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

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ABSTRACT

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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 ± SD) years, and were included in this study. The patients were divided into 5 groups based on their age (30-80 years). Patients aged 59 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>
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<th>Characteristics</th>
<th>n</th>
<th>(%)</th>
<th>Age, mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>464</td>
<td>(67.5)</td>
<td>62.8±13.2</td>
</tr>
<tr>
<td>Female</td>
<td>223</td>
<td>(32.5)</td>
<td>60.5±15.2</td>
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<tr>
<td>Nationality</td>
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<tr>
<td>Saudi</td>
<td>628</td>
<td>(91.4)</td>
<td>61.6±13.9</td>
</tr>
<tr>
<td>Non-Saudi</td>
<td>59</td>
<td>(8.6)</td>
<td>61.4±10.2</td>
</tr>
<tr>
<td>Hemiplegia/hemiparesis</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Right</td>
<td>375</td>
<td>(54.6)</td>
<td>61.4±13.7</td>
</tr>
<tr>
<td>Left</td>
<td>312</td>
<td>(45.4)</td>
<td>60.9±15.2</td>
</tr>
<tr>
<td>Diagnosis sub groups</td>
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<tr>
<td>Stroke alone</td>
<td>306</td>
<td>(44.5)</td>
<td>61.3±14.5</td>
</tr>
<tr>
<td>Stroke + DM</td>
<td>46</td>
<td>(6.7)</td>
<td>60.2±10.4</td>
</tr>
<tr>
<td>Stroke + HTN</td>
<td>58</td>
<td>(8.5)</td>
<td>60.3±11.2</td>
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<tr>
<td>Stroke + DM + HTN</td>
<td>277</td>
<td>(40.3)</td>
<td>62.1±13.9</td>
</tr>
</tbody>
</table>

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.
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The sample was 61.7 ± 14.7 (mean ± 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. 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. 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. 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. 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 hospital 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


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