Risk Factors Affecting Disability Rates in Patients with Stroke

İnmeli Hastalarda Özür Oranlarını Etkileyen Risk Faktörleri

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ABSTRACT Objective: The relation between the disability rates of affected patients and the risk factors affecting the health care system were investigated. **Material and Methods:** Between January 2011-September 2015, data of 613 (348 F, 265 M) patients with unilateral motor deficits at least 1 year history of stroke were retrospectively analyzed. Demographic features, disability rates, and comorbid conditions were recorded. **Results:** Of 613 (mean age; 70.0±10.0 years (range; 50 to 100 years)) hemiplegic patients, 270 (44%) had right and 343 (56%) had left hemiplegia. Hypertension was the most common comorbidity in 65% of the patients. The disability rate was higher in the right hemiplegics (86%) than in the left hemiplegics (83%) (p=0.009). Of the study group, 57% (n=351) had severe disability. The mean age and disability rate were higher in patients with severe disability (both p<0.001). The severe disability rate was also higher in the right hemiplegics (62%) than left hemiplegics (53%) (p<0.05). In addition to the presence of right-sided hemiplegia, severe disability was also associated with advanced age, presences of dementia, and aphasia. **Conclusion:** Due to the increased prevalence of other risk factors such as hypertension in stroke patients, patients sustaining stroke must be evaluated in detail from this perspective. We were unable to find any study in the literature that evaluated the health commission assessments and disability status in stroke patients, and the present study might light the way for future studies.

Keywords: Stroke; disability evaluation; hemiplegia; hypertension; rehabilitation

ÖZET Amaç: İnme nedeni ile sağlık kuruluna başvuran hastaların özür oranları ve etkileyen risk faktörlerinin ilişkisi araştırılmıştır. **Gereç ve Yöntemler:** Çalışmaya, Ocak 2011-Eylül 2015 tarihleri arasında sağlık kuruluna başvuran hastaların dosyaları retrospektif olarak taranarak, en az bir yıl önce serebrovasküler olay geçirmiş ve tek taraflı alt ve üst ekstremitesinde motor defisiti olan 613 (348 kadın, 265 erkek) hasta dâhil edildi. Hastaların demografik özellikleri, özür oranları ile eşlik eden hastalıkları kaydedildi. **Bulgular:** Altı yüz on üç hemiplejik hastanın (ortalama yaşları 70,0±10,0, yaş aralığı 50-100 yıl) 270 (%44)'i sağ hemiplejik iken, 343 (%56)'ü sol hemiplejikti. Hastaların %65'inde hipertansiyon mevcuttu. Sağ hemiplejiklerin ortalama özür oranı (%86), sol hemiplejiklere (%83) göre yüksek idi (p=0,009). Tüm hastaların %57 (n=351)'si ağır özürlü kabul edilmişti ve bunların yaşı ağır özürlü olmayanlara göre yüksek idi (p<0,001). Sağ hemiplejiklerin ağır özürlü olma oranı (%62), sol hemiplejiklere (%53) göre yüksek idi (p<0,05). Ağır özürlülük ile sağ taraf tutulumu, ileri yaş, demans ve afazi varlığı ilişkili saptandı. **Sonuç:** İnme geçirmiş hastalarda başta hipertansiyon olmak üzere diğer risk faktörlerinin sıklığı arttığından bu yönden ayrıntılı incelenmelidir. Literatürde, inme geçirmiş hastaların sağlık kurulu değerlendirmeleri ve özür durumu ile ilgili başka çalışmaya rastlamadığımızdan, çalışmamız ileride yapılacak daha geniş kapsamlı çalışmalara ışık tutabilir.

Anahtar Kelimeler: İnme; sakatlık-maluliyet değerlendirmesi; hemipleji; hipertansiyon; rehabilitasyon

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Stroke is a temporary or permanent condition caused by ischemia or hemorrhage involving a certain brain site or primary pathological condition of the blood vessels of the brain.[1] It is often defined as a

possibly fatal condition lasting more than 24 hours which leads to focal or generalized neurological deficits rapidly developing due to impairment in cerebral functions associated with vascular degeneration.[2] Stroke is the third leading cause of death worldwide following cardiovascular disorders and cancer. Nearly two thirds of the patients survive after sustaining stroke for the first time and about half of the survivors develop sequelae which lead to physical and social disability.[3]

The World Health Organization (WHO) defined disability as any restriction/lack of ability to perform an activity considered normal in daily living, while handicap is defined as a disadvantage for an individual that limits/prevents the fulfillment of a role that is considered normal.[4] The regulations on official descriptions related to disability in Turkey, structure of health commission, and disability rates have been enacted with the code of practice promulgated on July 16, 2006.[5] According to these regulations, disabled person was defined as an individual with congenital/acquired condition who experience difficulties in adjusting to social life and fulfilling his/her own needs due to loss of physical, mental, psychological, and social abilities to varying degrees. The term severe disability, on the other hand, refers to individuals with loss of more than 50% of bodily functions, who are lack of self-care abilities, who experience difficulties in independent ambulation and communication skills.[5] The legal regulations on this subject have been subjected to amendment a few times on different dates and the term disabled has been replaced with handicapped on May 3, 2013.[6]

Social benefits of the patients increase in proportionate to disability ratings determined by the healthcare professionals. In addition, access to certain benefits requires severe disability/handicap. The decision of whether a given patient fulfills criteria for severe disability is one the most delicate decisions given by the health commission.

To the best of our knowledge, there is no study in the literature evaluating the severe disability condition in relation to comorbidities in stroke patients. Therefore, we aimed to evaluate the relationship between comorbidities and disability rates in stroke patients who applied to the health care services.

MATERIAL AND METHODS

Between January 2011 and September 2015, hospital records of 30.843 patients were reviewed. Of these, 1598 patients were diagnosed with stroke. Patients with concomitant diseases such as Parkinson's disease, multiple sclerosis, motor neuron disorder, myopathy, polyneuropathy, head injury, spinal cord/brain tumor, brain metastasis leading to neurological sequelae, and patients younger than 50 years were excluded. Data of 613 stroke patients (348 F, 265 M) with unilateral motor deficits at least one year history who were admitted to Şanliurfa Mehmet Akif Inan Training and Research Hospital were retrospectively analyzed. The disability rate was calculated according to the relevant legislation.[7] The patients were assessed in terms of demographic features such as age, gender, hemiplegic side, comorbidities, disability rates of the hemiplegic upper and lower extremities, and total disability rates after addition of other concomitant pathologies, and the presence of severe disability.

The study protocol was approved by the Ethics Committee of Harran University, Faculty of Medicine (Date: 09/10/2015; number: 74059997.050.01.04/74). The study was conducted in accordance with the principles of the Declaration of Helsinki. Since the data was collected retrospectively, informed consent could not be obtained from the patients.

STATISTICAL ANALYSIS

Statistical analyses were carried out using SPSS 17.0 for Windows. Distributions of parametric variables were evaluated by using the Kolmogorov-Smirnov test. Student's t-test was used to analyze parametric numerical data, and Mann-Whitney U test was used to analyze non-parametric data. A Kruskal Wallis variance analysis was used, and post-hoc comparisons were performed with Mann-Whitney U test to compare the differences between the subgroups. Chi-square or Fisher's exact test was used to compare categorical data. Spearman correlation

tests were used to determine the relationships between the variables. All demographic and quantitative data are expressed as mean ± standard deviation (SD). A p value <0.05 was considered to be statistically significant.

RESULTS

The disability rating scores were calculated according to the Tables 1 and 2. Demographic features, comorbidities, gender distribution according to the age groups, and disability rates of all patients are summarized in Tables 3-6. Of 613 patients (mean age; 70.0±10.0 years (ranging 50 to 100 years)), 270 (44%) had right hemiplegia and 343 (56%) had left hemiplegia. Although the mean age was higher in females than males (p<0.001), there was no difference in the disability rates between the two genders (p>0.05). When patients were divided into age subgroups, total disability rates and lower extremity involvement rates were increased with the advanced age (p<0.001). The disability rate was higher in right hemiplegics than left hemiplegics (p=0.009); however, the mean age was not different between the groups (p=0.645). Of the study group, 57% of the patients (n=351) had severe disability rates. Age and disability rates were found to be higher in patients having severe disability (both p<0.001). Right hemiplegics (61.5%) had more severe disability rates than left hemiplegics (52.8%) (p<0.05).

Hypertension (HT) was found in 65% of the patients with a higher prevalence among female patients (69% vs. 61%; p=0.03). Of the patients, 26% had at least one cardiac disorder. The mean age was lower in patients with CAD (67.7±9.8 years) than without CAD (70.2±9.8 years) (p<0.001).

Of the patients, 40% had eye problems as the second most common comorbid condition. Age was higher in patients with eye problems (71.8±9.1 years), than without eye problems (68.8±10.1 years)

TABLE 1: The regulations promulgated on December 16, 2010 in the official journal number 27787 on disability criteria, classification, and health commission reports provided to the patients. Musculoskeletal system section Table 4.1 -Standing, walking, and movement disorders (accompanying central nervous system and spinal cord lesions).

Standing, walking and movement disorders		Disability rate (%)
Mild	- Able to stand up - Walks short distance but experiences difficulties in climbing slopes, levels, steps, deep chairs, and walking long distance	20
Mild to moderate	- Able to stand up - Walks short distance with difficulty and unaided, but walking is limited to flat surface	40
Moderate to severe	- Able to rise and remain standing with difficulty - Unable to walk unaided	60
Severe	- Unable to rise unaided or without mechanical support and/or assistive device	80

TABLE 2: The regulations promulgated on December 16, 2010 in the official journal number 27787 on disability criteria, classification, and health commission reports provided to the patients. Musculoskeletal system section Table 4.2.a–Upper extremity disorders (accompanying central nervous system and spinal cord lesions).

		Disability rate (%)	
Single upper extremity disorder		(Dominant Side)	(Non-Dominant Side)
Mild	Uses the affected extremity in self-care, activities of daily living, but having difficulties in fine motor skills of fingers.	10	5
Mild to moderate	Uses the affected extremity in self-care, activities of daily living with some difficulty, grabs objects and holds, but no fine motor skills in the fingers.	25	15
Moderate to severe	Uses the affected extremity in self-care, but having some difficulty in performing activities of daily living.	40	30
Severe	Unable to use the affected extremity in self-care, activities of daily living.	60	45

TABLE 3: Comparison of the demographic features of all patients (n=613).

	Female	Male	Right hemiplegia	Left hemiplegia	Severe disability	Non-Severe disability	All
Female			143	205	201	147	
Male			127	138	150	115	
Severe disability	201	150	167	184			351
Non-Severe disability	115	147	103	159			262
Age (year)	71.4±10.1	68.1±9.1	70.0±10.0	70.1±9.6	71.9±9.2	67.4±10.1	70.0±10.0
Dis. rate	84.4±12.5	84.1±13.3	85.8±11.8	83.1±13.5	90.1±7.5	76.5±14.4	85.3±12.9
Total	348	265	270	343	351	262	613

Dis. rate: Disability rate; Data are given as mean±SD or n.

TABLE 4: Comorbidities of all patients.

	Female (n=348)	Male (n=265)	Right hem. (n=270)	Lefthem. (n=343)	All (n=613)
Hypertension	240 (69)	161 (61)	170 (63)	231 (67)	401 (65)
Eye problem	140 (40)	107 (40)	99 (37)	148 (43)	247 (40)
Cardiac disorder *	85 (24)	73 (28)	68 (25)	90 (26)	158 (26)
Diabetesmellitus	86 (25)	47 (18)	64 (24)	69 (20)	133 (22)
Otorhinolaryngologic disorder	62 (18)	49 (18)	48 (18)	63 (18)	111 (18)
Dementia	58 (17)	39 (15)	42 (16)	55 (16)	97 (16)
Speech disorder **	15 (4)	30 (11)	38 (14)	7 (2)	45 (7)
COPD	12 (3)	14 (5)	12 (4)	14 (4)	26 (4)
CKD	10 (3)	9 (3)	6 (2)	13 (4)	19 (3)
Urinary dysfunction	12 (3)	6 (2)	3 (1)	15 (4)	18 (3)
Epilepsi	4 (1)	4 (2)	1 (0)	7 (2)	8 (1)

*: Cardiac disorders other than left ventricular hypertrophy secondary to hypertension (valvular disorders, heart failure, coronary artery disease, arrhythmia) were evaluated.

**: The presence of aphasia and dysarthria was evaluated.

Hem: Hemiplegia; COPD: Chronic obstructive pulmonary disease; CKD: Chronic kidney disease; Data are given as n (%).

(p<0.001). Of patients, 18% were found to have an otorhinolaryngologic disorder and the mean age (73.2±10.5 years) in these patients was higher than the other patients (69.3±9.5 years (p<0.001).

Diabetes mellitus (DM) was found in 22% of the patients with a higher prevalence among female pa-

TABLE 5: Gender distribution of the patients according to the age groups.

	50-64 y	65-74 y	75-84 y	85-100 y
Female(n)	90	120	102	36
Male (n)	95	102	59	9
Total (n)	185	222	161	45

TABLE 6: Disability rates of patients according to the age groups.

	L.E.D (%)	p[a]	U.E.D (%)	p[a]	Total D.R (%)	p[a]
50-64 y	52.7±17.0	<0.001	30.8±19.1	0.3	79.8±14.6	<0.001
65-74 y.	56.2±17.2		32.0±18.4		84.7±12.8†	
75-84 y.	58.0±16.5*		29.4±18.7		86.8±10.3†	
85-100 y.	64.4±16.5*¶		34.2±17.5		90.8±7.1†α	

L.E.D: Lower Extremity Disability Rate (%); U.E.D: Upper Extremity Disability Rate (%); Total D.R.: Total Disability Rate; [a]Kruskal Wallis test

* p<0.0125 compared with 50-64 subgroup; ¶p<0.0125 compared with 65-74 subgroup; †p<0.0125 compared with 50-64 subgroup; αp<0.0125 compared with 65-74 subgroup by Mann-Whitney U test, with Bonferroni adjustment.

tients (25% vs. 18%; p=0.04). The mean age was lower in patients with DM (67.4±8.8 years) than non-diabetic patients (70.7±9.9 years) (p<0.001).

Of 40 aphasic patients, 35 (87.5%) had right hemiplegia. The prevalence of aphasia was higher in right hemiplegics (p<0.001). Aphasia occurred in 10% of male patients and 4% of female patients (p=0.004). There was also severe disability in 33 patients (82.5%) who had aphasia. The patients with aphasia were more likely to be considered as severely disabled (p=0.001).

Dementia occurred in 16% of the patients. The mean age was also higher in patients with dementia (73.±8.89 years) than those without dementia (69.3±9.8 years) (p<0.001). The severe disability rate (84%) was higher in patients with dementia than those without dementia (52%) (p<0.001).

Urinary dysfunction (3% of all patients) was more prevalent in the left hemiplegics (15 vs. 3) (p=0.018). Age was higher in patients with urinary dysfunction (75.7±9.5 years), than those without urinary dysfunction (69.8±9.8 years) (p=0.011).

DISCUSSION

Stroke is one of the leading disability causes associated with a neurological disorder and the disability rate is reported to be 22%.[8,9] The risk factors can be evaluated as modifiable and non-modifiable.[10] Age, gender and genetic factors are defined as non-modifiable risk factors. Modifiable risk factors include cardiac disorders HT, DM, atrial fibrillation, symptomatic carotid stenosis, smoking, alcohol, obesity, lipid disorders, physical inactivity and hypercoagulability.[10]

The reason for including stroke patients at least one year was that this study attempted to evaluate maximum functional status. Motor recovery (80% of all) is more rapid in the early period and often occurs within the first three to six months.[10] The studies reported measureable recovery up to 12 months in only 5% of the patients.[11,12]

Stroke increases with age, by two-fold in every decade after 55 years of age.[13] Although it is more common in males, it is higher in females aged 35 to 44 years and ≥85 years.[13-16] Consistent with the literature, males aged 50 to 64 years predominated in this study, and females in the remaining age groups. The studies have reported a relationship between age and disability level, and most of them reported poor prognosis with advancing age.[3,17-19] Arrich et al. showed that females experienced sustain in a more advanced age, leading to a more severe clinical presentation.[18] Although age was higher in female patients in this study, the total and severe disability rates did not differ between the genders. Age was higher in severely disabled patients than those without severely disabled, and positive correlation was found between age and functional impairment. Further, eye and otorhinolaryngologic problems, and dementia increased with advancing age. These factors could contribute to an increased disability by adversely affecting the rehabilitation process.

Furthermore, HT is a major risk factor for stroke. The prevalence of HT in this study was 65% (higher in females), while several studies reported a rate ranging from 34% to 78%.[20-25] In this study, 26% of the patients had at least one cardiac disorder. Several studies carried out in Turkey reported a prevalence rate for cardiac disorders ranging from 20% to 34% in stroke patients.[22,26,27] The presence of HT or cardiac disorder does not seem to be a determinant for the development of severe disability, which can be suggested to be a factor for the stroke development .

In the present study, 22% of the patients (more common in females) had DM. The studies reported a prevalence of DM 28% in stroke.[21,27] In addition, the presence of DM was related with the presence of CAD in females, consistent with the literature.[28] Moreover, the finding that age was lower in CAD patients with DM may suggest that these two factors may lead to stroke at an earlier age.[29-31]

On the other hand, the rate of aphasia in our patients was only 6.5%, lower than the literature findings ranging from 16% to 38%.[32,33] Aphasia occurred at a rate of 33% after stroke, reduced to 12% to 18% at six months with a recovery period of up to one year.[10] Lower rate of aphasia in this study can be attributed to the inclusion of patients at least one year and that the assessment of aphasia was

conducted roughly in the outpatient setting. However, we were unable to find a study which evaluated aphasia reported by the health commission. The data in the literature are based on inpatients and outpatients, whereas the data in our study are based on those acquired during a short examination period in the health care setting. This suggests that the diagnosis of aphasia can be overlooked during examination. In addition, the majority of aphasic patients in this study (82.5%) were deemed as severely disabled.

The prevalence of dementia was lower in aphasic patients. When only patients with severe disability are taken into consideration, eye pathologies were also underdiagnosed in addition to dementia. Therefore, we consider that these problems might have been overlooked in aphasic patients due to the inability to answer certain/related questions to evaluate dementia and eye problems. As a result, it should be kept in mind that underdiagnosing these conditions may lead to underestimation of disability rates.

Furthermore, the urinary incontinence was reported to be 47% in the acute period and decreased to 19% at six months.[34] The reason for 3% prevalence rate for urinary dysfunction in this study is that only chronic patients were included. In addition, we also consider that some patients rejected the referral to another center for further urodynamic studies, which might contribute to the low prevalence rate. Aphasia and urinary/fecal incontinence have been shown to be poor prognostic factors and these conditions often occur in association with extensive lesions.[17,35-37] We found a relationship between severe disability and aphasia (not with urinary dysfunction). This may result from small sample size with urinary dysfunction with more than one year after stroke.

Additionally, of our patients, 16% had dementia. Consistent with other study findings, dementia was related to an advanced age in our study.[3] It has been reported that there was a prevalence rate about 30% for dementia.[3] The main reasons for lower rate can be explained by the inclusion of chronic patients and the fact that these patients were evaluated in a limited time period in the health care setting.

Of stroke patients, 82% recover with an improved function allowing independent walking, while only 50% are able to functionally use their upper extremities.[38] In our study, 57% of the patients were considered as severely disabled. However, we were unable to compare this finding to the literature, since no study in the literature evaluated severe disability status in stroke. However, there are studies reporting that 47% to 76% of them reach partial/complete independence.[11,23,39] High rates of severe disability rates in this study can be attributed to the inclusion criteria. Most studies reported no relationship between the hemiplegic side and functional outcome.[27,40] Right-sided hemiplegia was related with total/severe disability rates. It has been reported that poorer quality of life in right hemiplegics was associated with more extensive involvement of the speech area.[40] In addition to right-sided involvement, advanced age, presences of dementia and aphasia were found to be related with severe disability in our study. As severe disability causes serious personal, social, and financial difficulties, identification of risk factors would contribute to the establishment of proper rehabilitation program and nationwide health policies. Further research are required to identify risk factors for severe disability.

Nonetheless, there are some limitations in this study. The main limitation is its retrospective design. We included only those in whom at least one year after stroke; however, the time was not specified definitely in numbers. In addition, there was no sufficient data in the medical charts regarding whether the patients had ischemic or hemorrhagic type of stroke and whether they underwent a rehabilitation program. The other limitations were that at what level of accompanying pathologies (and their disability rates) was not assessed, and patients were evaluated by health commission only for the pathology that constituted the disability rate.

CONCLUSION

Our suggests that stroke patients should be thoroughly evaluated due to an increased rate of other risk factors such as HT. Based on our findings, stroke patients with dementia, aphasia, and right hemiplegia are more commonly considered as severely disabled in the health care setting. Therefore, it should be kept in mind that dementia and eye problems can be underdiagnosed in patients with aphasia due to impaired ability of self-expression. It would be beneficial to conduct more comprehensive multi-center and prospective studies by establishing coordination between hospitals providing health care services.

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