An Evaluation of Pre-Admission Factors Affecting the Admission Time of Patients with Stroke Symptoms

İnme semptom veya bulguları ile acil servise başvuran hastaların başvuru zamanlarını etkileyen hastane öncesi faktörlerin değerlendirilmesi

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Tanzer KORKMAZ,[1] Gürkan ERSOY,[2] Kürşad KUTLUK,[2] Bülent ERBİL,[3]
Funda KARBEK AKARCA,[4] Nesibe SÖNMEZ,[5] Ömer Faruk DEMİR[6]

[1]Department of Emergency Medicine, Abant İzzet Baysal University, Faculty of Medicine, Bolu

[2]Department of Emergency Medicine, Dokuz Eylül University, Faculty of Medicine, İzmir

[3]Department of Emergency Medicine, Ankara Hacettepe University, Faculty of Medicine, Ankara

[4]Atatürk Training and Research Hospital, İzmir

[5]Buca Medical Center, İzmir

[6]Ankara Dışkapı Training and Research Hospital, Ankara

SUMMARY

Objective: New drugs to be optimally curative in stroke therapy should be given quickly after the appearence of the symptoms. In this study, we studied the factors regarding the delay of the patients' admissions to the emergency departments and the knowledge level of the people about the stroke.

Methods: A prospective study was designed in a third referral hospital. The adult patients admitting to hospital with neurologic symptoms were recruited in the study. The patients who admit to the hospital in more than 3 hours after the symptoms appear were asked about the reasons of the delay with open ended questions.

Results: The mean age of 117 patients that included in the study were 66.7±13.2. Of these patients, 44% (n=52) were admitted in the first three hours. For patients arriving at hospital in the first three hours the demographic analysis were statistically significant for those living with family members (p=0,008) and for those with speech impairment (p=0,002). Of the patients who arrived at the hospital in more than three hours (n=61, 45.9%), most had either waited for the symptoms to disappear or were hesitant about coming to the hospital.

Conclusions: The general knowledge level of the people about the symptoms and risk factors of stroke is thought to be the most important parameter concerning the early admittance. However in this study we found that even the knowledge level is insufficient stroke patients have been reported to admit to the emergency department in the first six hours.

Key words: Acute stroke; delay; hospital arrival; stroke onset.

ÖZET

Amaç: *Yeni geliştirilen tedaviler ve özellikle de riskli trombolitik tedavi seçeneği nedeniyle acil tedavi gerektiren bir hastalıktır. Çalışmamızda amacımız, hastane öncesi gecikme nedenlerinin neler olduklarını ve toplumumuzun inme konusundaki bilinç düzeyini araştırmaktır.*

Gereç ve Yöntem: *Çalışma prospektif olarak Dokuz Eylül Üniversitesi Acil servisine 6 ay süresince 18 yaş üstü nörolojik semptom veya bulgularla başvuran tüm hastaların çalışmaya alınması ile yapıldı. İnme ön tanısı düşünülen hastaların demografik özellikleri ve hastaneye üç saatten geç başvuran hastaların gecikme nedenleri soruldu.*

Bulgular: *Nörolojik semptom veya bulgularla acil servise başvuran 117 hastanın yaş ortalaması 66.7±13.2 (aralık 22-93) olarak bulundu. Bu hastaların başvuru zaman ortalaması 9.5±14.5 saat idi; %44'ünün (n=52) ilk üç saatte hastaneye başvurduğu tespit edildi. Ailesi ile yaşayan (p=0.008), konuşma bozukluğu bulunan (p=0.002) hastaların anlamlı olarak ilk 3 saat içinde hastaneye başvurdukları görüldü. Hastaneye üç saatten uzun sürede başvuran hastaların (n=61) çoğunluğunu semptomların geçmesini bekleyen veya hastaneye gelmek konusunda isteksiz olan hastaların (n=28) oluşturduğu tespit edildi.*

Sonuç: *Toplumun inme semptomları ve risk faktörleri hakkındaki genel bilgi düzeyinin, erken başvuruyu belirleyen en önemli parametre olduğu düşünülür. Ancak, akut inme olguları azımsanmayacak bir oranda ilk 6 saatte acil servise başvurmuşlardır. Bütün bunların ışığında toplumun hastalığı tanıması ve tedavi yaklaşımları ile fiziksel sakatlıkların önlenebileceği veya azaltılabileceği konusunda hızlı ve acil olarak eğitilmesi gerekliliği vardır.*

Anahtar sözcükler: *Akut inme; başvuru zamanı; başvuru gecikmesi; inme başlangıcı.*

Correspondence

Tanzer KORKMAZ, M.D.

Abant İzzet Baysal Üniversitesi,
Acil Tıp Anabilim Dalı, 14100 Bolu, Turkey.

Tel: +90 - 374 - 253 46 56
E-mail: tanzerkorkmaz@gmail.com

Introduction

A stroke is a loss of neurologic function arising from the sudden blockage of blood flow to the brain. As defined by the World Health Organization (WHO), strokes are "rapidly developing clinical signs of focal (or global) disturbance lasting 24 hours or longer or leading to death with no apparent cause other than of vascular origin".[1]

Strokes, especially when treated with new, risky thrombolytic agents, qualify as medical emergencies. To achieve optimal effects with such agents, treatment should be prompt after the appearance of symptoms. It is imperative to increase public awareness of how to identify symptoms, increase the efficacy of paramedic care and improve the accuracy of early diagnosis. Patients experiencing stroke symptoms must be evaluated quickly by a multidisciplinary stroke team in a hospital ER setting.[2,3] Our purpose is to identify pre-admission factors affecting the admission time of patients with stroke symptoms, and prognosis of the patients in respect with admission time. The results of this study may encourage the development of necessary precautions and stimulate further study in this area.

Materials and Methods

This study was designed as a prospective cross-sectional analytic study. During the six-month period between March-September 2003, all patients over 18 years of age who were admitted to Dokuz Eylul Medical Faculty Emergency Department with neurologic symptoms who diagnosed as stroke were included in the study. All patients were fully informed and consent was obtained.

Excluded from the study were trauma patients, those who did not want to participate, cases where unreliable history taking occurred and patients with uncertain diagnoses were excluded from the study. Additionally patients who left the hospital prior to the confirmation of a diagnosis, patients referred to other centers, patients who left due to insurance reasons, patients whose diagnosis could relate to conditions other than stroke and patients whose first site of admission was not Dokuz Eylul University Hospital were excluded.

Information was provided by patients themselves if they were conscious; otherwise it was provided by the closest relative or the individual who brought the patient to the hospital. After physical and neurological examinations, the severity of stroke symptoms was measured using a mRS (modified Ranking Scale) and the GCS (Glasgow Coma Scale). Various demographic information was obtained, such as patient age (older or younger than 65 years), sex, educational status, insurance, living status (alone, retirement home, those living with family members) and method of transportation used to reach the hospital (ambulance, public transport, on foot, etc.).

Once admitted to the emergency department, patients were asked if they understood their symptoms were related to stroke, if they had other medical conditions, if they had experienced any previous transient ischemic attack and/or had a history of stroke and if there was a family history of stroke. If the patient was unconscious, these questions were asked to the closest relative present with the patient. The time the initial symptoms appeared (if sleeping, between 00.01-6.00, 06.01-12.00, 12.01-18.00, 18.01-24.00) and the time of admission to the hospital were noted. The duration of initial symptoms up until admission to the emergency room was divided into four groups (0-3 hours, 3-6 hours, 6-12 hours, >12 hours). Of the patients those who arrived at the hospital in more than three hours after the onset of symptoms were asked about the reasons for the delay. They were let to explain the reasons in their own words. The reasons were then further categorized into groups. The neurologic examinations were grouped as follows: GCS scores ($\leq$10, >10) and mRS scores ($\leq$3, >3). All patients were followed up for 30 days, and were then contacted by telephone the following week. The patient or their relatives were asked verbally about the mRS criteria. If the patient was still in the hospital, then they were visited and asked the same questions. All patients were also asked about their daily activities.

Statistical Analysis

Hospital admission time and independent variables were analyzed using chi-square (continuity correction) tests and Fisher's Exact test. In the analysis of factors affecting hospital admission time, logistic regression was used. A result of $p<0.05$ was considered statistically significant.

Results

During the six-month period of the study, there were 196 patients admitted with neurologic symptoms who diagnosed as stroke. A total of 79 patients were excluded from the study (10 had incomplete surveys and 69 patients were admitted to a hospital other than Dokuz Eylul University

Table 1. *Patient admission time to the hospital*

Hospital admission time (h)	n	Mean (min.)	%
0–3	52	68.75±4	44.4
3–6	16	277.50±41.6	13.7
6–12	18	510.27±120.1	15.4
>12	27	1768.8±1109.5	23.1
Uknown	4		3.4
Total	117		100

Hospital first (some patients were admitted to more than one hospital and we could not find the time lag between the onset of symptoms and hospital admission for those patients). Patient demographics were based on 117 surveys and the analysis of admission time was based on 113 surveys.

The mean age of the patients was 66.7±13.2 (26-93 years old). Fiftyfour patients (46.2%) were female and 63 (53.8%) were male. The mean age of female patients was 68.6±14.5 and the mean age of male patients was 65.0±11.8.

The time difference between the onset of symtoms and admission to the hospital was 574.8 ± 874.6 mins (9.5±14.5 hours). Of the patients, 44% (n=52) were admitted in the first three hours and 58.1% (n=68) were admitted in the first six hours after the onset of symptoms (Table 1).

For patients arriving at hospital in the first three hours after the onset of symptoms the demographic analysis was statistically significant only for those living with family members vs those living alone or in retirement homes (Table 2). Stastisical analysis was insignificant in respect of age, employement status, education status, insurance or the vehicle used (Table 2).

When patients presenting with stroke symptoms were examined it was found that hemiparesis (n=124, 66.7%) and speech impairment (n=98, 52.7%) were the most common symptoms (Figure 1). Comparing the most common symptoms, history, comprehension of symptoms, the GCS, and the mRS to the time of delay, only admission within three hours of the onset of symptoms for patients with speech impairment was statistically significant (Table 3). Likely stroke subtypes as ischemic or hemorrhagic and mRS pointing the prognosis predictör after 30 days were also insignificant in respect of the admission time (Table 4).

Table 2. *Hospital admission time compared to demographic properties*

	Hospital admission time (h)		p
	0.00-3.00	>3.01	
Age			**0.94**
≥65	35 (67.3%)	39 (63.9%)	
<65	17 (32.7%)	22 (36.1%)	
Employment			**0.16**
State employed	7 (13.5%)	4 (6.6%)	
Housewife	19 (36.5%)	22 (36.1%)	
Retired	15 (28.8%)	29 (47.5%)	
Unemployed	7 (13.5%)	3 (4.9%)	
Manual Studyer	4 (7.7%)	3 (4.9%)	
Education status			**0.82**
Primary school	33 (63.5%)	39 (63.9%)	
Highschool	13 (25.0%)	13 (21.3%)	
Illiterate	6 (11.5%)	9 (14.8%)	
Insurance			**0.92**
Government	43 (82.7%)	50 (82.0%)	
Other*	9 (17.3%)	11 (18.0%)	
Vehicle used			**0.14**
Public-Taxi	22 (%42.3)	36 (%59)	
112 ambulance	12 (%23.1)	13 (%21.3)	
Other**	18 (%34.6)	12 (%16.7)	
Resides with…			**0.008**
Family	38 (73.1%)	56 (91.8%)	
Other***	14 (26.9%)	5 (8.2%)	

* Private insurance, no insurance; ** Walking, ambulance, public transport etc; *** Alone, retirement home, those staying with different people.

Table 3. *Patients ability to understand their signs/ symptoms, history, GCS, mRS scores and admission time comparison*

	Hospital admission time (h)		p
	0.00-3.00	>3.01	
Symptom			
Hemiparesis	37 (71.2%)	41 (67.2%)	0.65
Speech impairment	34 (65.4%)	22 (36.1%)	0.002
History			
TIA history	16 (30.8%)	19 (31.1%)	0.96
Stroke history	12 (23.1%)	16 (26.2%)	0.69
Stroke in family history	9 (17.3%)	6 (9.8%)	0.24
Comprehension of symptoms			
Understood	27 (51.9%)	33 (54.1%)	0.81
Did not understand	25 (48.1%)	28 (45.9%)	
GCS			
≤10	8 (15.4%)	8 (13.1%)	0.73
>10	44 (84.6%)	53 (86.9%)	
mRS			
≤3	6 (11.5%)	9 (14.8%)	0.61
>3	46 (88.5)	52 (85.2%)	

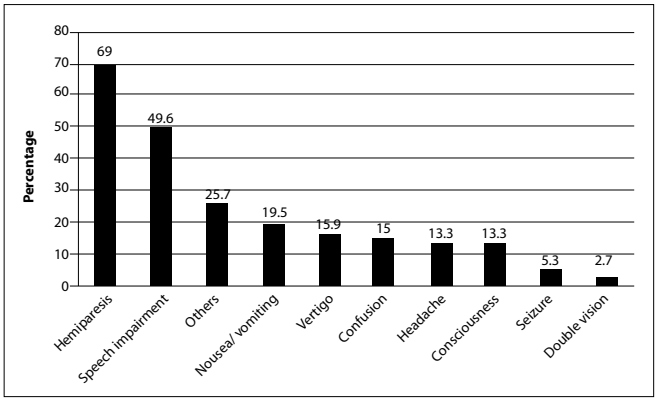

Fig. 1. *Signs and symptoms associated with stroke.*

Logistic regression analysis was applied to the following variables with regards to admission time: age, time of the onset of symptoms, stroke subtypes, mRS and GCS scores and the two most common symptoms (hemiparesis and speech impairment). Once insignificant variables were eliminated, only speech impairment and hemiparesis were found to be statistically significant. On the groups of stroke symptom onset time (00.01-6.00, 06.01-12.00, 12.01-18.00, 18.01-24.00), 00.01-06.00 hours of symptom onset, when compared to the other time groups were four times more delayed in admission time when compared to other groups (p=0.06, OR=4.03). Patients with speech impairment arrived at the hospital 0.3 times (30%) earlier than other patients (p=0.004, OR 0.30) (Tables 3, 4).

Of the patients who arrived at the emergency department more than three hours after the onset of symptoms (n=61), most had either waited for the symptoms to disappear or were hesitant about coming to the hospital (n=28, %45.9) (Table 5).

Discussion

The physical and cognitive sequelae that may develop after stroke affects patients biologically, psychologically, socially and economically.[4,5] These patients often require extra care. Recently, stroke therapy is possible in the emergency hospital setting. The most important factor in treating strokes that have occurred with in the past three hours is administration of the proven curative drug known as t-PA (tissue plasminogen activator).[4,5] Even though the use of t-PA to improve quality of life is selective, early administration is imperative. The most important parameters about early admission to hospital are considered to be population knowledge level about of stroke and risk factors of the disease.[6]

Table 4. *Patients stroke subtype, the comparison of prognosis and stroke onset to hospital admission time*

	Hospital admission time (h)		p
	0.00-3.00	>3.01	
Prognosis (mRS)			
≤3	27 (51.9%)	29 (47.5%)	0.64
>3	25 (48.1%)	3 (52.5%)	
Stroke subtypes			
Ischemic stroke	46 (88.5%)	52 (85.2%)	0.61
Hemorrhagic stroke	6 (11.5%)	9 (14.8%)	
Stroke onset			0.07
00.01-06.00	3 (5.8%)	14 (23%)	
06.01-12.00	14 (26.9%)	16 (26.2%)	
12.01-18.00	20 (38.5%)	17 (27.9%)	
18.01-24.00	15 (28.8%)	14 (23%)	

mRS: Modified Rankin Scale.

Table 5. *Reasons for delay more than 3 hours*

Reason	n (%)
Waited for symptoms to subside (not willing to go)	28 (45.9%)
Did not understand symptoms (side effect)	13 (21.3%)
Was unable to reach anyone	11 (18%)
No clear answer	5 (8.2%)
Came once he/she woke up	4 (6.6%)
Total	61 (100%)

Referring to the literature, although there is no statistical significance most stroke patients are older and male.[7] Accordingly, in our study there was no significant difference regarding age or sex.[6]

In our study, the mean admission time of our patients (n=117) was 9.5±14.5 hours. In the literature, the percentage of patients admitted to hospital within the first three hours of the onset of symptoms was reported to be between 24%-92.2% and within six hours between 51%-61%.[8-14] Our results are in parallel with the literature as 44% (n=52) of the patients arrived within three hours of the onset of symptoms and 58.1% (cumulative) arrived within six hours.

There have been many studies that have tried to determine the factors that affect hospital admission time. According to the literature, the main causes leading to the delayed admission of stroke patients are slow onset of symptoms, living alone, inability to contact relatives, relatives inability to recognize symptoms, and younger age. The sudden

onset of symptoms, transport via ambulance, a high stroke score and living in an urban area were found to be factors contributing to early hospital admission.[11,15,16] In our study, none of these factors were found to be statistically significant. To give one example about these factors that is the transportation vehicle, we found conflicting reports in the literature. Like our results Srivastava et al., have shown that the type of vehicle used for transportation of the patients is irrelevant to the hospital admission time unlike Chen et al., and Lopez-Hernandez et al., who reported just the opposite results.[8,12,17]

As in previous studies, our results about educational status, insurance, the number of stroke symptoms, recognition of symptoms by relatives, a previous history of transient ischemic attack, stroke subtypes and mRS scores were not found to be statistically significant.[11,12,15,18,19] Unlike our study, Pittock et al. found that a previous history of transient ischemic attack or a low GCS score were reasons for earlier hospital admission time.[16] There have also been studies demonstrating that a lack of symptom recognition delayed hospital admission time and other studies have found that being female or having a severe neurologic deficit quickened hospital admission time.[7-10,15]

The reasons witholding the patients from coming to the hospital earlier may be the presence of an overt symptom pain. Most of the time, a slight numbness of the extremities is not enough for a patient to take it seriously. Usually, patients only decide to go to a hospital when a serious development occurs. In our study, reasons for delayed admission were mostly that patients waited for symptoms to pass, had a fear of the hospital, or simply did not want to go as shown in Table 5.

Patients whose symptoms began within the 00:01-06:00 timeframe were, on average, admitted four times later compared to the other groups. The results of studies by Williams et al, Azzimondi et al., and Lopez-Hernandez et al. were congruent with our results.[14,17,19] On the other hand, other studies have claimed that stroke symptoms appearing either at night or during the day were not statistically significant with regards to hospital admission time.[14,15,19,20] Another important result obtained from our study was that stroke patients presenting with speech impairment had a tendency to arrive at the hospital sooner (p=0.002). The study by Wester et al. supports our results.[18] Earlier admission of patients with speech impairment might be the interpretation of that symptom as a major health problem by the patients and their relatives.

In the light of our results, we think that the public has to be better educated to recognize stroke symptoms which may let them to get the opportunity about the newly developed treatment modality in stroke that are the thrombolytic agents. Equally important is the improvement of the education level for all health personnel, including doctors.[5,6,8,16,19] There is a need to develop new organizations and educational programs dealing with this issue. We believe that taking these necessary precautions will improve people's ability to recognize the symptoms of stroke in the future and will ensure patients reach a hospital within an appropriate timeframe. It is our responsibility as physicians to help educate the public on this topic.

Limitation

There are a few limitations in our study. One of the limitations was that this study included only one metropolitan university hospital and cannot be generalized to rural areas. The other one was the short duration and the number of the patients included. If this study had been propagated to more centers with inclusion of more patients the results would be more generalized in helping evaluate prehospital delay factors for acute stroke.

Conclusion

More delays were observed in case the patients do not understand the symptoms and when they wait for the symptoms to subside. Another cause of the delay was found to be the unwillingness of the patients to go to the hospital. Those living with family members and the patients with speech impairment were found to apply earlier than the others. This study emphasizes on information about stroke symptoms and reducing delay time to hospital arrival for stroke.

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