

The Duration of Accident and Kind of Transportation as Death Predictor of the Patients with Severe Head Injury

E I Lutfi¹,

Department of Nursing Science, University of Kadiri
Kediri, Jl. Selomangkleng no.1 Kota Kediri, East Java
Indonesia

Email : erik.irham@unik-kediri.ac.id

Y L Agnes²

Department of Nursing Science, University of Kadiri
Kediri, Jl. Selomangkleng no.1 Kota Kediri, East Java
Indonesia

yeni.lufiana@unik-kediri.ac.id

E M Yunalia³

Department of Nursing Science, University of Kadiri
Kediri, Jl. Selomangkleng no.1 Kota Kediri, East Java
Indonesia

endang.mei@unik-kediri.ac.id

Abstract. Head injury is a neurological emergency which has complex effects because the head is the center of someone's life. The treatment of head injury patient in the place of accident, the transportation to the hospital, diagnosis, and the first aid done will influence prognosis and outcome of the patients. The objective of this study is to analyze the correlation between duration of accident and transportation mode toward the death of patients with severe head injury. This research is correlative analytic. Based on analytical test using *chi square*, it is got that there is correlation between duration of accident and transportation model toward the death of patients with severe head injury. It can be interpreted that the more non ambulance transportation, the higher prediction of mortality rate of the patients with severe head injury. The duration to be brought to the hospital determines the continuing process of secondary head injury which can cause the increasing of intra cranial pressure, and bad prognosis until the death.

1. Introduction

Trauma case is one of the biggest death causes in the world [1]. The effects of head injury will be more complex than injury of the other organs such as disorder of neurological function that may cause defect until death because of intra cranial bleeding[1][2]. The worst prognosis is for the patients with severe head injury which have $GCS \leq 8$, so the mortality rate reaches around 60%[3]. The patients with severe head injury have lower survival ability than those who have moderate or light head injury. It happens especially during 6-12 hours from the accident[4].

The treatment of patients with head injury in the place of accident, the transportation to the hospital, diagnosis,

and the first aid which done in emergency room are very important for deciding the next treatment which will influence the prognosis of patients [5]. The mortality rate of the patients with head injury can be reduced by fast and proper aid [6]. The pre hospital treatment is started from the accident until the patients arrive in hospital [3]. The right and fast pre hospital treatment can reduce mortality rate and defect because of trauma [2]. During 6 – 12 hours after having severe head injury, the brain will get initial systemic phase such as decreasing of blood pressure, oxygen, temperature of the body, blood glucose control, liquid status, and infection which this phase is signs of death [4][7]. In this phase, it has happened secondary head injury which will determine *outcome* of head injury patients[7].

The previous researchs about *prehospital time and survival* of the patients with head injury show different results. For example, the research done to 360 patients revealed that the prehospital treatment does not relate with the survival of patients, but *prehospital time* > 6 hours has correlation with the death. Eventhough the result of the researchs about pre hospital time and survival of the patients with head injury still vary, *pre hospital treatment toward* survival of the patients has possibility to get bigger role. it is because the longer patient ignored, the bigger possibility in decreasing process of brain function which increase possibility of defect and death.

2. Literature Review

Head injury is a a traumatic disorder of brain function which is followed or without bleeding and without disconnecting of brain continuity [4]. Head injury incidents globally are around 200 until 100,000 people every year. However, it is regarded as not real number, and it is *underestimated* number. The data got from *Center of Disease Control and Prevention* (CDC) shows that the incident of head injury in United States is around 1.7 million cases every year. In Indonesia, the study about incident of head injury is still few, so the number of head injury incident have not been found yet. Data from Haji Adam Malik Public Hospital in Medan recorded 1,627 cases of head injury in 2010. In dr. Pirngadi Hospital Medan, it was found 1,095 head injury cases in 2002 with mortality rate 92 patients. Head injury becomes the main cause of death for adult people under 45 years old, and for children between 1-15 years old [3].

Head injury can happen because of either sharp trauma or blunt trauma such as fall off, hit, accident, and trauma when was born which can influence head and brain so they cause disorder of brain function and all of the body system. When the trauma reaches extra cranial, it can cause acceleration on skin and blood flow that create bleeding [8]. If the bleeding cannot stop, it can bother blood flow that cause lack of oxygen. The next effect, the brain will be edema and the increasing of blood volume in the brain so intra cranial pressure be higher [9].

The treatment of victims on the spot, transportation to the hospital, diagnosis, and the first aid given in emergency room will be very important in determining the next treatment and patients' prognosis [5]. The fast response to bring the patients to emergency room will be very important in increasing patients' prognosis with severe head injury [3]. The first an hour after accident has big contribution toward the death of patients with severe head injury. The time of accident can be divided into two namely fast (< 60 minutes), long (> 60 minutes)[3][4]. The duration more than 60 minutes after accident will increase the opportunity the process of secondary brain insult, and followed by the risk of death among the patients with severe head injury [3].

Revised Trauma Score assesses the whole of human physiological system, and *Revised Trauma Score instrument* is the result of completing *Glasgow Coma Scale instrument* to assess the prior condition of patients with head injury [10]. *Revised Trauma Score* should be

done immediately after the accident, and it is usually given before entering hospital or when the patients are in emergency room [11]. *Revised Trauma Score* has been validated as assessment method to differ between patients who have good and bad prognosis [10]. The duration of head injury is the time needed from the accident happen until the arrival in emergency room[12].

The transportation mode is the facility used to bring patients from the place that accident happened to emergency service, and it is the important part in emergency treatment [2][5]. By using the proper transportation, it can help to handle the emergency patients well. In the emergency treatment, sometime it is needed to refer patients because of some reasons such as the limited of tools and human resources that cannot be able to be done definitive service. Therefore, the proper means of transportation, such as complete ambulance with all of accommodation is very recommended [2].

3. Methods

This research is correlative analytic by using retrospective cohort approach. The data taken focus on secondary data of the patients which consist of general data such as age, gender, job, and special data namely communication system, transportation mode, kind of transportation to evacuate patients, and the duration from accident until the arrival in emergency room. The data were taken from June to July 2017. The number of respondents in this research are 46 respondents. The data analysis used is bivariate by using chisquer and spearman rho test.

4. Result and Discussion

Table 5.1 Relative Frequency Distribution of patients age with severe head injury

No.	Age	Frequency	Percentage (%)
1.	Early teenager (11-16 tahun)	5	10.9
2.	Last teenager (17-25 tahun)	13	28.3
3.	Early adult (26-35 tahun)	22	47.8
4.	Early elder (46-55 tahun)	6	13.0
Jumlah		46	100

Based on interpretation from Table 5.1 above, it can be seen that almost a half of the severe head injury

patients are early adult namely 22 responden (47.8%). It is suitable with the research [4] that many of those who are age between 15-45 years old become trauma victims which cause severe head injury.

Table 5.2 Relative Frequency Distribution of patients job with severe head injury

No.	Job	Frequency	Percentage (%)
1.	Student	7	15.2
2.	Housewife	6	13.0
3.	Farmer	2	4.3
4.	Non civil servant	24	52.2
5.	Civil servant	7	15.2
Total		46	100

Based on Table 5.2 above, most of the patients with severe head injury have jobs in non civil servant, namely 24 respondents (52.2%).

Table 5.3 Relative Frequency Distribution of the first aid duration toward patients with severe head injury

No.	Duration	Frequency	Percentage (%)
1.	Cepat (< 60 menit)	22	47.8
2.	Lama (> 60 menit)	24	52.2
Total		46	100

Based on Table 5.3 above, most of the duration from the accident happened until first aid to the severe head injury patients is in long category (> 60 menit) namely 24 respondents (52.2%)

Table 5.4 Relative Frequency Distribution of Transportation toward patients with severe head injury

No.	Transportation	Frequency	Percentage (%)
1.	Ambulance	21	45.7
2.	Non ambulance	25	54.3
Total		46	100

Based on Table 5.4 above, most of the transportation mode to bring patients with severe head injury is non ambulance namely 25 respondents (54.3%)

Table 5.5 Relative Frequency Distribution of Mortality Prediction

No.	Mortality Prediction	Frequency	Percentage (%)
1.	Moderate	2	4.3
2.	Heavy	8	17.4
3.	Serious	36	78.3
Total		46	100

Based on Table 5.5 above, almost of Mortality Prediction on patients with severe head injury is in serious category namely 36 respondents (78.3%)

Table 5.6 Bivariate Analisis Correlation between Duration of Accident and Mortality Prediction on patients with severe head injury

No.	The duration	Mortality Prediction			Jumlah
		Sedang	Berat	Serius	
1.	Fast (<60 menit)	2 (4.3%)	8 (17.4%)	12 (26.1%)	22 (47.8%)
2.	Slow (>60 menit)	0 (0%)	0 (0%)	24 (52.2%)	24 (52.2%)
Jumlah		2 (4.3%)	8 (17.4%)	36 (78.3%)	46 (100%)
Correlation Coefficient = .548**				Sig. (2-tailed) = .000	
$\alpha=0.05$					

Based on Table 5.6 above, it can be interpreted that most of the respondents who have severe head injury > 60 minutes get mortality prediction in serious category namely 24 (52.2%). The result of data analysis by using *Spearman rank test* get result value ρ value= 0.000 ($\alpha=0.05$) with correlation coefficient 0.548. The result research in Emergency Room of dr Iskak Public Hospital Tulungagung revealed that from 46 respondents, there are 24 respondents (52.2%) in long duration a (> 60 menit), and almost of the half from 46 namely 22 (47.8%) the duration of first aid from the accident in fast category (< 60 menit). The duration of accident is the time needed from the accident happen until the arrival in Emergency Room of the hospital [3][4]. It will determine *outcome* of the patients with severe head injury. The faster patients arrive emergency room, the better prognosis of the patients with severe head injury [2]. The first of an hour after the accident has big contribution toward mortality of patients with severe head injury. The longer duration more than 60 minutes give more opportunity the insult process of secondary brain, and also increase the death risk of patients with severe head injury [3][11]. This kind of process cause the increasing of intra cranial pressure gradually which when it reaches the tolerance ultimate point from the brain, so the brain cannot defend neuron integrity which followed by hypoksia and hypoksemia and the death because of hibernation [13][14]. Based on the research, the duration in long category, so it gives effects in early

handling that should be done in order to prevent the insult process of secondary brain which can cause the increasing of intra cranial pressure, and cause bad prognosis until death.

Table 5.7 Transportation Bivariate Analysis with Mortality Prediction on Patients with Severe Head Injury

No	Transportation	Mortality Prediction			Percentage
		Moderate	Heavy	Serious	
1.	Ambulance	2 (4.3%)	8 (17.4%)	11 (23.9%)	21(45.7%)
2.	Non ambulance	0 (0%)	0 (0%)	25 (54.3%)	25(54.3%)
	Total	2(4.3%)	8(17.4%)	36(78.3%)	46(100%)
Sig. (2-tailed) = .000					$\alpha=0.05$

Based on Table 5.7 above, it can be interpreted that most of the patients with severe head injury who use non ambulance to the hospital have serious mortality prediction namely 25 patients (54.3%).

The result of data analysis which use *Chi Square* test got p value= $0.000 < \alpha = 0.05$. Based on the result of the research, it can be interpreted that most of the transportation mode for the patients with severe head injury use non ambulance namely 25 respondents (54.3%). Transportation mode is an important part in emergency service [11][15]. By using suitable transportation, it can help to care an emergency patients well. On the emergency service, it sometimes needs to refer the patients because of some reasons such as the limited of tools and human resources that make unable to be done definitive treatment. The research reveals that there are 54% respondents do not use ambulance when they were brought to the hospital. It is because when there is a traffic accident some of people do not contact the nearest medical service so they use private car, motorcycle and even police car to the hospital. It can influence the early treatment to the patients with severe head injury because the usage non ambulance transportation when the patients are being brought to the hospital can make the patients' condition worse. It can increase mortality prediction among the patients severe head injury because the treatment of patients on the spot, the transportation mode choice, diagnosis, and the first aid done in emergency room are the important factors to determine the nexts actions and prognosis of the patients [5]. The

mortality rate among patients with severe head injury can be reduced by proper first treatment [6]. The management of pre hospital is started from the accident until the arrival in emergency room [3]. The giving of right pre hospital treatment can reduce mortality rate and defect because of the trauma they suffer [2].

The importance of on the spot treatment is very significant because they often also get breathing disorder, shock, liquid balance and electrolyte disorder, the high intra cranial pressure, stiff, cardio vascular disorder and the others. That's why the fast response is needed. An emergency treatments which should be done to save the patients are to keep air ways smooth, adequate oxygen, fluid resuscitation, keep vertebra servikalis and thorakolumbal, identify and stabilize extra cranial bleeding, and evaluate the awareness level of the victims [9]. In handling the patients with severe head injury, the choice of transportation mode is very important because it can influence secondary head injury, such as hypoksia and hypotension that can cause death. Hypotension is the effect of secondary head injury that cause the decreasing of blood supply from the heart to the brain which is needed to supply oxygen for metabolism process in the brain. Anaerob metabolism in the brain stimulates pain chemical receptor and increase capillar abilitis so there is no certain process and result edema of the brain. The presence of hypotensin can double mortality and increase morbidity [8].

The correlation between transportation mode and mortality prediction among patients with severe head injury is that most of the patients with severe head injury who use transportation mode non ambulance to the hospital have serious mortality prediction namely 25 patients (54.3%). The result of data analysis using *Chi Square* test reveals p value= $0.000 (\alpha = 0.05)$. It means there is correlation between the choice of transportation mode and mortality of the patients with severe head injury. The transportation for the patients with moderate and severe head injury must choose fast, proper and save vehicle namely ambulance [6]. The success of emergency treatments is not only determined by the success in maximizing fast ABCD procedures in hospital, but also the transportation choice to bring the patients to emergency room in the hospital. The use of ambulance can make faster process to the hospital, besides the availability of transportation in ambulance such as collar neck,

ambulance stretcher which have function in immobilisation of the patients. Collar neck is to protect neck or servical in order no complication or more severe injury of servical bone because of hyper extension , or rotation. Ambulance stretcher has function to mobilize the patients from lower parts to the head. The increasing of servical injury can cause block in parasymphatis neuron that emerge hypoventilation and hypotension so the brain will get iskemik that will end in death. Ambulance must have oxygen tool facility which is ready to be used in it. Oxygen is the primary need for survival of the human. The availability of oxygen facilities in ambulance has function to supply oxygen given to the patients during process to transport the patients to the hospital so brauin cell iskemik can be prevented.

5. Conclusion

The treatment of head injury patients in the place of incident, transportation to the hospital, diagnosis, and the first aid done in emergency room are very important in deciding the next treatments. They will also influence of patients' prognosis so it is needed to manage maximal treatment on the spot by medical team, and further treatment immediately in emergency unit. By doing those responses, it will increase patient's outcome who get severe head injury.

References

- [1] D. K. Cullen *et al.*, *Injury Models of the Central Nervous System*, vol. 1462. 2016.
- [2] T. Chowdhury, S. Kowalski, Y. Arabi, and H. Dash, "Pre-hospital and initial management of head injury patients: An update," *Saudi J. Anaesth.*, vol. 8, no. 1, p. 114, 2014.
- [3] C D Arnold, "Faktor – Faktor Yang Berhubungan Dengan Outcome Pasien Pasca Operasi Hematoma Epidural (EDH)," pp. 1–48, 2013.
- [4] A. Cindy and N. Afni, "Analisis Faktor- Faktor yang Mempengaruhi Mortalitas dalam 12 Jam Perawatan Pasien Cedera Otak Berat," *Inst. Heal. Sci. Kusuma Husada Surakarta*, 2017.
- [5] NICE, "Pre-hospital management for patients with head injury," *NICE Pathw. Guidel.*, no. October, pp. 1–11, 2014.
- [6] A. C. Falk, A. Alm, and V. Lindström, "Has increased nursing competence in the ambulance services impacted on pre-hospital assessment and interventions in severe traumatic brain-injured patients?," *Scand. J. Trauma. Resusc. Emerg. Med.*, vol. 22, no. 1, pp. 1–5, 2014.
- [7] S. Mudatsir, M. S. Sangkala, and A. Setyawati, "Related Factors of Response Time in Handling Head Injury in Emergency Unit of Prof . Dr . H . M . Anwar Makkatutu," *Indones. Contemp. Nurs. J.*, vol. 2, no. 1, pp. 1–12, 2013.
- [8] M. Smith, "Cerebral perfusion pressure," *Br. J. Anaesth.*, vol. 115, no. 4, pp. 488–490, 2015.
- [9] D. J. Miller, "perfusion pressure□: management too low , and when it."
- [10] Y. Kondo, T. Abe, K. Kohshi, Y. Tokuda, E. F. Cook, and I. Kukita, "Revised trauma scoring system to predict in-hospital mortality in the emergency department: Glasgow Coma Scale, Age, and Systolic Blood Pressure score," *Crit. Care*, vol. 15, no. 4, p. R191, 2011.
- [11] C. H. C. Settervall, R. M. C. de Sousa, and S. C. F. e Silva, "In-hospital mortality and the Glasgow Coma Scale in the first 72 hours after traumatic brain injury," *Rev. Lat. Am. Enfermagem*, vol. 19, no. 6, pp. 1337–1343, 2017.
- [12] S. Evie, "Jurnal Ilmiah Kesehatan Keperawatan, Volume 12, No.3 Oktober 2016," *Anal. Fakt. YANG BERHUBUNGAN DENGAN OUTCOME PASIEN CEDERA KEPALA DI IGD RSUD Prof. Dr. MARGONO SOEKARDJO PURWOKERTO*, vol. 12, no. 3, pp. 154–164, 2016.
- [13] R. McCourt *et al.*, "Cerebral perfusion and blood pressure do not affect perihematoma edema growth in acute intracerebral hemorrhage," *Stroke*, vol. 45, no. 5, pp. 1292–1298, 2014.
- [14] R. C. Ostermann, M. Hofbauer, J. Joestl, P. Platzer, T. M. Tiefenboeck, and N. Lang, "Risk factors predicting prognosis and outcome of elderly patients with isolated traumatic brain injury," *J. Orthop. Surg. Res.*, vol. 13, no. 1, pp. 1–6, 2018.
- [15] H. Gerritsen, M. Samim, H. Peters, H. Schers, and F. Van De Laar, "Incidence, course and risk factors of head injury: A retrospective cohort study," *BMJ Open*, vol. 8, no. 5, pp. 1–8, 2018.