationship between education and health in a 25 year follow-up study. In a multivariate model including many factors such as educational level, life style, fatty acids and intake of anti-oxydants, smoking and alcohol consumption, antropometric variables, they reported that low educational level was a significant predictor of coronary heart disease and cancer mortality (Kilander *et al.*, 2001). In another study,

Table 4

Baseline characteristics of surviving patients according to dependence at the end of 1 year (percentages are indicated in brackets)

	Dependent (n = 29. 26%)	Independent (n = 83. 74%)
Age (years)	65.97 ± 7.30†	59.53 ± 10.22
Gender		
Female	14 (48.3)	48 (57.8)
Male	15 (51.7)	35 (42.2)
Marital status		
Married	24 (82.8)	67 (80.7)
Single/widowed	5 (17.2)	16 (19.3)
Educational level		
Literate	11 (37.9)	55(66.3)
İlliterate	18 (62.1) †	28 (33.7)
Occupation		
Manual	7 (24.1)	24 (28.9)
Nonmanual	8 (27.6)	26 (31.3)
Housewife	14 (48.3)	33 (39.8)
Presence of medical health insurance	24 (82.8)	72 (86.7)
Side of involvement		
Right	13 (44.8)	47 (56.6)
Left	16 (55.2)	36 (43.4)
Stroke subtype		
Nonlacunar	22 (75.9)	73 (88.0)
Lacunar	7 (24.1)	10 (12.0)
Presence of coma	11 (37.9) †	12 (14.5)
Hemianopia	11 (37.9) †	16 (19.3)
Aphasia	8 (27.6)	13 (15.7)
Urinary incontinence	8 (27.6) †	8 (9.6)
Hypertension	25 (86.2)	62 (%74.7)
Hypercholesterolemia	11 (37.9)	27 (32.5)
Diabetes mellitus	9 (31.0)	26 (31.3)
Atrial fibrillation	5 (17.2)	21 (25.3)
Coronary heart disease	7 (24.1)	16 (19.3)
Smoking	9 (31.0)	23 (27.7)

† $p < 0.05$
(Dependent compared to independent).

Table 5

Logistic regression analysis of factors affecting dependence at the end of 1 year

	OR	Cl% 95
Age (years)	1.54	1.47-5.03
Educational level	0.94	0.22-4.02
Presence of coma	1.69	1.53-5.85
Hemianopia	0.87	0.23-3.29
Urinary incontinence	3.8	1.00-14.88

van den Bos et al only took educational level as an indicator of socioeconomic status (van den Bos *et al.*, 2002). Demographic factors, clinical features, health outcomes and related health care utilisation were investigated in 465 stroke patients randomly chosen from 23 hospitals. They reported that in patients of low socioeconomic status handicap and disability were worse on long term follow-up and that disease etiopathogenesis did not affect prognosis. Patients of low socioeconomic status were more often addressed to a nursing home, had a lower chance of living in the community and those who were non-instutionalised did receive significantly more community care, particularly ADL care**.** In the FINMONICA Stroke Registry study, a population based study done on 6903 patients with first-ever stroke, ischemic stroke morbidity and mortality was increased in patients with lower socioeconomic status (Jakovljevic *et al.*, 2001).

In addition to these factors we also found marital status to be an independent prognostic factor for mortality within 1 year of an ischemic stroke. Fifty-one percent of the patients who died were single or widowed and this percentage was significantly higher than in the survivors. This might well be an indicator that these patients had problems receiving care. Unfortunately in our country even patients who live alone or do not have family support have to be discharged to their homes after acute stage stroke treatment, because of lack of nursing homes and insufficient place in medical facilities. It is possible that relatives other than partners, who are responsible to care for the patients often are working, have their own family to care for and therefore have less time left to care for the disabled, sometimes bedridden, older patient and often hire cheap, non professional persons as a day time carer. This might explain the high rate of death in our single or widowed patient group.

We did not find any difference in mortality and functional outcome between patients with lacunar and nonlacunar infarctions. This finding stands in contrast to other studies who report a lower mortality and better functional outcome in patients with lacunar infarctions (Sacco *et al.*, 1991 ; Landi *et al.*, 1992 ; Sacco *et al.*, 1994 ; de Jong *et al.*, 2003). It is possible that a sufficient statistical power has not been reached due to a low number of patients.

Even though our study is hospital-based this is the first one-year prospective follow-up study on first-ever stroke in Turkey. Other factors differentiating our study from others are that we used both mortality and functional independence as prognostic end-points and assessed both biological and socioeconomic factors as prognostic risk factors. In addition to those, we used 19 independent variables in this study.

Some limitations of our study warrant mention. Our results may not reflect the general population because patients with low income, no health insurance, very bad prognosis or with a rapidly resolving deficit may not have been addressed to hospital. Moreover, the number of patients is small. Another limitation of our study is the lack of information about the causes of deaths. The main reasons for this are that in Turkey reliable cause-specific mortality data are not routinely available and these patients often die in places other than medical facilities. Stroke affects not only physical functioning

but also emotion, memory, thinking and communication and these have been reported to affect prognosis, but we did not evaluate cognitive and psychological deficits (Duncan *et al.*, 1999).

Conclusion

In this study we demonstrated that in addition to biological factors like age, urinary incontinence and level of consciousness, other factors like being single or widowed and educational level, which is a good indicator of socioeconomical status, are independent predictors of prognosis.

Health and educational planning and politics which are adjusted to a country's condition and needs could be helpful in reducing the differences in patient outcome due to socioeconomic status. Increasing the socioeconomic status and physical condition of patients with low educational level who are facing problems with care would give them the chance to live a longer life of better quality.

Further development of models for stroke risk and stroke mortality that account for both conventional or biological risk factors is needed, as are specific social conditions that independently increase the public health burden of stroke. Identification of key social conditions associated with stroke risk and prognosis will result in better planned health policies in all communities.

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