Abstract. – OBJECTIVE: The main objectives of this study were to describe the epidemiologic characteristics, the associated factors and outcomes of extra-axial hematoma (EAH) in patients of traumatic brain injury (TBI) due to road traffic accident (RTA) and to assess their survival probability after 6 and 12 months to RTA.

PATIENTS AND METHODS: This was a retrospective record-based study. A total of 520 patients diagnosed with EAH due to RTA-related TBI were studied. This study covered ten years from January 1, 2010, to December 31, 2019. Descriptive statistics, including frequencies, percentages, mean, standard deviation, median and range were used. To test for significance in the difference between proportions, a chi-square test was applied and adjusted standardized residual to confirm the differences between groups. The Kaplan-Meier curve was plotted, and mean survival rates were calculated for each type of EAH. A two-sided p-value less than 0.05 (5%) at 95% CI was considered to be statistically significant.

RESULTS: EAH occurred in 42.1% of RTA-related TBI. Subdural hematoma (SDH) was the most common RTA-related EAH. Age and sex differences exist in the type of EAH with male preponderance and a significantly higher rate of SDH in patients aged 55 years or above. The total EAH mortality was 18.7%, and most occurred within the first month of the incident. Traumatic subarachnoid hemorrhage (tSAH) was associated with poorer outcome in terms of mortality. Epidural hematoma (EDH) has the best prognosis and survival probability at six months and one year from the accident.

CONCLUSIONS: Extra-axial hematomas are very common in RTA-related TBI and have high mortality. SDH is the most common, tSAH had the highest mortality, while EDH has the best survival. Aggressive efforts are compulsory to reduce RTA-related TBI.

Key Words: Traffic accident, Brain injury, EDH, SDH, SAH, Survival.

Introduction

Injury is the primary cause of disability and fatality in Saudi Arabia (SA). The majority of injury-related fatalities are caused by road traffic accidents (RTAs)². RTA-related injuries therefore are a national health problem in SA, yet the relevant research is severely deficient².

Furthermore, traumatic brain injury (TBI) is among the foremost serious RTA related injuries and a minimum of one-third of all injury-related deaths have TBI¹. Though RTA is known leading source of TBI worldwide, studies on RTA-related TBI are scarce, especially in developing countries². Additionally, since RTA is the foremost reason for TBI globally, an in-depth analysis of its resulting injuries is important for a far better understanding of the disease, better prevention, and superior treatment programs.

Among TBI victims, intracranial hemorrhage is common and often causes serious medical emergency involving critical management decisions⁴. Traumatic intracranial hemorrhage or hematoma refers to any bleeding within the intracranial vault and is classified into an intra-axial and extra-axial hemorrhage. Extra-axial hemorrhage (EAH) is further categorized into extradural (EDH), subdural (SDH), and subarachnoid hemorrhage (SAH). Among TBI lesions, EAH is one of the most lethal owing to its consequences of severe increases in intracranial pressure (ICP), secondary brain injuries, herniation, and death⁴,⁵.

Although RTA is a primary cause of TBI, with EAH representing primary lethal TBI lesions, the literature describing RTA-related EAH is deficient. The epidemiologic and outcome data on TBI from several mechanisms cannot be generalized to TBI caused by specific trauma mechanism, such as RTA. Studies⁶,⁷ have revealed that the prevalence, multiplicity, and pattern of intracranial lesions are distinct in traffic-related TBI...
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from non-traffic-related TBI. Furthermore, data reflecting local epidemiologic details of RTA-related TBI are essential for health care planning and public policy. Information on rates of EAHs, their risk factors, mortality, survival data and other short-term outcomes like intensive care unit (ICU) admission rates and length of hospital treatment may guide clinicians for better patient management and aid public health professionals to design proper interventions.

The current study aims to describe the RTA-related traumatic extra-axial hemorrhages of a tertiary care hospital-based trauma registry in Aseer, southwest Saudi Arabia, from the past decade in terms of epidemiological features, outcomes, mortality, and survival statistics. The results from this study will provide helpful information on RTA-related injuries and help fill the knowledge gap on TBI-related EAH due to RTA.

Patients and Methods

We used the Aseer Hospital register for road traffic injuries for retrospective identification of the entire 1235 (among them, 520 patients admitted with the diagnosis of EAH) patients admitted with traumatic brain injury sustained in road traffic accidents. The study covered the ten-years period between the 1st of January 2010, and the 31st of December 2019. The collected data were examined for completeness, consistency and accuracy. The SPSS statistical package (version 23, IBM, Armonk, NY, USA) was used for statistical analysis of the tested data. Patients diagnosed with any type of acute extra-axial hemorrhage (EDH, SDH, SAH) or any combination of these types were selected from the RTA-related TBI cases. These combinations created seven groups of EAH: EDH, SDH, SAH, EDH+SDH, EDH+SAH, SDH+SAH, and EDH+SDH+SAH. After analysing the descriptive data of the seven groups of EAHs, the cases with more than one type of extra-axial bleed were labelled as complex EAH for additional statistical analysis. Furthermore, the EAHs were correspondingly classified according to the number of different hematomas per patient (1, 2, or 3 subtypes).

In addition, the medical records were assessed to determine patient demographic data, like age, sex, ICU admission rates, the duration of hospital treatment, discharge status, and mortality. Age was dichotomized into less than 55 and 55 years or more. Descriptive statistics included frequencies, percentages, mean, standard deviation, median, and range. The duration of hospital treatment was ordered by the time spent for treatment as up to a month and more than one month. To test the significance of the difference between proportions, the chi-square test was applied. Post-hoc analysis was run to confirm where the differences occurred among the studied groups utilizing adjusted standardized residual. A two-sided p-value less than 0.05 was considered statistically significant. Survival analysis was conducted to measure survival probability in the different groups of EAH at one month and maximum duration of hospital treatment (approximately one year). The Kaplan-Meier curve was plotted, and mean survival rates were calculated for each hematoma type. Approval of this research work was obtained from the Research Ethics Committee of King Khalid University. The informed consent was waived because the analysis was done on de-identified patient data.

Results

Extra-axial hematoma occurred in 42.1% of RTA-related traumatic brain injuries. The demographic data for these 520 patients with EAH have been presented in Table I. From the total population of 1235 RTA-related TBIs, 183 (14.82%) had SDH, 167 (13.53%) had EDH, and 97 (7.86%) had SAH. The total number of incidents for each EAH type in isolation or as part of a complex EAH was SDH in 247 (47.5%), EDH in 202 (38.84%), and SAH in 107 (20.5%) of all EAH cases. Complex EAH (i.e., more than one type of EAH in different combinations) constituted 14.04% of EAH. Thus, most patients suffered a single type of EAH (85.96%).

The mean age of patients suffering RTA-related EAH was 28.67±17.99 years with an age range of 0-86 years. The distribution by the patient’s age of different groups of EAH shows SDH, SAH, and their combined groups to have more cases above the median age (as shown in Figure 1). Older patients (outliers) are more in SDH, SAH, and the combined group (SDH+SAH).

The association of EAH with different socio-demographic characteristics of patients and the disease outcome was analyzed using the Chi-square test (as shown in Table II). Age, sex, extra-cranial injury, ICU admission, discharge status, and mortality were significantly associated with the different types of EAH. We confirmed
the significant group using Pearson’s standardized residuals. Age was dichotomized into two groups for analyzing the effect of older age, and it was found that SDH was significantly more common in the older age group ($p<0.001$). SDH is also significantly more frequent in males. Cranial fractures were present in more than one-third of complex EAHs and one-fourth of EDH cases, however, with no significant differences between the groups. The need for ICU and mortality were
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A statistically significant association was found between EDH and discharge home. The mortality rate was lowest in EDH (7.2%) and highest in SAH (32%, *p*<0.001). We analyzed the proportion of deaths occurring within one month, which was 87.6%, and was statistically significant (*χ^2* =5.51, odds ratio= 2.13, 95% CI=[1.12-4.07]; *p*=0.01) (data not shown).

Kaplan-Meier estimate was used to compute the survival probability over time for different types of EAH (as shown in Figure 2A and 2B). Patients with EDH fare better with more than 80% survival at one month and six months. Most unsatisfactory rates were for patients with SAH with less than 20% survival probability at six months.

The mean survival time for different types of EAH is presented in Table III. The longest mean survival at one month was found in patients with EDH (26 days) and at one year in SDH (223.55 days). The shortest mean survival at one month was in complex EAH (17 days) and at one year in SAH (112.89 days). As seen in Table III, median survival for EDH is undefined, as survival is greater than 50% at the last time point.

Log-rank test was run to determine if there were differences in the survival distribution for the different types of EAH. The survival distributions for the different kinds of hematoma were significantly different at one month and one year, *χ^2* = 19.33 and 17.52, *p*<0.05 (Table IV). Furthermore, post-hoc pairwise comparison by log-rank (Mantel-Cox), Breslow (Generalized Wilcoxon), and Tarone-Ware tests confirmed that as compared to EDH; SDH, SAH, and complex EAH had a significant (*p*<0.05) effect on mortality. (Data has been depicted in Table V).

### Table II. Logistic regression analysis for probable independent associated factors with mortality as dependent prognostic factor.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Type of EAH</th>
<th>χ^2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EDH</td>
<td>SDH</td>
<td>SAH</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;55</td>
<td>164 (98.2)</td>
<td>148 (80.9)</td>
<td>81 (83.5)</td>
</tr>
<tr>
<td>≥55</td>
<td>3 (1.8)</td>
<td>35 (19.1)</td>
<td>16 (16.5)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>151 (90.4)</td>
<td>177 (96.7)</td>
<td>86 (88.7)</td>
</tr>
<tr>
<td>Female</td>
<td>16 (9.6)</td>
<td>6 (3.3)</td>
<td>11 (11.3)</td>
</tr>
<tr>
<td>Skull fracture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>125 (74.9)</td>
<td>148 (80.9)</td>
<td>76 (78.4)</td>
</tr>
<tr>
<td>Yes</td>
<td>42 (25.1)</td>
<td>35 (19.1)</td>
<td>21 (21.6)</td>
</tr>
<tr>
<td>Extra-cranial injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>97 (58.1)</td>
<td>114 (62.3)</td>
<td>80 (82.5)</td>
</tr>
<tr>
<td>Yes</td>
<td>70 (41.9)</td>
<td>69 (37.7)</td>
<td>17 (17.5)</td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 1 month</td>
<td>141 (84.4)</td>
<td>146 (79.8)</td>
<td>70 (72.2)</td>
</tr>
<tr>
<td>&gt;1 month</td>
<td>26 (15.6)</td>
<td>37 (20.2)</td>
<td>27 (27.8)</td>
</tr>
<tr>
<td>ICU admission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required</td>
<td>19 (11.4)</td>
<td>49 (26.8)</td>
<td>64 (66.0)</td>
</tr>
<tr>
<td>Not required</td>
<td>148 (88.6)</td>
<td>134 (73.2)</td>
<td>33 (34.0)</td>
</tr>
<tr>
<td>Discharge status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>152 (91.0)*</td>
<td>140 (76.5)</td>
<td>62 (63.9)</td>
</tr>
<tr>
<td>Died/Transferred</td>
<td>15 (9.0)</td>
<td>43 (23.5)</td>
<td>35 (36.1)</td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Died</td>
<td>12 (7.2)</td>
<td>34 (18.6)</td>
<td>31 (32)*</td>
</tr>
<tr>
<td>Alive</td>
<td>155 (92.8)</td>
<td>149 (81.4)</td>
<td>66 (68.0)</td>
</tr>
</tbody>
</table>

EAH: extra-axial hematoma, EDH: epidural hematoma, SDH: subdural hematoma, SAH: subarachnoid hemorrhage, Complex: more than one type of EAH.

significantly associated with SAH, while extra-cranial injury was significantly less common in patients with SAH than other types of EAH. A statistically significant association was found between EDH and discharge home. The mortality rate was lowest in EDH (7.2%) and highest in SAH (32%, *p*<0.001). We analyzed the proportion of deaths occurring within one month, which was 87.6%, and was statistically significant (*χ^2* =5.51, odds ratio= 2.13, 95% CI=[1.12-4.07]; *p*=0.01) (data not shown).

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Discussion

Traumatic brain injury (TBI) is the primary cause of death in young adults while a leading cause of death and disability in all other age groups globally. Among injuries victims, TBI is responsible for half of injury-related deaths. Extra-axial hematoma (EAH) is a critical category of TBI because it can enlarge, giving rationale for surveillance and early intervention. Furthermore, TBI with EAH is associated with a poorer prognosis compared to TBI without EAH. EAH is generally associated with high-energy trauma, especially road accidents. Saudi Arabia is among the leading nations in road traffic accidents and their related injuries. Though it should be a public health priority, there is an evident information gap on epidemiological features of RTA-related traumatic injuries, particularly grave injuries, such as EAHs.
This study analyzed the records of 520 RTA-related TBI cases diagnosed with EAH (EDH, SDH, SAH, or their combination) for age and sex distribution and measured their outcomes.

Our results show that all types of extra-axial hematoma are more in men than in women. This is commonly reported across studies, mainly because the road accident data is skewed towards the male population. In this study, EAH was present in 42% of RTA-related TBIs. This indicates that EAH is a prevalent lesion in RTA victims suffering from TBI. The prevalence of EAH reported here is similar to the overall prevalence of intracranial bleeding (IB) in TBI from various mechanisms. Previous studies confirmed SDH as the most common extra-axial bleeding in TBI, but with inconsistency on the relative frequency of SAH vs. EDH.

Studies consistently show SDH to be the most common intracranial hematoma in the elderly victims of TBI. This was verified in our study, where SDH is a statistically significant lesion among the elderly. In contrast, elderly patients affected by an EDH were a minority (1.8%), consistent with other studies.

Reported TBI mortality varies considerably between studies. This is related to the differences between studies regarding population age, injury severity, trauma mechanism, specific TBI diagnosis, and timing of death, among others. In this study, the overall EAH mortality rate was 18.7%, which is close to the 22% from a study that looked at TBI-related IB due to any mechanism. The same study found the presence of IB, wherever located, as a predictor of mortality. The majority (87.6%) of deaths in our study occurred within 30 days.

### Table III. Means and Medians for Survival Time at one month and one year.

<table>
<thead>
<tr>
<th>Time</th>
<th>Mean*</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>S.E.</td>
</tr>
<tr>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
</tr>
<tr>
<td>30 days</td>
<td>EDH 26.160</td>
<td>1.066</td>
</tr>
<tr>
<td></td>
<td>SDH 22.061</td>
<td>1.198</td>
</tr>
<tr>
<td></td>
<td>Complex 17.657</td>
<td>1.673</td>
</tr>
<tr>
<td></td>
<td>Overall 22.478</td>
<td>0.686</td>
</tr>
<tr>
<td>One year</td>
<td>EDH 123.780</td>
<td>4.962</td>
</tr>
<tr>
<td></td>
<td>SDH 223.550</td>
<td>30.036</td>
</tr>
<tr>
<td></td>
<td>Complex 220.283</td>
<td>54.223</td>
</tr>
<tr>
<td></td>
<td>Overall 203.632</td>
<td>22.761</td>
</tr>
</tbody>
</table>

*Estimation is limited to the largest survival time if it is censored. S.E.= standard error. EAH: extra-axial hematoma, EDH: epidural hematoma, SDH: subdural hematoma, SAH: subarachnoid hemorrhage, Complex: more than one type of EAH.

### Table IV. Test of equality of survival distributions for the different types of extra-axial hematoma.

<table>
<thead>
<tr>
<th>Time</th>
<th>Log rank test</th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 days</td>
<td>(Mantel-Cox)</td>
<td>19.331</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Breslow (Generalized Wilcoxon)</td>
<td>28.805</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Tarone-Ware</td>
<td>24.648</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td>One year</td>
<td>(Mantel-Cox)</td>
<td>17.526</td>
<td>6</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Breslow (Generalized Wilcoxon)</td>
<td>20.358</td>
<td>6</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>Tarone-Ware</td>
<td>18.086</td>
<td>6</td>
<td>0.006</td>
</tr>
</tbody>
</table>
days of injury. We found no significant difference in mortality based on gender, which is supported by other studies.4,19,20 The type of EAH, on the other hand, had a significant effect on mortality, which varied between 7.2% in EDH to 32% in SAH. Our data showed that traumatic SAH (tSAH) has the highest mortality, shortest mean survival time, and poorer survival rates at one month and one year compared to the other EAHs. The findings of significantly fewer extra-cranial injuries, yet significantly more ICU admissions and higher mortality support non-isolated traumatic SAH as an indicator of increased head injury severity.

Several studies4,21,22 support our findings and disclose non-isolated traumatic SAH as a prognostic marker for poor survivability. Most of the studies4,23-26 that showed good prognosis for tSAH were limited to mild head injuries, isolated tSAH, or both. In fact, a study has shown the adjusted odd ratio for mortality to increase by 27 times in non-isolated tSAH compared to isolated tSAH.26

The low mortality reported here for EDH and finding EDH as a good prognostic factor for decreased mortality, compared to other EAH, is consistent with the literature.11,27,28 In our study, SDH mortality was 18.6% which is similar to some studies.29,30 However, there is a wide variation in the reported rate of SDH mortality due to the difference in population cohorts and severity of cases studied. The very high mortality reported by some studies on acute SDH is essentially a reflection of the advancing age which stands as one of the most critical factors influencing acute SDH mortality.31,32 Our population of RTA-related EAH tended to be younger than previous studies, which might have impacted the

### Table V. Pairwise comparison of survival curves for the different types of extra-axial hematoma.

<table>
<thead>
<tr>
<th>Log rank Test</th>
<th>EAH type</th>
<th>EDH</th>
<th>SDH</th>
<th>SAH</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 30 days (Mantel-Cox)</td>
<td>EDH</td>
<td>-</td>
<td>6.312</td>
<td>0.012</td>
<td>11.986</td>
</tr>
<tr>
<td></td>
<td>SDH</td>
<td>6.312</td>
<td>0.012</td>
<td>-</td>
<td>2.419</td>
</tr>
<tr>
<td></td>
<td>SAH</td>
<td>11.986</td>
<td>0.001</td>
<td>2.419</td>
<td>0.120</td>
</tr>
<tr>
<td></td>
<td>Complex</td>
<td>13.768</td>
<td>0.000</td>
<td>1.865</td>
<td>0.172</td>
</tr>
<tr>
<td>Breslow (Generalized Wilcoxon)</td>
<td>EDH</td>
<td>-</td>
<td>-</td>
<td>5.800</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>SDH</td>
<td>5.800</td>
<td>0.016</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SAH</td>
<td>7.342</td>
<td>0.007</td>
<td>0.258</td>
<td>0.611</td>
</tr>
<tr>
<td></td>
<td>Complex</td>
<td>19.092</td>
<td>0.000</td>
<td>5.509</td>
<td>0.019</td>
</tr>
<tr>
<td>Tarone-Ware</td>
<td>EDH</td>
<td>-</td>
<td>-</td>
<td>6.172</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>SDH</td>
<td>6.172</td>
<td>0.013</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SAH</td>
<td>9.243</td>
<td>0.002</td>
<td>0.765</td>
<td>0.382</td>
</tr>
<tr>
<td></td>
<td>Complex</td>
<td>16.843</td>
<td>0.000</td>
<td>3.770</td>
<td>0.052</td>
</tr>
<tr>
<td>At one year (Mantel-Cox)</td>
<td>EDH</td>
<td>-</td>
<td>-</td>
<td>7.480</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>SDH</td>
<td>7.480</td>
<td>0.006</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SAH</td>
<td>12.302</td>
<td>0.000</td>
<td>1.126</td>
<td>0.289</td>
</tr>
<tr>
<td></td>
<td>Complex</td>
<td>19.095</td>
<td>0.000</td>
<td>4.153</td>
<td>0.042</td>
</tr>
<tr>
<td>Breslow (Generalized Wilcoxon)</td>
<td>EDH</td>
<td>-</td>
<td>-</td>
<td>6.429</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>SDH</td>
<td>6.429</td>
<td>0.011</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SAH</td>
<td>8.652</td>
<td>0.003</td>
<td>0.321</td>
<td>0.571</td>
</tr>
<tr>
<td></td>
<td>Complex</td>
<td>27.491</td>
<td>0.000</td>
<td>10.212</td>
<td>0.001</td>
</tr>
<tr>
<td>Tarone-Ware</td>
<td>EDH</td>
<td>-</td>
<td>-</td>
<td>7.073</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>SDH</td>
<td>7.073</td>
<td>0.008</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SAH</td>
<td>10.636</td>
<td>0.001</td>
<td>0.654</td>
<td>0.419</td>
</tr>
<tr>
<td></td>
<td>Complex</td>
<td>24.918</td>
<td>0.000</td>
<td>7.686</td>
<td>0.006</td>
</tr>
</tbody>
</table>

EAH: extra-axial hematoma, EDH: epidural hematoma, SDH: subdural hematoma, SAH: subarachnoid hemorrhage, Complex: more than one type of EAH.
Overall mortality of SDH. It is also possible that the trauma mechanism plays a role in EAH injury-specific mortality.

Therefore, we conclude that SAH in RTA-related TBI with mostly non-elderly population is a more independent reliable predictor of mortality than SDH.

Cranial fractures were present in more than one-third of complex EAHs and one-quarter of EDH cases, with no significant differences between the proportion of specific EAH. The rate of skull fracture reported here is less than reported by others which could be related to the injury severity, mechanism, and the relatively young age of our population.28,33

In terms of patient disposition, 91% of EDHs were discharged home. With more than 80% survival at six months, EDH patients fared significantly better than other EAH types. These findings are consistent with existing evidence supporting EDH favourable outcome.27,28,31,33. It should be noted that EDH was present as alone or combined with other hematomas in a percentage of 32.11% and 38.84% of EAHs, respectively. Therefore, special attention to search for and treat EDH in RTA-related TBI should be of utmost importance given its high frequency, treatability, and significantly favourable outcome.

The survival analysis indicated the longest mean survival for SDH among all expired EAH patients. This indicates that SDH is the hardest EAH to treat, with many patients dying after a prolonged hospitalization. Previous studies support our findings that acute SDH is more expected to have increased duration of hospital treatment and poorer rates of discharge home compared to other EAHs. This finding is pertinent when it comes to case management planning and resources allocations.

Limitations

This research studied admitted patients and, therefore, milder TBI cases that required no admission and the fatal ones that died before admission were not included. Data on injury severity measured by validated tools such as the Glasgow coma scale or injury severity score was not available. Moreover, some of the statistical analyses were restricted by small numbers of patients in certain subgroups. Even with these limitations, this work provided a unique insight into the epidemiology, patterns, and outcome of extra-axial hematomas caused by road traffic accidents. The researcher was able to show consistent, significant relationships between socio-demographic characteristics and the outcomes of the different types of EAH. It is expected that the information generated from this study will help clinicians to provide better care to patients presenting with TBI and assist in establishing and implementing strategies to reduce RTA-related injuries and deaths.

Conclusions

The current study showed that SDH is the most common RTA-related EAH. Sex and age do influence the type of hemorrhage with male preponderance and a significantly higher rate of SDH in elderly patients. Most of the fatalities associated with extra-axial hematoma occur within the first month of trauma. SAH is associated with increased mortality, while EDH has the best prognosis and survival probability at six months and one year from the incident. In RTA-related TBI, SAH may be a more reliable predictor of mortality than SDH.

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Conflict of Interests

The author declares he has no conflict of interests.

References


