

The effect of hemiplegia/hemiparesis, diabetes mellitus, and hypertension on hospital length of stay after stroke

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ABSTRACT

الأهداف: تحديد مدى تأثير العوامل المتغيرة المتمثلة في العمر، والشلل النصفي، والسكري، وانخفاض ضغط الدم على مدة البقاء في المستشفى خلال فترة التأهيل بعد حدوث السكتة الدماغية.

الطريقة: أُجريت هذه الدراسة الاستراتيجية المقطعية في مدينة الأمير سلطان للخدمات الإنسانية، الرياض، المملكة العربية السعودية وذلك خلال الفترة من يناير 2007م إلى أكتوبر 2010م. شملت الدراسة المرضى الذين أكملوا برنامج العلاج التأهيلي بعد السكتة وكان عددهم 687 مريضاً، وبلغ معدل أعمارهم 61.7 ± 14.7 عاماً (الانحراف المعياري \pm متوسط العمر)، وبعد ذلك تم تقسيم المرضى إلى 5 فئات عمرية تتراوح أعمارهم ما بين 30-80 عاماً. بالمقابل أُستبعد المرضى الذين تبلغ أعمارهم أو تقل عن 29 عاماً، والمرضى الذين تبلغ أعمارهم أو تزيد عن 81 عاماً وذلك بسبب قلة عدد العينة، وقد تم استبعاد المرضى الذين يعانون من شلل نصفي ثنائي الجانب أيضاً.

النتائج: أشارت نتائج الدراسة إلى أن نسبة حدوث السكتة الدماغية كانت عالية في المجموعة التي تتراوح أعمارها ما بين 61-70 عاماً مقارنة بالمجموعات الأخرى، وكانت متدنية في المجموعة التي تتراوح أعمارها ما بين 30-40 عاماً بالمقارنة مع المجموعات الأخرى. لقد كانت مدة البقاء في المستشفى في المجموعة التي تعاني من الشلل النصفي الأيمن (47.3 يوماً) أطول من المجموعة المصابة بالشلل النصفي الأيسر (43.5 يوماً). وكانت مدة البقاء في المستشفى في المجموعة التي تعاني من السكتة الدماغية المتزامنة مع السكري، وانخفاض ضغط الدم أطول في مجموعة الشلل النصفي الأيمن ($p=0.003$) ومجموعة الشلل النصفي الأيسر ($p=0.046$) مقارنةً بالمجموعة المصابة بالسكتة الدماغية فحسب.

خاتمة: أثبتت الدراسة مدى تأثير الشلل النصفي الأيمن المتزامن مع السكري وانخفاض ضغط الدم على طول فترة الإقامة في المستشفى، كما أن لعامل العمر نفس التأثير.

Objective: To determine and analyze the variables of age, hemiplegia/hemiparesis, diabetes mellitus (DM), and hypertension (HTN) on the hospital length of stay (LoS) in the stroke rehabilitation unit.

Methods: We conducted a retrospective cross-sectional study of all patients who completed the stroke rehabilitation program at Sultan Bin Abdulaziz Humanitarian City, Riyadh, Kingdom of Saudi Arabia between January 2007 and October 2010. Admission records of 687 patients were identified with the mean age of 61.7 ± 14.7 (mean \pm SD) years, and were included in this study. The patients were divided into 5 groups based on their age (30-80 years). Patients aged ≤ 29 and ≥ 81 years were excluded due to small sample sizes. Mixed hemispheric patients were also excluded.

Results: The frequency of the stroke occurrence was highest in the 61-70 age group, and lowest in the 30-40 age group. Compared with left hemiplegia/hemiparesis (43.5 days), patients with right hemiplegia/hemiparesis (47.3 days) had significantly higher LoS ($p=0.042$). Compared with stroke alone, in patients with stroke combined with DM and HTN the LoS was significantly higher in right ($p=0.003$) and left hemiplegia/hemiparesis ($p=0.046$) patients.

Conclusion: Right hemiplegia/hemiparesis and combined comorbidity (DM + HTN) has a significant effect on LoS stroke patients; age also had a similar effect.

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Stroke is the most common cause of disability and a leading cause of mortality world wide, although the incidence is decreasing in the West, it is increasing in Asia.^{1,2} According to the World Health Organization (WHO) estimates, 15 million people each year suffer strokes, and 5 million are left permanently disabled. The stroke burden is projected to rise from approximately 38 million disability adjusted life years (DALYs) globally in 1990, to 61 million DALYs in 2020.³ Studies reported that stroke is the major cause of mortality, hospitalization, chronic disability, and has imposed considerable physical and socioeconomic burden.^{4,5} The economic burden of stroke has direct, indirect, and intangible components. The direct cost of stroke is mostly determined by the length of early hospital stay.^{4,5} Combining acute and rehabilitation services in a stroke unit may improve patients' functional outcomes and decrease length of hospital stay (LoS).^{6,7} The duration of hospital stay depends not only on clinical factors, but also social and economic factors.^{8,9} The present study aimed to determine and analyze the relationship among hemiplegia/hemiparesis stroke, diabetes mellitus (DM), and hypertension (HTN) on the LoS in the inpatient rehabilitation unit after stroke.

Methods. We conducted a retrospective cross-sectional study of all patients who completed the stroke rehabilitation program at Sultan Bin Abdulaziz Humanitarian City Rehab Hospital, Riyadh, Kingdom of Saudi Arabia (KSA) between January 2007 and October 2010. The admission records of 687 patients were identified. Their mean age was 61.7±14.7 (years ±SD). The Research and Ethics Committee of Sultan Bin Abdulaziz Humanitarian City, Riyadh, KSA approved the study.

Hemiplegia/hemiparesis was determined by a neurologist's review of all medical records. Patients in the age range of 30-80 years, who completed the stroke rehabilitation program were included in this study. Bilateral hemiplegia/hemiparesis patients and patients aged ≤29 and ≥81 years were excluded. The patients were divided into 5 age groups between 30-80 years. All medical records and patients details were reviewed to determine the clinical etiology of their disease and rehabilitation needs. Patients were classified according to either one of the following clinical groups: 1) stroke alone; 2) Stroke + DM, 3) Stroke + HTN, and 4) Stroke + both HTN and DM.

Data analysis was carried out using Microsoft Excel 2002 (Microsoft Corporation, Seattle, WA, USA) and GraphPad InStat Version 3 (GraphPad Software, San Diego, CA, USA). Data are presented as mean ± standard error of mean. The LoS was analyzed by one-way analysis of variance (ANOVA). Tukey-Kramer

multiple comparisons test, and Student's t-test were used for analyzing the relationship between hemiplegia/hemiparesis, DM, and HTN on the LoS. A *p*-value of <0.05 was considered statistically significant.

Results. Table 1 shows the distribution of patients according to the study variables. The mean age of the

Table 1 - Distribution of 687 stroke rehabilitation program patients in Saudi Arabia according to the major study variables.

Characteristics	n	(%)	Age, mean±SD
Gender			
Male	464	(67.5)	62.8±13.2
Female	223	(32.5)	60.5±15.2
Nationality			
Saudi	628	(91.4)	61.6±13.9
Non-Saudi	59	(8.6)	61.4±10.2
Hemiplegia/hemiparesis			
Right	375	(54.6)	61.4±13.7
Left	312	(45.4)	60.9±15.2
Diagnosis sub groups			
Stroke alone	306	(44.5)	61.3±14.5
Stroke + DM	46	(6.7)	60.2±10.4
Stroke + HTN	58	(8.5)	60.3±11.2
Stroke + DM + HTN	277	(40.3)	62.1±13.9

DM - diabetes mellitus, HTN - hypertension

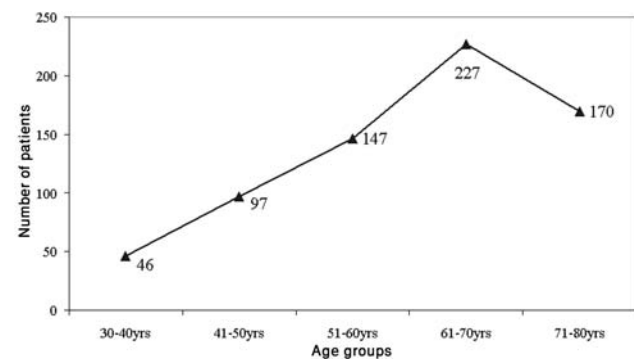


Figure 1 - Age wise frequencies of stroke in 687 stroke rehabilitation program patients in Saudi Arabia.

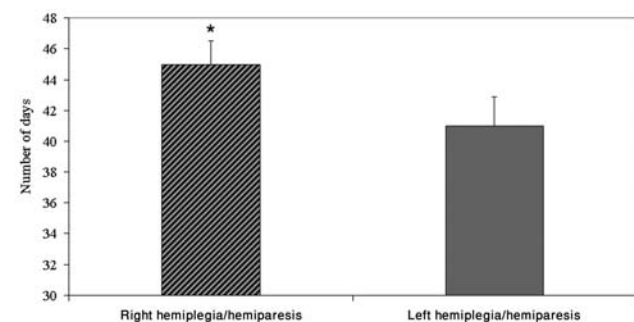


Figure 2 - The influence of right and left hemiplegia/hemiparesis on hospital length of stay among 687 stroke rehabilitation program patients in Saudi Arabia. Values are shown as mean ± standard error of mean, **p*=0.042 by student's t-test.

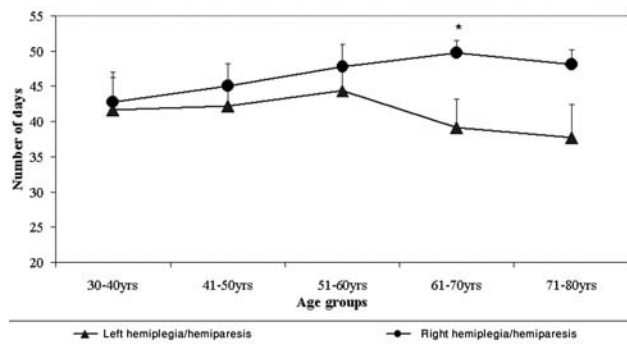


Figure 3 - The influence of age on length of stay of right and left hemiplegia/hemiparesis stroke rehabilitation program patients in Saudi Arabia. Values are shown as mean \pm standard error of mean, * $p=0.042$ by one way analysis of variance.

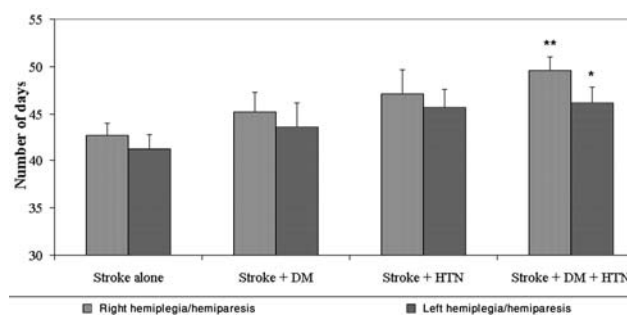


Figure 4 - The influence of comorbidities on length of stay of right and left hemiplegia/hemiparesis stroke rehabilitation program patients in Saudi Arabia. DM - diabetes mellitus, HTN - hypertension. Values are shown as mean \pm standard error of mean, * $p=0.046$ (stroke without DM+HTN versus stroke + DM +HTN), ** $p=0.003$ (stroke without DM + HTN versus stroke + DM +HTN) by one way analysis of variance.

sample was 61.7 ± 14.7 (mean \pm SD) years (30-80 years). The male to female ratio of the study population was 2:1. Figure 1 shows the age frequencies of stroke in the study population. Results showed that the highest frequency of stroke was found in the 61-70 age group, and the lowest frequency was found in the 31-40 age group. The influences of the side of hemiplegia/hemiparesis on LoS of the study population are shown in Figure 2. Our study shows that patients with right hemiplegia/hemiparesis had significantly longer LoS than the left hemiplegia/hemiparesis patients ($p=0.042$). Furthermore, only the 61-70 age subgroup shows a significant change in LoS among the right hemiplegia/hemiparesis (Figure 3). Figure 4 shows that only stroke patients with combined comorbidity (stroke + DM + HTN) have significantly higher LoS for both right ($p=0.003$) and left ($p=0.046$) hemiplegia/hemiparesis patients.

Discussion. There has been a rapid growth in elderly (≥ 65 years old) populations throughout the world. As stroke is a chronic illness that commonly

occurs in the elderly, its incidence has also been on the rise with age.^{7,10,11} The results of our study also showed that the highest frequency of stroke was found in the 61-70 age group, and the lowest frequency was found in the 31-40 age group.

Research has shown that medical complications such as presence of HTN or DM may adversely affect the functional outcome, and the LoS of stroke patients.^{12,13} Certain studies have reported conflicting statistics because the populations studied were often different. However, stroke severity and the nature of the stroke are strong and reliable predictors of LoS.^{12,13} Our data shows that when patients have a comorbidity the LoS was longer than when they have stroke alone. In addition, the results of the present study found longer LoS among patients with right hemiplegia/hemiparesis. This is clinically expected and consistent with other literature findings.^{14,15} This is an interesting finding that needs further exploration, and we are not aware of similar data in stroke research in Saudi Arabia.

This study has explored certain clinical factors and their effect on LoS for a relatively large number of stroke patients in a rehabilitation setting. In line with other studies, the type of hemiparesis/hemiplegia and the combination of more than one risk factors/diseases influenced the LoS of those patients. This could have clinical and planning implications. Resources should be addressed for type of stroke and the presence of comorbidities, which were high (>50%) in our sample.

The major limitation of this study is its retrospective nature, though it includes a fairly large number of patients. Another limitation of this study is that we have not addressed systematically the onset of stroke. Future study may address prospectively some of those clinical and comorbid variables. Despite the limitation, the study provides valuable data on the effect of hemiplegia/hemiparesis on LoS in stroke rehab patients.

In conclusion, the results of the study indicate that the right and left hemiplegia/hemiparesis, DM, and HTN were the influencing factors on hospital LoS in stroke patients. Future studies may be carried out exploring other clinical variables to provide an additional picture on the effects hemiplegia/hemiparesis on hospital LoS in stroke rehab patients.

References

1. Reggiani M; Societ  Inter-Regionale Piemonte e Valle d'Aosta per le Cerebrovasculopatie Group. Five-year survival after first-ever ischaemic stroke is worse in total anterior circulation infarcts: the SINPAC cohort. *Cerebrovasc Dis* 2009; 27: 29-36.
2. Khealani BA, Hameed B, Mapari UU. Stroke in Pakistan. *J Pak Med Assoc* 2008; 58: 400-403.
3. WHO publishes definitive atlas on global heart disease and stroke epidemic. *Indian J Med Sci* 2004; 58: 405-406.

4. Caro JJ, Huybrechts KF, Duchesne I. Management patterns and costs of acute ischemic stroke: an international study. For the Stroke Economic Analysis Group. *Stroke* 2000; 31: 582-590.
5. Rossnagel K, Nolte CH, Muller-Nordhorn J, Jungehulsing GJ, Selim D, Bruggenjurgan B, et al. Medical resource use and costs of health care after acute stroke in Germany. *Eur J Neurol* 2005; 12: 862-868.
6. Ang YH, Chan DK, Heng DM, Shen Q. Patient outcomes and length of stay in a stroke unit offering both acute and rehabilitation services. *Med J Aust* 2003; 178: 333-336.
7. Al-Jadid MS, Robert AA. Determinants of length of stay in an inpatient stroke rehabilitation unit in Saudi Arabia. *Saudi Med J* 2010; 31: 189-192.
8. Al-Jadid M, Robert AA. An analysis of the length of stay in traumatic and non-traumatic spinal cord injured patients. A rehabilitation unit experience in Saudi Arabia. *Saudi Med J* 2010; 31: 555-559.
9. Winter Y, Wolfram C, Schaeg M, Reese JP, Oertel WH, Dodel R, et al. Evaluation of costs and outcome in cardioembolic stroke or TIA. *J Neurol* 2009; 256: 954-963.
10. Khor GL. Cardiovascular epidemiology in the Asia-Pacific region. *Asia Pacific J Clin Nutr* 2001; 10: 76-80.
11. Saposnik G, Black S; Stroke Outcome Research Canada (SORCan) Working Group. Stroke in the very elderly: hospital care, case fatality and disposition. *Cerebrovasc Dis* 2009; 27: 537-543.
12. Appelros P. Prediction of length of stay for stroke patients. *Acta Neurol Scand* 2007; 116: 15-19.
13. Khan FY. Risk factors of young ischemic stroke in Qatar. *Clin Neurol Neurosurg* 2007; 109: 770-773.
14. Sun Y, Toh MP. Impact of diabetes mellitus (DM) on the health-care utilization and clinical outcomes of patients with stroke in Singapore. *Value Health* 2009; 12 Suppl 3: S101-S105.
15. Delbari A, Salman Roghani R, Tabatabaei SS, Lökk J. A stroke study of an urban area of Iran: risk factors, length of stay, case fatality, and discharge destination. *J Stroke Cerebrovasc Dis* 2010; 19: 104-109.

Related topics

Streletz LG, Wazzan O, Bin Sadiq B, Bohlega S, Al-Kawi S, Murad H. Acute stroke: A patient management system. *Neurosciences (Riyadh)* 2003; 8 Suppl: 51.

Donnan GA. Stroke: A world challenge. *Neurosciences (Riyadh)* 2003; 8 Suppl: 51-52.