

## Risk Factors for Neuroworsening of Moderate Head Injury Cases in Emergency Department Sanglah General Hospital Bali-Indonesia

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**Objectives:** To determine risk factors such as hypoxia, hypotension, age >40 years old, amount of focal lesion, low GCS upon arrival, and female associated with neuroworsening of moderate head injury cases.

**Method:** The study was a cohort study on 152 cases of moderate head injury admitted in Surgery Department/Udayana University Faculty of Medicine/Sanglah General Hospital from April 2010 – March 2011. The variables were analyzed using multiple logistic regression model ( $p<0.05$ ).

**Results:** The multivariate analysis showed age group  $\geq 40$  years old {OR 4,490 (CI 95%: 1,750 – 11,521)  $p=0.002$ }, male sex {OR 2,276 (CI 95%: 0,810 – 6,395)  $p=0.119$ }, initial GCS 9-12 {OR 2,905 (CI 95%: 0,097 – 24,440)  $p=0.048$ }, hypoxia {OR 13,582 (IK 95%: 4,315 – 42,750)  $p=0.000$ }, hypotension {OR 5,179 (CI 95%: 1,097 – 24,440)  $p=0.038$ }, and multiple focal lesion {OR 5,674 (CI 95%: 2,008 – 16,038)  $p=0.001$ } were risk factors for neuroworsening in moderate head injury cases. Area Under Curve value was 84.7% from the Receiver Operator Curve.

**Conclusions:** This study showed that hypoxia, multiple focal lesion, age  $\geq 40$  years old, and hypotension were risk factors for neuroworsening in moderate injury cases.

**Keywords:** Moderate head injury, neuroworsening, risk factors.

### INTRODUCTION

In developing countries including Indonesia, incidence rate of head injury is high. Prognosis of head injury is good, more than 90% of patients with head injury undergoing repair.<sup>1</sup> Some of the literature and research conducted focused to assess or predict the outcome of head injury from mild to severe, however, only few studies conducted to observe the development of mild head injury.<sup>2,3</sup> We predict that the risk factors associated with outcome of mild head injury are also risk factors for the occurrence of this mild head injury exacerbations.<sup>4-8</sup> Therefore in this study, the authors want to determine if the mild head injury patient with the above risk factors associated with deterioration of clinical and radiological assessed.

### METHODS AND PATIENTS

This is a prospective cohort study of 152 mild head injury patients conducted during the period April 2010 - March 2011 at Emergency Room Sanglah General Hospital Bali-Indonesia. Patients who are diagnosed as head injury were evaluated and accounted for risk factors related to age and sex, hypotension, hypoxia, and whether they have sedative drug. CT scan was applied as soon as the patient in stable condition and intracranial lesions including the type and location was recorded.

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Medikamentosa treatment was applied to all patients and then recorded. Follow up was carried out for 3 days and treated with  $O_2$  and head up 30°. When, before 2 days there was an exacerbations observed indicate with a decrease of GCS more than 2 point, another CT Scan was applied to evaluate intracranial condition. Therefore, evaluation was carried out for exacerbations as decrease of CGS and changes of CT Scan.

The data were then analyzed using SPSS 17.0 for Windows to determine the risk factors of mild head injury, including age, gender, hypotension, hypoxia, intracranial lesion type and initial GCS. Multivariate regression tests were employed to obtain the require results. Statistical tests performed to the level of significance based on the value of  $p <0.05$ . Results data were then presented in tables and graphs.

### RESULTS

During research period, there were 152 patients meet inclusion criteria. A number of 114 (75.0%) subjects were man and 38 (25.0%) subjects were women. Age range of 16 – 39 years is 108 (71.1%) patients, between 40 – 65 years is 44 (28.9%) patients. Patients with 9-12 point score of initial GCS during onset is 121 (79.6%), with 13 point score of GCS is 31 (20.4%). Patients with hypoxia are 34 (22.4%) and without hypoxia are 118 (77.6%). Mainly, the patients are not in hypotension which were around 139 (91.4%) and the rest 13 (8.6%) were hypotension. In addition, based on CT Scan patients with single focal lesion are 50 (32.9%) and with

multipkle focal lesions are 102 (67.1%). In summary, all data were presented on Table 1.

Table 1  
Characteristic of Patients

Characteristic	Results
Sexes:	
man	114 (75.0%)
women	38 (25.0%)
Ages	
16-39 years	108 (71.1%)
40-65 years	44 (28.9%)
Initial GCS	
9-12 point	121 (79.6%)
13 point	31 (20.4%)
Hypoxia	
with hypoxia	34 (22.4%)
without hypoxia	128 (77.6%)
Hypotension	
with hypotension	13 (8.6%)
without hypotension	139 (91.4%)
Focal Lesions	
single	50 (32.9%)
multiple	102 (67.1%)
Exacerbations	
exacerbations	61(40.1%)
no exacerbations	91 (59.9%)

Association between dependent and independent variables were then analysed by applying multiple logistic regresion. Multiple regression analysis reveals that sexes variable on second step were exluded as a risk factor. On the other hand, for other five variables were included and have a role on worsening of mild head injury. Odd ratios for these five variables were 13.58 for hypoxia, 5.67 for focal lession, 5.18 for hypotension, 4.49 for age groups, and 2.91 for initial GCS. Association quality of these five variables was detrmined by evaluating the ROC curve. Then, in this study it was obtained that the value of AUC was 0.847 (84.7%) which means there was a strong association among five variables towards the occurrence of worsening mild head injury.

## DISCUSSION

Number of head injury patients increases every year and at Sanglah General Hospital Bali-Indonesia 95% of the case due to traffic accident. This research obtain that mainly the mild head injury is man for 114 (75.0%) and women 38 (25.0%) in the ration of 3 : 1. With regards to age, range of age of 16 - 39 years was about 108 (71.1%) and range of 40 - 65

years was 44 (28.9%) patients. Taking into account of intial GCS within score of 9-12 points was 121 (79.6%) patients and with 13 point was 31 (20.4 %) patients. The most of the patients was not in hypoxia, it was about 118 (77.6%) patients and with hypoxia about 34 (22.4%) patients. Only a little of patients with hypotension, 13 (8.6%) patients were hypotension and 139 (91.4%) were not hypotension. Focal lesions obtained based on CT Scan were as a results of five factors that affect the occurrence of worsening of the mild head injury, including hypoxia, focal lesion, hypotension, age groups, and initial GCS, respectively from the strongest to the weaknes. On the other hand, in this study sexes were found not as a risk factor of worsening of mild head injury. Supported by multiple logistic regression analysis that five risk factors mention above were the true risk factors for occurrence of worsening mild head injury and increase to 44.0 % in line with AUC value of 84.7% which was significant to affect the worsening.

## CONCLUSION

There was about 13.58 time of risk worsening of moderate head injury with hypoxia compare to head injury without hypoxia. Moreover, there was around 5.67 time of risk worsening of moderate head injury with multiple focal lesions compare to single focal lesions. This study also indicates that there was around 5.18 time of risk worsening of moderate head injury with hypotension compare to moderate head injury without hypotension. We also found that there was about 4.49 time of risk worsening of moderate head injury with in an age  $\geq 40$  years compare to moderate head injury with in an age  $< 40$  years. In this study, it was also found that there was around 2.91 time of risk worsening of moderate head injury with lower initial compare to moderate head injury with high initial. This study also obtain that there was around 2.28 time of risk worsening of moderate head injury in man compare to the case in women.

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