Original Article

AN ANALYSIS OF FACTORS INFLUENCING THE OUTCOME OF HEAD INJURED PATIENTS ACCORDING TO THE THEORY OF NEED FOR HELP PROPOSED BY ERNESTINE WIEDENBACH, IN RSUD BANGIL, PASURUAN DISTRICT

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ABSTRACT

Head injury is the major cause of morbidity and mortality in individuals aged under 45 years. The focus of the management of head-injured patients is to prevent and limit the possibility of secondary brain injuries which strongly affect the outcome of patients. Patients with head injury are in emergency conditions and must be immediately and precisely treated to obtain better outcome. This research was conducted to analyze the factors that relate with the outcome of patents with head injury based on the approach namely the need for help theory proposed by wiedenbach in the emergency unit of public regional hospital (*rsud)* of bangil, pasuruan district. This research employed a quantitative approach using cross sectional method, involving 53 respondents who were selected using the purposive sampling method. The data obtained in this research were analyzed using spearmanyang correlation test, which result shows the p value of age factor $=0.020 < \alpha = 0.05$, respiratory rate factor obtained p value $=0.013 < \alpha = 0.05$, pulse factor obtained p value $=0.031 < \alpha = 0.05$, and iss factor obtained p value $=0.013 < \alpha = 0.05$. Based on those results, h0 was rejected as no correlation was found between age, rr, pulse, iss score and the outcome of patients with head injury. Those data were then analyzed using the mann-whitney test, which showed the gaps among gcs factors at p value $= 0.000 < \alpha = 0.05$, systole pressure at p value $= 0.001 < \alpha = 0.05$, transportation factor at p value $= 0.017 < \alpha = 0.05$ toward the outcome of head-injured patients. Therefore, h0 was rejected, implying the existence of meaningful gap between gcs score, systole pressure, transportation and the outcome of patients with head-injury. In addition, a linear regression test was also administered, which result showed gcs factor with p value $= 0.000 < \alpha = 0.05$ was the most dominant factor influencing the outcome of the patients with head injury as the correlational coefficient of this factor was obtained at -0.520.

KEYWORDS: Head injury, factors influencing patients' outcome, nurse, need for help, ernestine wiedenbach.

INTRODUCTION

Head injury is the main cause of morbidity and mortality in people under 45 years old.[1] In indonesia, the rate of traffic accident has increased from 2009 – 2013 at an average increase of 12.29% per year. This increase is also followed by increases in the number of dead victims, fatalities and trauma.[2]

The focus of the management of patients with head injury is on the attempts to prevent and limit the possibility of secondary brain injury occurrence which might negatively affect the outcome of the patients[3] bielier *et al.,*[4] have mentioned several prognosis factors

which are known to have certain influences on the outcome of head-injured patients including the sex, age, initial gcs score, pupil reflects, graph of the ct scan, vital sign and laboratory test outcome. Riordan *et al*[5] explained that seen from the epidemiology context, factors influencing the outcome of patients with head injury include age, sex, causes of the injury, alcohol influence, and the time of arrival in the hospital. While clinically, some prognosis factors that influence the outcome of patients with head injury are the blood pressure, oxygenation, gcs score, pupil reflect and treatment.

The prediction of outcome after head injury occurrence is an important aspect that determines the long-term effects that may occur after the injury. According to zamzami *et al* (2013)[6] related to the rate of occurrence and outcome of patients with head injury in hasan sadikin hospital bandung, head injury mostly occurs in males (79.8%) than in females (20.2%), and the highest number of occurrence was found in people aged between 18 – 45 years. The waiting time for surgery is mostly more than 6 hours (410 patients or 60%), while 243 patients had to wait for less than 6 hors (40%). Positive outcome was found in patients with minor injuries at 94.7%, while negative outcome was found in patients with moderate injuries at 5.3%.

The emergency situation in patients with head injuries needs immediate and precise treatment to obtain good outcome. The effectiveness of the management done by medical personnels is an important aspect. Improper treatment given to patients with head injury might lead to brain metabolism disorders, blockage of substrate transportation to the brain tissues and blockage of blood flow to the brain which cause brain ischemic. The golden period of definitive treatment should be in lesser than 6 hours after the occurrence since secondary brain trauma and brain ischemic occur after 6 hours.[7]

Proper management can be done using the "need for help wiedenbach" theory. The theory is defined as "any measure or action required and desired by the patient that has the potential to restore or extend the ability to cope with the demand implicit in his situation". This theory is included in the nursing practice as it has high practicality to be implemented. The theory also develops excellent team work system, determination of the standards or pathway of each area, allowing medical personnels to perform optimal treatment within an emergency situation.[8]

This research analyzed the correlation among age, sex, respiratory rate, gcs, systole pressure, pulse, and trauma in other organs. In addition, this research also looked into the effect of prehospital time, transportation and mechanism of the injury toward the outcome of patients with head injury and toward the immediateness in the management of treatment in emergency unit by the medical personnels. Determining the outcome of patients with head injuries is indeed difficult, but the accurate outcome is an important aspect to be determined.

One of ways to measure the outcome of patients with head injury is using the trauma and injury severity score (triss). Triss predicts the viability of the patients and it has broader scope compared to other types of measurement. Moreover, this method is considered effective as it includes various anatomic, physiological, age-related, and mechanism of injury measurements.[9]

The rate of traffic accident in pasuran was considered high as 888 cases occurred in 2016, which rate was higher than the one in 2015 where 813 cases occurred. According to the data obtained from *rsud* bangil, patients' medical records specifically showed that 167 patients experienced minor head injury in 2014, 182 patients in 2015, and 188 patients in 2016.

Those results intrigued the researchers to investigate the possible aspects influencing the outcome of patients with head injury based on the theory of the need for help wiedenbach in *rsud* bangil, pasuruan district.

METHOD
This research was a quantitative research which employed the cross sectional approach as it attempted at analysing the influence between independent variables (age, sex, initial gcs score, systolic pressure, respiratory rate, pulse, trauma in other organs, trauma mechanism, length of prehospital time and transportation used to transport the patients to the hospital) and the dependent variable (patients' outcome). The data was collected once in april to may 2018. A univariate analysis was employed to describe each research variable. The correlation between variables was measured using spearman test, and linear regression test was administered to see if the gap between independent variables and dependent variable was significant.

RESEARCH RESULTS

1. The general data and distribution of frequency of the respondents
The data obtained in this research are presented as follows:

Table 1: The general data of the respondents.

Characteristics		N	%
Sex	Male	31	58
	Female	22	42
Age	<55 year-old	49	92
	≥55 year-old	4	8
Gcs	Low	24	45
	Moderate	13	25
	High	16	30
Systolic pressure	< 90 mmhg	7	13
	≥ 90 mmhg	46	87
Respiratory rate (rr)	Normal	50	94
	Abnormal	3	6
Pulse	Normal	40	75
	Abnormal	13	25
Trauma in other organs (iss score)	Major	10	19
	Minor	43	81
Injury mechanism	Kll	50	94
	Non kll	3	6
Length of prehospital	<3 hours	53	100
	≥3 hours	0	0
Transportation	Ambulance	18	34
	Non ambulance	35	66

Table 1 above shows that the number of male patients with hale head injury is higher than female (31 cases or 58%). While the majority of respondents (49 patients) with head injuries aged under 55 years (92%). There are cases that occurred related to head injury including 24 (45%) minor head injuries, moderate head injury (13%) and severe head injury (16%). There are 7 patients whose systolic blood pressure was under 90 mmhg were (13%). The respiratory rate of the majority of respondents (50 patients or 94%) are within the normal range. Out of 53 patients with head injury, 40 respondents (75%) have normal pulse frequency. The trauma variable in the other organs of the table was obtained from a total of there are 10 patients (19%) out of the 53 medical records of head injury experienced major trauma. A total of 50 (94%) of respondents suffered head injuries due to traffic accidents. The duration of prehospital time of all respondents (100%) was <3 hours and in 35 cases (66%) non-ambulance vehicle were used to transport the patients.

Table 2: The results of bivariate analysis.

Dependent variable	Independent variable	Median (min-max)	Average ±s.b	P *value*
Patients' outcome	Male	77 (10-97)	67.03±28.22	0.075
	Female	89.5 (11-98)	77.18±27.19	
Patients' outcome	Age		(31.94±18.02)	0.020
Patients' outcome	Gcs (low)	92 (85-98)	92.71±3.92	0.000
	Gcs (moderate)	78 (51-89)	75.54±12.46	
	Gcs (high)	39.5 (10-76)	35.56±21.37	
Patients' outcome	Sbp (<90 mmhg)	14 (11-78)	33.86±28.88	0.001
	Sbp (≥90 mmhg)	87.5 (10-98)	76.93±2.31	
Patients' outcome	Rr		(21.64±2.94)	0.013
Patients' outcome	Pulse		(90.51±14.83)	0.031
Patients' outcome	Iss score		(14.77±15.79)	0.013
Patients' outcome	Injury mechanism(kll)	85.5 (10-98)	71±27.08	0.616
	Injury mechanism (non kll)	92 (11-98)	67±48,59	
Patients' outcome	Length of prehospital (<3hours)	86 (10-98)	71.25±27.98	-
	Length of prehospital (>3hours)	-	-	-
Patients' outcome	Transportation (ambulance)	63.5 (10-97)	57.61±31.98	0.017
	Transportation (non ambulance)	89 (13-98)	78.26±23.18	

Table 2 shows the outcome value of the patient and sex is p = 0.075 (p> 0.05) meaning that there is no significant difference between male and female outcome. Krusakal-wallis test resulted showed the values of minor and moderate data p = 0.000. Minor and major p = 0.000. Moderate and major p = 0.000. Hence, significant differences have been confirmed to exist in the outcomes of patients with minor, moderate and major head injury. Mann-whitney test done to the systolic blood pressure and patients' outcomes showed p value = 0.001 (p <0.05). This suggests that there is a significant difference between the outcome of patients with systolic blood pressure <90mmhg and> 90 mmhg. Spearman correlation test obtained a significance value of 0.013 indicating that the correlation between respiratory frequency and the outcome of patients with is significant. Spearman correlation test showed value of 0.031 significant, indicating that the correlation between pulse and the outcome of patients with head injury is significant. Mann-whitney test done to see the correlation between accident mechanism and the outcome of head-injured patients obtained p value = 0.616 (p> 0.05). This shows that there is no significant difference between the outcome of patients with injury and the mechanisms of injury whether from traffic accidents or non-traffic accidents.

All head-injured patients (100%) received prehospital help within <3 hours. Mann-whitney correlation test done between the types of transportation and the outcome of patients with head injury showed p value = 0.017 (p <0.05). Thus, it can be inferred that a significant difference exists between the outcome of the patient and the types of transportation used (ambulance or non-ambulance).

Table 3: The results of multivariate analysis.

Coefficients[a]					
Model	Unstandardized coefficients		Standardized coefficients		Sig
	B	Std.e	Beta	T	
Constant	116.225	2.943		39.492	0.000
Gcs score	-16.854	1.844	-0.520	-9.139	0.000
Iss score	-0.935	0.101	-0.528	-9.274	0.000

Table 3 presents the most dominant factor seen from the result of linear regression analysis that influences the outcome of head-injured patients. Gcs score was found as the most dominant factor with p value <0.05 and correlation strength of -0. 520.

DISCUSSIONS

1. The correlation between sex and the outcome of patients with head-injury

It can be seen from the results of this research that sex does not have any significant relationship toward the outcome of patients with head injury as the p value was found at p value = 0.075 (p> 0.05). Sex consisted of women and men categories. In this research, men obtained greater percentage than women (31 respondents or 58%). This result goes in line with melo et al (2010)[10] which study concludes that mortality in patients with severe head injury in france had no significant differences, indicating the absence of any meaningful relationship between sex and mortality of patients with severe head injury (p> 0.05).

In addition, siregar and makmur (2017)[11] also found similar result in which the percentage of 46 survivors of head injuries were male (86.8% or 46), 15 (100.0%) survivors were female and 7 (13, 2%) patients who died were male. The result of the analysis shows p> 0.05 at 0.334. Therefore, it can be concluded that there is no significant correlation between sex and the outcome of patients with head injury.

Meaningful statistical differences were not found in this research due to several factors such as driving speed, injury mechanism, whether the patients were drivers or passengers and whether injuries occur to other organs. According to pearce (2008),[12] the anatomy of human's head between men and women is not much different. The anatomy of the head in humans consists of the skull and brain which plays an important role in human's neural system. Hence, no significant correlation has been found in the outcome of patients with head injuries based on their sexes.

2. The correlation between age and the outcome of patients with head-injury

This research found that age significantly correlates with the outcome of patients with head injury as indicated from the value of p value = 0.020 and the correlation coefficient (r) = -0.318. Those value prove that age has a correlation toward the outcome of head injured patients.

In this research, it is found that the number of incidence causing head injuries mostly occurred to people below <55 years (49 patients or 92%). The average age is 31.94 ± 18.02 years. According to depkes (2009),[13] this range of age is included in the category of adolescents and young adults. According to lin., et al (2009),[14] traffic accident appears as the major factor that cause head injuries.

Hartoyo, et al (2011)[15] found a different result where they found that the average age of head-injured patients ranges between 20-40 years (31 patients or 54.4%). The research also found no significant correlation between age and the outcome of head-injured patients. The different result might be due to the in-equal distribution of the patients' age.

3. The correlation between gcs score and the outcome of patients with head-injury

One of indicators that can be used to assess head-injured patients' consciousness is gcs score. In addition, gcs score can also be used to assess patients' clinical condition when the arrive at the emergency unit. Gcs score strongly influences the survival and recuperation of patients with head injuries. Initial gcs scores of patients with injuries usually show poor outcome.[16]

The result of the data analysis showed that there was a significant correlation between gcs scores of patients when they arrived at the emergency unit and their outcomes in rsud bangilpasuruan regency (p = 0.000). The value shows that the lower the gcs score the lower the percentage of survival chance.

Melo et al (2010)[17] in a view about mortality in patients with severe head injury in france, a meaningful correlation between gcs score ≤ 5 and the death of severe head injury (p <0.05) has been confirmed. Gcs score has been known to have a significant correlation and influence on the mortality of head-injured patients. Patients whose gcs scores were around 15 were predicted to have a mortality rate of 1%, whereas gcs 8-12 had higher predicted mortality rate of 5%, and those with gcs 8 had a mortality prediction up to 40%.[18] Those data show that the gcs measurements indirectly indicate the level of brain normal function as the central of the control for all organs in human's body. Any failure in the function of organs might directly impact one's chance of survival. Lower gcs score indicates greater degree of neurological damage in cerebrum and brainstem.[19]

4. The correlation between systole pressure and the outcome of patients with head-injury

The results of this research showed that systolic blood pressure has a significant correlation with the outcome of patients with head injury as shown by p value = 0.001 (p <0.05). The value indicates that the higher the blood pressure the higher the risk of mortality.

The data showed that 13% of patients were brought to the emergency department with hypotension and 30% others with hypoxia. Hypotension is the most common factor among the five strongest factors that affects the outcome of head-injured patients. The patients' hypotension history is often associated with increases in the incidence of morbidity and mortality among patients with head injury. It is fond that 83% of mortality rate in patients with systemic hypotension occurred within 24

hours after admission, compared to the mortality rate of patients without systemic hypotension of around 45%.

Hypotension usually attack head-injured patients due to the loss of blood from systemic injury. Besides, it might also happen because of direct injuries that occur to the cardiovascular reflex center in the medulla oblongata. Hypotension that occurs during the initial phase of resuscitation is significantly associated with death, although the attack is relatively short. One attack of hypotension may double the rate of mortality and increase the morbidity. The increased morbidity from systemic hypotension may result from secondary ischemic injuries from the decreased cerebral perfusion.

5. The correlation between respiratory rate (rr) and the outcome of patients with head-injury
Respiratory rate has been confirmed to share a significant correlation with the outcome of head-injured patients as shown from the value of p value = 0.013 and the correlation coefficient (r) 0.338. Those values indicate that respiratory rate has a significant-low correlation to the outcome of patients with head injury.

Koutsoukou et al., (2015)[20] stated that hypoxia and oxygen saturation lower than 90% are associated with poor outcomes. Neither increase nor decrease in rr beyond the normal range is associated with poor outcomes in patients with head injury. Respiratory rate is a good predictor of the outcome of head-injured patients besides patients' systolic blood pressure.[21]

Several research have shown that decrease in oxygen saturation and tissue perfusion occur within 12-24 hours. The time is the compensatory time required by the body to before complications occur including lung injury that affects oxygen saturation and respiratory rate.

6. The correlation between pulse and the outcome of patients with head-injury
Pulse frequency has been confirmed to have significant correlation with the outcome of head-injured patients as shown by the value of p value = 0.031 and the correlation coefficient (r) 0.297. Those values indicate that pulse frequency has a significant but low correlation towards the outcome of head injured patients.

One of the vital signs that also affect the outcome of head injury patients is the pulse. Poor prognosis is often found in patients whose pulse> 130x / min. Damage in the autoregulation of the brain and cardiovascular system in the brainstem lead to impairment in cardiac output.[22] Different results were obtained among patients > 65 years old, whose function of the body has decreased. Worse outcome often happen in patients> 65 years old whose pulse> 90xminutes.[22]

7. The correlation between injury severity score (iss) and the outcome of patients with head-injury
A significant correlation has been found between the injury severity score (iss) with the outcome of head-injured patients at the emergency unit of *rsud* bangil in pasuruan (p = 0.013). The value indicates that the higher injury severity score (iss) increases the risk of death. The association with trauma in other organs may occur due to disrupted function of vital organs and areas in human anatomy.

Iss instrument is tool that is medically developed to assess the severity of trauma in 6 regions of the limbs, including the head and neck, face, chest, abdomen, extremities and skin.[23] Studies done at the trauma center in germany during 2010-2012 resulted in a finding that head -injured patients with major trauma also have trauma in other organs which negatively affect the outcome of patients with multi-trauma (p <0.05).

According to ehsaei (2014)[24] in patients with major trauma, the higher the severity of the injury, the worse the outcome that seem to occur faster. Iss score > 39 leads to patient mortality within the first 72 hours of hospitalization. Iss score above 70 causes poor prognosis in patients within the first hour of treatment at trauma center. The results of multivariate analysis done in the study showed that iss score significantly correlates to patients' outcomes.

8. The correlation between injury mechanism and the outcome of patients with head-injury
This research found no significant correlation exists between the mechanism of injury and the outcome of patients with head injury in igd rsud bangilpasuruan, p = 0.616 (p> 0.005). In this research, the majority of the causes of head injuries were due to traffic accidents (50 patients or 94%), and the rest occurred due to non-traffic accidents such as falling from height, getting slipped, and bumps (6%). Most of the patients were involved in motorcycle accidents. Head injury due to traffic accidents is the major cause of morbidity and mortality among the society in developing countries. This phenomena occurs because some motorcycle riders do not wear helmets or wearing unstandardized helmets.[25]

Similar results were also revealed by tsao and moore (2010)[26] that the outcome of head injury patients is not determined by the injury mechanism experienced by the patient, instead, it is rather affected by the injury conditions whether the injury occurs due to traffic accident or other causes. Most of the patients in this research had head wounds, bleeding and hematoma. Siregar and makmur (2017)[11] also found similar result, in which no significant relationship has been found between the mechanism of injury and the outcome of head injured-patients, p = 0.493.

9. The correlation between prehospital time and the outcome of patients with head-injury

It is found in this research that the average prehospital time among the patients was <3 hours. According sasmito et al (2017)[27] there is a significant relationship between the immediateness of the arrival time at the hospital and the outcome of head injured patients (p = 0.006). The main principle of pre hospital is to provide quick help and treatment for head injured patients appropriately to improve their head injury outcome. To obtain better outcome, patient's pre-hospital time is of the utmost importance since it is associated with "platinum ten minutes" and "golden period".

Platinum ten minutes is the first treatment given at the scene and during the referral to the nearest medical service,[28] and it also refers to the utilization of the time to give the patients treatment and to prevent any further harm (not increasing the severity of the injury). While the time required for the patient after the trauma until the patient is given the definitive treatment at the patient's health facility according to the conditions and needs of the patient (definitive therapy) is called the golden hours which is the period in which rates of mortality and morbidity can be decreased (1-3 hours).[29]

10. The correlation between the types of transportation and the outcome of patients with head-injury

This research found that the type of transportation used to transport the patients has a significant correlation with the outcome of head-injured patients as shown by the value of p value = 0.017. A significant difference has been confirmed between the use of ambulance and non ambulance and patients' outcome. Thea average triss scores in patients who were carried using non-ambulance transportation were higher (78.26 ± 23.18) than those who were carried by ambulance (57.61 ± 31.98). This result shows that head-injured patients are transported using non-ambulatory transportation are likely to have better outcomes than patients whoare transported using ambulance.

In this research there were more patients who were admitted to hospitals using non ambulance transport (35 patients or 66%). The use of non-ambulance transport allows patients to reach the hospital more quickly, and patients can be immediately treated during the golden hour. According to singh (2007)[30] treatment given to patients within the golden hour after injury reduces the possibility of worse prognosis.

CONCLUSIONS

Significant differences and correlation have been found among various factors including patients' sex, age, gcs score, systolic blood pressure (sbp), respiratory rate, pulse frequency, other organ trauma, and type of transport with the outcome of patients with head injury based on wiedenbach's need for help theory at rsud bangil pasuruan. There was no significant correlation found between injury mechanism and prehospitallength towards the outcome of head-injured patients seen the theory of need for help wiedenbach at the emergency unit of rsud bangil pasuruan.

SUGGESTIONS

It is necessary to improve and develop nurses' ability as the human resources in the hospital by conducting various forms of nursing education, emergency training, and evaluation of medical services in emergency units.

ETHICAL ISSUES

The study was approved by the ethical committee at east java, medicine faculty, universitas brawijaya.

AUTHOR'S CONTRIBUTION

All authors contributed to the study concept, design, data analysis and manuscript preparation.

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