



Factors Affecting Mortality of Patients with Severe Head Injury at Tugurejo General Hospital of Semarang

Mugi Hartoyo¹, Nova Reynaldo², Budiyati³, Riskiyana Sukandhi Putra⁴
^{1,3,4}Poltekkes Semarang

²Inche Abdoel Moeis Hospital Samarinda Kalimantan

Article

Article History

Submitted: 2022-02-05

Accepted: 2022-03-13

Published: 2022-03-21

Keywords: Factors

*Affecting Mortality, Severe
Head Injury.*

Abstract

The mortality rate from head injuries is half of the deaths caused by all injuries. In the period from January to December 2009, 40% of inpatients with moderate and severe head injuries died at Tugurejo General Hospital, Semarang. The purpose of this study was to determine the relationship between the factors that influence the mortality of patients with severe head injury who had died in the period 2008 to 2009. This study is a correlative design with a retrospective approach. The research subjects were 30 respondents who were determined by total sampling technique. The research data were sourced from the medical records of patients who were treated for severe head injuries. The data were processed by Fisher's exact statistical test and logistic regression. The results showed that there was a relationship between delay in early treatment/resuscitation and mortality ($p=0.005$), and there was a relationship between inadequate transportation and mortality ($p=0.034$). Inadequate hospital facilities and infrastructure factors and delays in surgery support the occurrence of rapid death, this is evidenced by 30 patients who did not undergo surgery, 24 of whom experienced rapid death (< 6 hours). There was a relationship between multiple injuries/other infections with mortality in patients with severe head injury ($p=0.002$). The factor of delay in initial treatment/resuscitation is the most dominant factor in influencing mortality in patients with severe head injury with a regression coefficient of -21.608 . Thus, the identification of the factors that influence the occurrence of mortality in patients with severe head injuries, it is hoped that nurses can act quickly and appropriately in dealing with patients with severe head injuries to reduce the risk of death.

Abstrak

Angka kematian akibat cedera kepala adalah setengah dari kematian yang disebabkan oleh semua cedera. Pada periode Januari-Desember 2009, terdapat 40% pasien rawat inap dengan cedera kepala sedang dan berat meninggal di RS Tugurejo Semarang. Tujuan dari

Corresponding author:

Mugi Hartoyo

hartoyo.mugi@yahoo.com

The 1st International Conference on Health, Faculty of Health

Universitas Ngudi Waluyo

penelitian ini adalah untuk mengetahui hubungan antara faktor-faktor yang mempengaruhi kematian pasien cedera kepala berat yang meninggal dalam kurun waktu 2008 sampai 2009. Penelitian ini merupakan penelitian korelasi dengan pendekatan retrospektif. Subjek penelitian adalah 30 responden yang ditentukan dengan teknik total sampling. Data penelitian bersumber dari rekam medis pasien yang dirawat karena cedera kepala berat. Data diolah dengan uji statistik Fisher Exact dan regresi logistik. Hasil penelitian menunjukkan bahwa ada hubungan antara keterlambatan pengobatan/resusitasi dini dengan mortalitas ($p=0,005$), dan ada hubungan antara transportasi yang tidak memadai dengan mortalitas ($p=0,034$). Faktor sarana dan prasarana rumah sakit yang tidak memadai serta keterlambatan pembedahan mendukung terjadinya kematian cepat, hal ini dibuktikan dengan 30 pasien yang tidak menjalani pembedahan, 24 diantaranya mengalami kematian cepat (<6 jam). Ada hubungan antara cedera multipel/infeksi lain dengan mortalitas pada pasien cedera kepala berat ($p=0,002$). Faktor keterlambatan penanganan awal/resusitasi merupakan faktor yang paling dominan mempengaruhi mortalitas pada pasien cedera kepala berat dengan koefisien regresi -21,608. Dengan teridentifikasinya faktor-faktor yang mempengaruhi terjadinya kematian pada pasien cedera kepala berat, diharapkan perawat dapat bertindak cepat dan tepat dalam menangani pasien cedera kepala berat untuk mengurangi risiko kematian.

Introduction

The increasing progress of science and technology, especially in the fields of industry and transportation, has increased the number of traffic accidents (Wibowo, 2008). Furthermore, Wibowo (2008) revealed that the increasing standard of living of the people and the facilitation of the process of owning a vehicle in Indonesia by credit had an impact on the fulfillment of the need for mobilization. The high mobility needs of the community make the traffic flow higher and denser. This results in an increase in the number of road accidents. Head injuries accounted for 49% due to traffic accidents, while the death rate from head injuries was half of the deaths caused by all cases of injury (Japardi, 2004).

Data from Tugurejo General Hospital Semarang in the period January - December 2009 showed that patients treated for head injuries consisted of 87% of patients with mild head injuries and 13% of patients with moderate and severe head injuries. There were no deaths in patients with mild head injuries, but 40% of patients with moderate and severe head injuries were reported to have died. With the high mortality rate in severe head injuries, it is necessary to identify the factors that cause death in these patients. According to Fauzi (2002) the factors that can influence or cause death in patients with severe head injuries are delays in initial treatment/resuscitation, inadequate transportation, inadequate hospital facilities and infrastructure, delays in surgery, and multiple injuries or infection.

Results and Discussion

The 1st International Conference on Health, Faculty of Health

Available on : <http://callforpaper.unw.ac.id/index.php/ICH-UNW>



1. Characteristics of Respondents

Table 1. Frequency distribution of the characteristics of respondents with severe head injury who died at the Tugurejo General Hospital, Semarang.

Age	Frequency	Percentage (%)
5-14 years	1	3,3
15-24 years	3	10,0
25-44 years	10	33,3
45-64 years	8	26,7
>65 years	8	26,7
Gender		
Female	6	20,0
Male	24	80,0
Cause of injury		
Fall down	3	10,0
Traffic accident	27	90,0

Based on the results of the study, respondents who died from severe head injuries in 2008 to 2009 at the Tugurejo General Hospital of Semarang were more experienced by patients with an age range 25-44 years as many as 10 people (33.3%). Japardi (2004) said that in patients with head injuries, the age group that often experiences injuries is people with an age range of 25-44 years, which are people of productive age who have a high level of activity.

The results showed that 80% of the respondents were male. This is associated with the number of male who are more than female in Indonesia (Japardi, 2004). Men have more activity levels in the outside than woman (Limoa,

2005). So it can be concluded that men have a greater risk of injury than women. This study found that the cause of the most severe head injuries was due to traffic accidents by 90%. Meanwhile, falls from a height are only 10%. The high number of traffic accidents that result in severe head injuries is based on advances in science and technology which are increasingly producing and marketing motorized vehicles, especially motorcycles (Wibowo, 2008). By simplifying the process of obtaining a motorized vehicle in Semarang Central Java, a high level of mobility in the community can be met, thereby making the traffic flow more congested. This resulted in an increase in the number of motorcycle accidents on the highway (Japardi, 2004).

2. Delay in initial treatment/resuscitation to mortality in severe head injury patients

Table 2. Cross tabulation of delay in initial treatment/resuscitation with mortality in patients with severe head injury at the Tugurejo General Hospital, Semarang.

Factor 1	Mortality				Total		P
	Fast (<6 hours)		Slow (>6hours)				
	f	%	f	%	f	%	
Does not support	0	0	3	10,0	3	10,0	0,005
Support mortality	24	80,0	3	10,0	27	90,0	
Total	24	80,0	6	20,0	30	100,0	

Table 2 shows that from 3 patients whose initial treatment was good had a death time of more than 6 hours (100%) and of 27 patients whose initial treatment was not good (supporting mortality) 24 patients (80%) had a fast death time (< 6

hours) and 3 patients (10%) died late (>6 hours).

Statistical test results obtained p value = 0.005 which means there is a relationship between the delay in initial treatment/resuscitation with the death of



patients with severe head injuries at the Tugurejo General Hospital Semarang, the worse the initial treatment, the faster the death of patients with severe head injuries.

The delay in initial treatment, for example in the primary survey, namely the assessment of C (circulation), A (airway), B (breathing), D (disability), and E (exposure/environmental control) can result in secondary brain injury and disrupt brain homeostasis (Fauzi, 2002).

The initial management of patients with head injuries basically has the aim of monitoring as early as possible and preventing secondary head injuries and improving the general condition as optimally as possible (Fauzi, 2002). Hypoxia can cause ischemia which over time can result in irreversible cerebral infarction. Hypoxia accompanied by hypotension in patients with severe head injuries will cause mortality to reach 75% (American College of Surgeon Committee on Trauma, 2004).

3. The relationship of inadequate transport factors to early and late mortality.

Table 3. Inadequate transport cross-tabulation with mortality in patients with severe head injury at the Tugurejo General Hospital, Semarang.

Factor 2	Mortality				Total		P
	Fast (<6 hours)		Slow (>6 hours)		f	%	
	f	%	f	%			
Do not support	0	0	2	6,7	2	6,7	0,034
Support mortality	24	80,0	4	13,3	28	93,3	
Jumlah	24	80,0	6	20,0	30	100,0	

Table 3 shows that from 2 patients with good transport (not supporting mortality) had a death time of more than 6 hours (100%). Of the 28 patients whose transportation was not good (supporting mortality) there were 24 patients (80%) who died quickly (< 6 hours) and 4 patients (13.3%) died late (> 6 hours).

The results of statistical tests showed p value = 0.034, which means that there is a relationship between inadequate transport and death of patients with severe head injuries at the Tugurejo General Hospital, of Semarang. The worse the transportation, the faster the death of people with severe head injuries. Impaired transportation is one of the factors that can cause death in patients with head injuries because it is associated with secondary brain injuries such as hypoxia, hypotension and infectious processes that can cause death (Dunn, 2000). Dunn (2000) further explained that transportation of people with severe head injuries must be done quickly to get prompt medical action. Immediate transfer of eligible patients will reduce morbidity and mortality and should not be delayed by diagnostic measures.

Japardi (2004) said that before transportation is carried out, the patient's condition must be in a stable condition first and must be accompanied by trained medical personnel.

4. Inadequate hospital facilities and infrastructure for fast and slow deaths.

Table 4. Cross tabulation of inadequate hospital facilities and infrastructure with mortality in patients with severe head injuries at the Tugurejo Regional General Hospital, Semarang.

Faktor 3	Mortality				Total	
	Fast (<6 hours)		Slow (>6 hours)		F	%
	f	%	f	%		
Do not support	24	80,0	6	20,0	30	100,0
Support mortality	0	0,0	0	0,0	0	0,0
Total	24	80,0	6	20,0	30	100,0

The results showed that from 30 patients who were supported by good facilities and infrastructure such as CT Scans and ventilators (not supporting mortality) there were 24 patients (80%) whose time



of death was less than 6 hours and 6 patients (20%) whose time of death was more than 6 hours.

Inadequate hospital facilities and infrastructure can result in less than optimal treatment (Hill, 2002). Breathing assistance using a ventilator is very useful in providing respiratory support for patients with severe head injuries who have stopped breathing. CT Scan facilities as a supporting tool are also needed in providing an overview of the extent of bleeding experienced by the patient so that prompt action can be taken for surgery. Neurosurgical facilities are a follow-up to the results of CT Scan supporting facilities to perform surgery on patients who experience intracranial

bleeding so as to reduce the increase in intracranial pressure which can lead to death (Hill, 2002). Availability of a CT Scan machine to diagnose, but the hospital does not have a neurosurgeon, the hospital should be able to refer the patient to a hospital that has good neurosurgery facilities as soon as possible after there is an indication for surgery.

The results of this study indicate that although the hospital has CT Scan facilities and ventilators but does not have neurosurgical facilities that support it, the time of death for patients with severe head injuries is also fast (<6 hours).

5. The relationship between late surgery and early and late mortality.

Table 5. Cross tabulation of delayed surgery with mortality in patients with severe head injury at the Tugurejo Regional General Hospital, Semarang.

Factor 4	Mortality				Total	
	Fast (<6 hours)		Slow (>6 hours)		F	%
	f	%	f	%		
Do not support	0	0	0	0,0	0	0,0
Support mortality	24	80,0	6	20,0	30	100,0
Total	24	80,0	6	20,0	30	100,0

The results showed that of the 30 patients who did not undergo surgery less than 4 hours after surgery was indicated (supporting mortality) 24 patients (80%) died in less than 6 hours. There were 6 (20%) patients died within more than 6 hours. This shows that neurosurgery is very important to be performed immediately to reduce the increase in intracranial pressure caused by bleeding in the intracranial space. Increased intracranial pressure that lasts a long time can cause hemodynamic conditions to become unstable, for example a decrease in blood pressure so that oxygen delivery to the brain is reduced which can result in

ischemia and infarction of the brain. Increased intracranial pressure can last until the patient dies (Shepard, 2004). Hill (2002) described that patients who had no surgery for less than 4 hours had a higher mortality rate than patients who had surgery for more than 4 hours. This can be an input for hospitals that already have CT Scan facilities, namely if they get a patient with neurosurgery indications, they are immediately referred to a hospital that has neurosurgical facilities so that prompt and appropriate intervention can be carried out.

6. Presence of multiple injuries/other infections leading to early and late death.

Table 6. Cross tabulation of multiple injuries/other infections with mortality in patients with severe head injury at the Tugurejo General Hospital, Semarang.

Factor 5	Mortality				Total		P
	Fast (<6 hours)		Slow (>6 hours)		F	%	
	f	%	f	%			



Do not support	3	10,0	5	16,7	8	26,7	
Support mortality	21	70,0	1	3,3	22	73,3	0,002
Total	24	80,0	6	20,0	30	100,0	

Table 6 shows that of 8 patients who did not experience multiple injuries/other infections (not supporting mortality) there were 3 patients (10%) who died in less than 6 hours (10%) and 5 patients (16.7%) died more than 6 hours. Meanwhile, from 22 patients with multiple injuries/other infections (supporting mortality) there were 21 patients (70%) who died quickly (< 6 hours) and 1 patient (3.3%) died late (> 6 hours). Statistical test showed p value = 0.002 which indicated that there was a relationship between the presence of multiple injuries/other infections with the death of patients with severe head

injuries at the Tugurejo General Hospital Semarang. The more accompanied by multiple injuries, the faster the death of patients with severe head injuries.

Fauzi (2002) explains that head injuries are sometimes accompanied by injuries to other parts called multiple injuries. Injury to other parts of the body can lead to secondary infections that result in systemic in other organs of the body. If this condition is not handled properly, it can worsen the condition of people with head injuries which can lead to death (Akhyar, 2008).

7. The dominant factor influencing mortality in patients with severe head injury.

Table 7. The results of logistic regression analysis between the independent variables and the dependent variable in the study at the Tugurejo General Hospital of Semarang.

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Factor 1	-21.608	40192.960	1.000	1	.000	.000
Factor 2	.000	49226.122	1.000	1	.000	1.000
Factor 5	2.639	1.371	3.703	1	.054	14.000
Constant	15.925	28420.720	1.000	1	.000	8242218.739

Nagelkarke R Square = 0.627

Table 7 shows that there are 2 independent variables that affect the mortality variable, namely the delay in early treatment/resuscitation and inadequate transportation with a significance value of 0.000. This shows that the delay in initial treatment/resuscitation and inadequate transportation are variables that have an influence on mortality in patients with severe head injuries. The most dominant variable that influences mortality is the delay in early treatment/ resuscitation because the regression coefficient value is -21,608. The magnitude of the effect of the independent variables together on the mortality variable is 62.7% (0.627 x 100%), this shows a strong influence. From the results of this study, it can be concluded that early treatment is very important and we need to pay attention to

because it is the basis before we refer the patient to a health service. Errors in early treatment can have a negative impact on the patient's prognosis, even resulting in rapid death, which is less than 6 hours.

8. Research Limitations

This study involved 30 respondents who were taken from medical records of patients with severe head injuries who died in only one hospital. Thirty respondents are the minimum sample in a study, therefore they are not very representative to describe the expected research results, so the research results cannot be generalized.

Conclusion and Sugestion

Conclusion

- Delay in initial treatment/resuscitation was associated with



mortality in patients with severe head injury with a p value = 0.005, which means that the worse the initial treatment, the faster the death of patients with severe head injuries.

- b. Inadequate transportation was associated with mortality in patients with severe head injuries with a p value = 0.034, which means that the worse the transportation, the faster the death of patients with severe head injuries.
- c. Inadequate hospital facilities and infrastructure and the delay in surgical procedures support the rapid death of patients with severe head injuries. Statistical test results cannot be displayed because the data is constant so that the relationship cannot be known.
- d. Multiple injuries/other infections were associated with rapid death in patients with severe head injuries with p value = 0.002, which means the more accompanied by multiple injuries, the faster the death of patients with severe head injuries.
- e. The most dominant factor associated with mortality in patients with severe head injury is the delay in initial treatment/resuscitation because the regression coefficient is - 21,608.

Suggestion

By identifying the factors that influence mortality in patients with severe head injuries, the hospital can improve so that it has better treatment. Regular BTLS and ATLS training for nurses and doctors working in the emergency room. Procurement of neurosurgical facilities should be considered to support the existing CT Scan and ventilator facilities.

References

Akhyar, Y. 2008. *Cedera kepala (head injury)*, diakses tanggal 20 Januari 2010 dari:

<http://www.yayanakhyar.wordpress.com/2008/04/25/cedera-kepala-head-injury.htm>.

Alfianto, U. 2003. *Bukupelatihan; Penanggulangan Penderita Gawat Darurat (PPGD) bagi dokter*, Instalasi Gawat Darurat RSUD dr. Moewardi Surakarta : UNS Press.

American College of Surgeon Committee on Trauma. 2004. *Cedera kepala: Advanced Trauma Life Support for Doctors*, (Ikatan Ahli Bedah Indonesia, penerjemah. Edisi 7), Komisi Trauma IKABI.

Dunn, L.T. 2000. *Head Injury, Oxford textbook of surgery*, edisi kedua, volume 3, Oxford Press.

Fauzi, A. A. 2002. *Penanganan cedera kepala di Puskesmas*, diakses tanggal 18 Januari 2010 dari: <http://www.tempo.co.id/medika/arsip/072002/pus-1.htm>.

Hill, M.G. 2002. *Emergency room management of the head injured patient*, diakses tanggal 06 Januari 2010 dari: <http://www.angelfire.com/nc/neurosurgery/uderural.htm>.

Japardi, I. 2004. *Cedera kepala: Memahami aspek-aspek penting dalam pengolahan penderita cedera kepala*, Nusantara.

Limoa, R.A. 2005. *Medical treatment of diffuse brain injury*, PIN II dan Kongres pertama PDSNI, Semarang.

Shepard, S.H. 2004. *Head trauma*, diakses tanggal 20 Januari 2010 dari: <http://www.emedicine.com/med/topic2820.htm>.



Wibowo, A. 2008. *Tesis: Nilai prediksi mortalitas berdasarkan gabungan skor Systemic Inflammatori Response*

Syndrome (SIRS) dan skor GCS pada penderita cedera kranioserebral tertutup, Makassar, Universitas Hasanuddin.

