TRAUMA IN ADOLESCENTS AND ADULTS: SEVERITY ASSESSMENT BY ANATOMICAL SCORE

ABSTRACT
Objective: to determine the severity of trauma in adolescents and adults by the New Injury Severity Score. Method: ecological, retrospective and quantitative study in medical records of 301 victims treated from January 2006 to July 2008 in the Emergency Hospital of Sergipe/SE/Brazil. The collection was performed after approval by the Ethics Committee in Research of the Federal University of Sergipe under No. 2448.0.000.107-08. Results: the head and neck region were the most severely affected in 61.5% and 66.8% had a score ≥ 16 points. There was a significant association between NISS and length of stay, number of body regions, Glasgow Coma Scale and outcome. Conclusion: the level of severity of trauma by the New Injury Severity Score showed that most victims with score ≥ 25 points and head and neck region as most severely affected, prevailing Traumatic Brain Injury. Descriptors: Indices of Severity of the Trauma; Wounds and Injuries; Adolescent; Adult.

RESUMO
Objetivo: determinar a gravidade do trauma em adolescentes e adultos pelo New Injury Severity Score. Método: estudo ecológico, retrospectivo e quantitativo em prontuários de 301 vítimas atendidas entre janeiro de 2006 e julho de 2008 no Hospital de Urgência de Sergipe/SE/Brazil. A coleta foi realizada após a autorização do Comitê de Ética em Pesquisa da Universidade Federal de Sergipe sob nº 2448.0.000.107-08. Resultados: a região da cabeça e pescoço foi a mais gravemente afetada em 61,5% e 66,8% apresentaram escore ≥ 16 pontos. Houve associação significante entre o escore NISS e o tempo de internamento, número de regiões corpóreas, Escala de Coma de Glasgow e desfecho. Conclusão: o nível de gravidade do trauma pelo New Injury Severity Score demonstrou maioria das vítimas com escore ≥ 25 pontos e a região da cabeça e pescoço a mais gravemente afetada, com predominio do Trauma Cranioencefálico. Descritores: Índices de Gravidade do Trauma; Ferimentos e Lesões; Adolescente; Adulto.

RESUMEN
Objetivo: determinar la severidad del trauma en adolescentes y adultos por el New Injury Severity Score. Método: se trata de estudio ecológico, retrospectivo y cuantitativo en registros de 301 víctimas tratadas entre enero de 2006 y julio de 2008 en el Hospital de Urgencias de Sergipe. La colecta se realizó tras aprobaración del Comité de Ética en Pesquisa de la Universidad Federal de Sergipe, bajo N.º 2448.0.000.107-08. Resultados: la región de la cabeza y cuello fueron las más afectadas en 61,5% y 66,8% con puntuaciones ≥ 16 puntos. Hubo asociación significativa entre NISS y duración de internación, número de partes del cuerpo, Escala de Coma de Glasgow y resultados. Conclusión: el nivel de severidad del trauma por el New Injury Severity Score mostró una mayoría de víctimas con puntuación ≥ 25 puntos y región de la cabeza y cuello fueron las más gravemente afectadas, predominando el Trauma Cranioencefálico. Descriptores: Índices de Gravedad del Trauma; Heridas y Traumatismos; Adolescente; Adulto.

Nunes MS, Hora EC, Fakhouri R et al. Trauma in adolescents and adults...
INTRODUCTION

Trauma is considered a disease of endemic character and the main cause of death in the first four decades of life, whose consequences are capable of producing significant changes in the life of the victim and their families, and, therefore, a serious public health issue.1,2

The sequelae that might be present in trauma victims produce strong impact in public health with increase of the needed resources because of the lesions which can be multiple and require immediate specialized care.3

The complexity of the trauma victims has encouraged researchers to the study, production and improvement of the so-called Trauma Indices that are mathematical or statistical values, quantified by numerical scores, which varies depending on the injuries severity resulted of trauma.4 These indices can be used in the evaluation of clinical status of the victim, quantification of the severity of the lesions, orientation of screening during nursing care, standardization of the language, the performance of clinical and epidemiological studies and, also, the orientation of educational campaigns for the prevention of trauma.5

The trauma indices are classified into physiological, anatomical and mixed. The anatomic indices assess the severity and extension of lesions in body regions that occurred at the moment of the trauma, using the Abbreviated Injury Scale (AIS), created in 1971, in the United States of America, by a committee formed by a group of experts constituted by the American Association for Automotive Medicine and the Society of Automotive Engineer.2 In 2005, it was revised to approximately 2,000 codified lesions, which were updated in 2008.6

The role of multiple lesions to predict the outcome is important because most victims present more than one lesion, which can influence the occurrence of clinical complications, the length to stay and long-term rehabilitation after the traumatic injury.7,8

The New Injury Severity Score (NISS) is based on the AIS and calculates the severity of trauma from the sum of the square of three most severe injuries, regardless of body region, which simplifies the calculation and increase the ability to predict the outcome.9,10

Studies revealed that it can be also used as mortality indicator and other clinical complications in victims with blunt trauma, especially those who present orthopedic injuries and, also, to indicate the use of mechanical ventilation support in critical patients with respiratory failure.11-13

Trauma victims need specialized support by means of multidisciplinary team and nursing, by the nature of work, fulfill a fundamental role in the prevention and control of complications originated from the severity of traumatic injuries.

This study is justified by the lack of studies with this specificity and it is believed that the determination of trauma severity by means of anatomical score helps the identification of severity level of the victims, and, therefore, can determine the nursing care.

OBJECTIVES

- To determine the trauma severity level in adolescents and adults by the New Injury Severity Score.
- To verify its relation with length of hospital stay, number of affected body regions, body region most severely affected, Glasgow Coma Scale and outcome of trauma.

METHOD

Ecological, retrospective study with a quantitative approach, performed at the Emergency Hospital of Sergipe - HUSE, linked to the State Health Department, located in the city of Aracaju, capital of the State of Sergipe/Brazil. It is a reference center for hospital care of trauma victims who are sent after pre-hospital care performed by the Mobile Emergency Care or by the Fire Brigade.

The sample consisted of 301 trauma victims’ medical records, who were treated from January 2006 to July 2008, according to the following inclusion criteria: (1) be a victim admitted to the hospital for any type of trauma, (2) length of hospital stay equal to or higher than 24 hours, (3) aged between 12 and 60 years (4) that has been discharged from hospital (excluding the discharge by request and hospital transferences) or death to ensure the description of the complete hospital treatment.

From 999 medical records registered in the Medical Records Service of the Hospital, 905 victims had a discharge outcome and 94 victims died. The sample size calculation was conducted with an error Eα, and established the minimum number of 286 medical records to constitute the sample. The collection was held from September to December 2008, according to the original sequence of
database by register number in the medical record and it was finished after 301 analyzed records. The object of this study did not include; trauma victims younger than 12 years and older than 60 years.

On the data collection instrument was registered the socio-demographic and epidemiological variables: age, sex, external cause, number of hospital days, discharge or death outcome, Abbreviated Injury Scale (AIS), information on the level of consciousness according to the Glasgow Coma Scale (GCS) at the moment of admission. The NISS severity score was calculated after coding the lesions by the manual AIS-2005/2008, considering the sum of the square of the most severe lesions, regardless of body region.

The research began after authorization and signing of confidentiality term by the Director of HUSE to access the records of trauma victims and after the approval of this study by the Ethics Committee in Research of the Federal University of Sergipe, registered under the Protocol No. 2448.0.000.107 -08. The data confidentiality has been provided in accordance with the Resolution 196/96 the National Health Council which regulates the researches that involve Human Beings.

The data were stored in a computerized database in Software Statistical Package for Social Science (SPSS) version 16.0. The associations between NISS score and the variables: number of affected body regions, body region most affected, GCS and outcome of trauma were conducted by means of the Chi-Square Test. It was used the variance analysis test (ANOVA) and the Post hoc Tukey test to verify the comparison of the averages of the variable length of stay in relation to score NISS. For the entire study the significance level of 5% was considered.

There were seven ISS intervals: 1-8, 9-15, 16-24, 25-40, 41-49, 50-74 and 75 and the body divided into six segments (head and neck, face, chest, abdomen or pelvic contents, extremities or pelvic waist, and external surface) in the identification of the most severely affected body regions and the number of lesions presented. The interval between 1 and 15 was classified as mild trauma, between 16 and 24 as moderate trauma and, when greater or equal to 25, indicates severe trauma.

### RESULTS

The characterization of victims in this study, previously published, demonstrated that the age average was 27.8±12.8 years, average length of hospital stay of 10.2±15.3 days, the majority (85.7%) were male, from municipalities of the State of Sergipe (56.2%), whose trauma occurred on a public road (78.1%) for transportation accidents (47.2%), followed by aggression (27.6%), which in 74.1% survived to the trauma.

The present study evaluated the trauma severity by NISS score, which revealed variation of 1 to 75 points, with average of 28±20.7 points. The trauma victims distribution, according to level of severity, is shown in Table 1 and reveals a predominance of 23.3 % of victims in the score between 25 and 40 points, being 66.8 % had NISS score equal to or greater than 16 points.

<table>
<thead>
<tr>
<th>NISS Score</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>1 - 8</td>
<td>42</td>
<td>14.0</td>
</tr>
<tr>
<td>9 - 15</td>
<td>58</td>
<td>19.3</td>
</tr>
<tr>
<td>16 - 24</td>
<td>46</td>
<td>15.3</td>
</tr>
<tr>
<td>25 - 40</td>
<td>70</td>
<td>23.3</td>
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<tr>
<td>41 - 49</td>
<td>24</td>
<td>8.0</td>
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<tr>
<td>50 - 74</td>
<td>44</td>
<td>14.6</td>
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<tr>
<td>75</td>
<td>17</td>
<td>5.6</td>
</tr>
<tr>
<td>Total</td>
<td>301</td>
<td>100</td>
</tr>
</tbody>
</table>

The number of affected body regions in trauma victims is represented in Table 2 and showed that there were more than one affected region in 32.9% of victims. The connection between NISS and number of affected body regions present p=0.004, which demonstrates significant statistical association between the variables.
The most severe lesions in the head and neck region were present in 61.5% of the victims, followed by the region of the abdomen or pelvic contents in 14.6%, as shown in Table 3. When investigated the association between NISS and body region most severely affected, the Chi-Square test showed p=0.001, which indicates a significant statistical association.

Regarding the length of stay, it was verified that the higher the NISS score the longer the length of stay of the victim. The maximum score of 75 points showed the shorter length of stay. The ANOVA test (p=0.01), and the post-hoc Tukey test (p=0.05) confirmed the significant association between NISS and length of hospital stay (Table 4).

The GCS score at the moment of admission ranged from 3 to 15 points and 63.8% of the victims presented a score of 13 to 15. It was observed that 100% of the victims classified with the lowest NISS score between 1-8, were discharged from hospital, as well as 100% of the victims who scored the maximum score of 75 points, had an unfavorable outcome characterized by death. The Chi-square test showed p=0.001, which demonstrates an association between the severity of the victims defined by NISS and trauma outcome as shown in Table 5.
The average number of points in the trauma severity level presented of 28±20.7 points, close to that presented in study that evaluated victims of external causes admitted in Intensive Care Unit in São Paulo, through several trauma levels, with NISS identification with average of 23.6±8.8 points, which indicates a need of specialized care.

It was observed in this study that the majority (66.8%) presented NISS equal or higher than 16 points, which has been considered as a critical point in the trauma evaluation, prevailing the score between 25 and 40 points, in 23.3% of victims, and, therefore, severe trauma. It is important to highlight that trauma outcome is directly related to several factors, such as: age and pre-existing health condition.

In studies with victims who had traumatic injuries punctuated with a score greater than or equal to 16 points were identified, in addition to loss in physical performance, deficiencies, such as: reduction of vitality, mental health disorders and cognitive function, limitations and restrictions related to pain that complicates to perform basic tasks of daily living activities, such as: mobility and, consequently, impairment of social role.

Trauma can achieve a single region or multiple regions with different levels of severity. In this study, the majority (67.1%) were affected in only one body region. However, it was evidenced that 32.9% of victims presented two or more affected body regions. In the association between NISS and number of traumatized regions, it was observed that the higher the number of traumatized regions the greater the trauma severity measured by NISS.

Most victims (61.5%) presented lesions in the head and neck region, followed by the abdomen or pelvic content region (14.6%). The association between NISS and body region most severely affected is demonstrated in the Chi-square test with p=0.001. The association between NISS and length of hospital stay showed a p-value=0.001, evidencing that the length of stay increased in victims who had been scored above 16 points. Scores between 25-40 points, as well as scores between 50-74 points, showed the highest average of length of hospitalization.

Then, it can be considered that the severe trauma predicts a longer hospitalization time for those victims and possible clinical complications, an example is pulmonary disorders, infections and pneumonia associated with the use of respiratory prosthesis in victims who need mechanical ventilation support.

Study identified that the long stay of adolescents victims of external causes was directly related to the need of hospitalization in Intensive Care Unit by comorbidities related to clinical changes, highlighting the hydrolelectrolyte disorders and the presence of infection.

The lowest average of admission was verified in the maximum score of 75 points. In this context, this result can be inferred to victims who had unfavorable outcome to trauma and, therefore, a shorter length of stay due to death. This fact can be verified in the NISS analysis with the trauma outcome, which was statistically significant with a p-value=0.001. It was also noticed that 100% of victims classified with the lowest NISS score from 1-8, were discharged from the hospital.

Study of systematic review highlights that, in Brazil, from 2009, there was a predominance of motorcyclists, in victims related to traffic accidents, with higher mortality for running over. It is revealed that the body region most frequently affected are upper and lower limbs, followed by head region. However, as severity, the injuries of head region, especially the Traumatic Brain Injury is the main lesion that predicts worse clinical prognosis. This fact can be justified by the inexistence of mechanical barrier.
between the motorcyclist and the object in which occurs the collision, thus the possibility of increase of mortality among these victims.

The involvement of the head and neck region in traffic accident victims was observed in several studies\(^5,12,13\) that show the need of measuring the consciousness level by GCS. It is noteworthy that, by being a physiological and dynamic index, it is considered an important tool for clinical evaluation of the victims\(^5\), it has a wide acceptance, ease of application and good correlation with trauma severity\(^6\). Nevertheless, the GCS is subject to changes during the hospitalization and, therefore, varies depending on the clinical status of the victim, since this presents complex lesions and often damages of several organs and body regions.\(^19\)

Study\(^22\) conducted with victims trapped in collisions of motor vehicles in the city of São Paulo, has shown that there is a chance three times greater for complications related to shock and hypotension, evidenced in necropsy data which demonstrated hemorrhage as the cause of the fatal outcome. Therefore, the severity and length of service during the accident should be considered in the treatment of these victims.

All the victims with a GCS score between 3 to 8 (17.3%) had fatal outcomes. The score GCS between 3 to 8 was compared with NISS, in which it was observed that all the victims in this interval have been scored with an NISS \(\geq\) 16 points, therefore, between moderate and severe trauma. These data corroborate the need for the GCS measurement as an outcome predictor in traumatic lesions, in which the minimum score of 3 points at the moment of intra-hospital admission seems to be a strong mortality predictor in this victims.\(^21\)

It is noteworthy that two victims scored as mild trauma and a victim scored as moderate trauma, both with an NISS score between 9-15 points presented death as an outcome. It can be inferred that these results are related to complications from multiple risk factors that influenced the mortality in trauma, such as age, pupillary changes, shock, and hypotension.\(^5\)

The physiological changes resulted from trauma, particularly Traumatic Brain Injury, are considered a second trauma, contributing to mortality and influencing the GCS measurement.\(^4,13\) Therefore, the use of anatomical and physiological indices combined might improve the severity measurement of the injuries and ease the victim assistance.

Therefore, the use of anatomical score is an instrument that allows subsidies for systematic evaluation of trauma victims, which can be used in pre and intra-hospital care, as it provides the severity measure, establishes priority to treatment, defines procedures and plans actions of nursing.

**CONCLUSION**

The determination of trauma severity, according to NISS reveals that most victims had a score \(\geq 25\) points, compatible with severe trauma. The head and neck region were the most severely affected in the majority of victims. The associations between NISS score and variables hospitalization time, number of affected body regions, body region most severely affected, GCS and trauma outcome presented a statistically significant association in the trauma severity measurement. These results indicate that there was a prevalence of Traumatic Brain Injury as the most severe injury resulted from trauma.

Studies using the registers from medical records may have limitations related to incomplete data. However, to minimize this bias, a thorough reading of all medical and nursing records researched was conducted.

It is expected to have contributed to the knowledge of the importance of the use of anatomical score in trauma victim evaluation in urgency and emergency services. Further studies are suggested with the use of trauma severity indices to assist in evaluating the treatment of victims, with improved of care quality and also encourage government actions that produce impact on reducing and preventing these issues.

**REFERENCES**


