

## THERE IS NO ASSOCIATION BETWEEN SYSTOLIC BLOOD PRESSURE AND MORTALITY IN HEAD TRAUMA PATIENTS

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### ABSTRACT

#### Key Words :

Mortality,  
Systolic Blood  
Pressure,  
Head Trauma,

**Abstract:** Head trauma is a major public health problem and is a major cause of mortality worldwide. In the case of head trauma patients, the mortality is determined by using systolic blood pressure as one of the predictors. This research aims to identify the association between systolic blood pressure and mortality in head trauma patients at Ulin Hospital, Banjarmasin. As a method, nonprobability sampling was used with accidental sampling technique and thirty-eight head trauma patients came to the A&E of Ulin Hospital. The observation sheet was used to record the initial systolic blood pressure measurements as well as the assessment of mortality in head trauma patients within twenty-four hours to find out whether the patient had mortality or not. Based on the data analysis, it showed that there is no association between systolic blood pressure and mortality in head trauma patients at Ulin Hospital. Other risk factors may cause mortality in head trauma patients.

**Abstrak:** Trauma kepala merupakan penyebab utama mortalitas di seluruh dunia dan merupakan masalah kesehatan umum yang sangat besar. Tekanan darah sistolik menjadi salah satu prediktor yang dapat digunakan untuk mengetahui mortalitas pasien trauma kepala. Penelitian ini bertujuan untuk mengetahui hubungan tekanan darah sistolik dengan mortalitas pada pasien trauma kepala di RSUD Ulin Banjarmasin. Penelitian ini menggunakan metode non probability sampling dengan teknik accidental sampling dengan sampel 38 responden trauma kepala yang datang ke IGD RSUD Ulin Banjarmasin. Lembar observasi digunakan untuk mencatat pengukuran tekanan darah sistolik awal pasien trauma kepala yang datang ke IGD RSUD Ulin serta penilaian mortalitas pasien dalam 24 jam untuk mengetahui apakah pasien mengalami mortalitas atau hidup. Hasil analisis data didapatkan bahwa tidak ada hubungan tekanan darah sistolik dengan mortalitas pada pasien trauma kepala di RSUD Ulin Banjarmasin. Hal ini dapat disebabkan oleh faktor risiko lain yang menyebabkan mortalitas pada pasien trauma kepala.

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## INTRODUCTION

Head trauma is a mechanical injury that occurs to the head, either directly or indirectly, which affects the neurological, physical, cognitive, psychosocial, and temporary or permanent functions (ACSC, 2008). Head trauma is a major cause of mortality worldwide and is a major public health problem. Every year, about 1,5 million patients experience mortality and millions more get emergency treatment (Steyeberg, 2008). Surveys conducted showed that 90% out of head trauma cases occurred in developing countries such as Indonesia. Every year, more than 2 million people suffer head trauma and 75,000 of them experience mortality (Saadat and Soori, 2010).

Predicting the incidence of head trauma mortality means there are several risk factors that affect mortality including age, Glasgow Coma Scale (GCS), and respiratory rate (Jasmine, 2014). Data from heart rate, GCS, and systolic blood pressure that is collected regularly can predict early mortality in traumatized adult patients within 24 hours since vital signs first measured (Martin *et al*, 2014).

Systolic blood pressure is a good predictor in predicting the mortality of head trauma patients. It is can be used for both developing and developed countries (Perel, 2012). Systemic change that often occurs in head trauma is the occurrence of hypotension, where systolic blood pressure patients are <90 mmHg. Patients with hypotension treated for 24 hours had a 45% mortality rate than those without hypotension. Hypotension found in early trauma to treatment is a major risk factor that can determine mortality in head trauma patients (Berry *et al*, 2012 and Fuller *et al*, 2014).

A preliminary study that was conducted at Ulin Hospital Banjarmasin

found that there was always a mortality with head trauma. In 2015, the number of head trauma patients was 259 people, of whom 29 had mortality. In 2016, the number of head trauma patients was increased to 290 people, of whom 34 had mortality. By 2017, the number of head trauma patients from January to September was 217 people, of whom 6 had mortality. In the surgical A&E Ulin Hospital, there were 968 people with mild to severe head injuries, 61 of whom had mortality. Therefore, head trauma cases registered in the top ten surgical diseases in 2017. Out of four of patients with mild to severe head trauma. Systolic pressure with an average value of 105 mmHg, where 1 of 4 patients experienced mortality was found in the A&E Ulin Hospital.

Based on the background mentioned above, researchers interested in conducting research on the association between systolic blood pressure and mortality in head trauma patients in Ulin Hospital, Banjarmasin.

## RESEARCH METHOD

The research used nonprobability sampling method with accidental sampling technique in the form of prospective cohort design using accidental sampling technique. 38 respondents of head trauma who come to A&E Ulin Hospital from December 2017 to January 2018 were the sample of the research. The research data were collected from the observation using observation sheet. The sheet was used to record the measurement of early systolic blood pressure of head trauma patients who come to Ulin Hospital. Besides, the sheet was also used to assess patient mortality within 24 hours to determine whether the patient is mortality or life. The researchers analyzed the data by using Statistical Product and Service

Solution (SPSS 17.0) for windows with Fisher Exact test.

## RESULTS AND DISCUSSION

### Characteristics of Respondents

**Table 1.**  
**Distribution of Respondents by Age, Gender, Cause of Head Trauma, and Type of Head Trauma at Ulin Banjarmasin Hospital December 2017 January 2018 (n = 38)**

Respondents' Characteristics	Frequency	Percentage
<b>Age (Year)</b>		
17-25	12	31,6%
26-35	10	26,3%
36-45	5	13,2%
46-55	5	13,2%
56-65	6	15,7%
Total	38	100%
<b>Sex</b>		
Male	23	60,5%
Female	15	39,5%
Total	38	100%
<b>Cause of Head Trauma</b>		
Traffic Accident	37	97,4%
Fall Down	1	2,6%
Total	38	100%
<b>Type of Head Trauma</b>		
Mild	15	39,5%
Moderate	13	34,2%
Severe	10	26,3%
Total	38	100%

Table 1 describes respondent characteristics by age, gender, a cause of head trauma, and type of head trauma. In the age's row in the table, it shows the number of patients in the age of 17-25 are 12 people (31,6%). It is because head trauma patients who come to Ulin Hospital are mostly in early adolescence an age in which a person can drive his

own vehicle without being accompanied by parents and the age of the first time driving a vehicle on the highway. In the age of adolescents, one often ride his vehicle with inadvertent on the highway that increases the risk of occurrence accidents and lack of safety while driving on the highway. This result is in line with Aprilia (2017) study results that most of head trauma sufferers occur in the age range of 12-25. In the table is shown 34 people in total (42,5%) (Aprilia, 2017). This happened due to the age span, which is a productive age that has high hopes in exploring the surrounding world in a community, joy, and current development (Yogatama and Leo, 2013) as well as having a high desire to move but the awareness of safety on the road is still low (Bustan, 2007).

In the sex section of the table, the amount of men is 23 people (60,5%). The work and physical activity that men do tend to be more at risk of accidents than women, for instance, drivers and construction workers. The results of the research are also in accordance with the research result conducted by Aprilia (2017) in Banjarmasin that the sex of most head trauma sufferers were men as many as 53 people (53%) (Aprilia, 2017). It happened since men mostly work outdoors and on the streets. Besides, they are the most users of vehicles on the highway (Damanik *et al*, 2013).

The most common cause of head trauma in this research was traffic accidents which amounted to 37 people (97,4%). This is because the users of motor vehicles, motorcycles, and cars every year are always increasing so that the traffic accidents are also increased. In accordance with the results of research conducted by Hartoyo *et al*, (2012) the cause of head trauma mostly is the traffic accidents as many as 55

people (96,5%) (Hartoyo *et al*, 2012). In the developing countries, the use of motor vehicles has increased rapidly. It is contrast compared to the introduction of the use of safety infrastructure and low public awareness in complying with traffic regulations (Park *et al*, 2008) and the high number of traffic accidents that result in head trauma based on progress science and technology that increasingly produce and market motorcycle and car (Wibowo, 2008).

Type of head trauma that are often experienced by respondents is mild head trauma (39,5%). Head trauma patients who came to A&E Ulin Hospital frequently only suffered blisters on the scalp without any bleeding and did not experience the loss of consciousness. The average cause head trauma patient is a small traffic accident such as avoiding a crash accident that in the result, it caused most respondents experienced mild head trauma. In line with Aprilia (2017), 62 respondents experienced mild head trauma (77,5%) (Aprilia, 2017). Based on mild-to-severe, head trauma is divided into three: mild head trauma with GCS score of 13-15, moderate head trauma with GCS values of 9-12, and severe head trauma with GCS values of 3-8 (Krisanty, 2009).

### Systolic Blood Pressure in Head Trauma Patients

**Table 2.**  
**Systolic Blood Pressure of Head Trauma Patients at Ulin Hospital, Banjarmasin (n=38)**

Systolic Blood Pressure (mmHg)	Frequency	Percentage
Hypotension	1	2,6%
Normotension	7	18,4%
Prehypertension	14	36,9%
Hypertension	16	42,1%
Total	38	100%

Table 2 shows that the highest systolic blood pressure experienced by head trauma patients is hypertension of 16 people (42,1%). Most head trauma patients came to Ulin Hospital in anxiety. The state of anxiety is caused by the pain they feel and the fear of handling that will be given to them such as fear of needles and fear of being scolded by their parents. As an additional information, most head trauma patients are teenagers. This is consistent with the theory that blood pressure is affected by several factors, one of which is anxiety (Potter and Perry, 2010).

In the initial condition of head trauma, the body reflexively attempts to increase blood pressure, in order to maintain the pressure of brain perfusion. If the condition of damage to the brain is increasingly expanded plus more bleeding, then the impact on the failure of the control mechanism of blood pressure. That is when the head trauma patient enters a secondary trauma phase, characterized by a decrease in systolic blood pressure (Werner and Engelhard, 2007).

Based on the research conducted by Manley *et al*, (2012), at the beginning of head trauma, reflexively the body will try to fulfill the need of oxygen, keep the perfusion of brain tissue, and prevent the occurrence of cerebral hypoxia by increasing the number of breath with systolic blood pressure (Manley *et al*, 2012). Similarly, Melo research (2010) explains that hypotension or hypertension in severe head trauma patients is a clear source of secondary brain damage. Hypotension can lead to brain ischemia, while hypertension may exacerbate cerebral (Melo, 2010). Extremely high or too low blood pressure shows a poor outcome and is usually at risk of mortality (Markam *et al*, 2005).

### The Incidence of Mortality in Head Trauma Patients

**Tabel 3.**  
**The Incidence of Mortality in Head Trauma Patients**

Mortality	Frequency	Percentage
Life	33	86.8%
Death	5	13.2%
Total	38	100%

Table 3 shows the incidence of mortality of head trauma survivors was 33 people (86,8%), whereas the mortality rate of patients with head trauma in the state of death was 5 (13,2%). The head trauma patients who died at Ulin Hospital were mostly caused by one or some of the risk factors, including patients traumatized by other organs such as abdominal trauma, high systolic blood pressure of 180 mmHg or low by 70 mmHg, high body temperature of 39,5°C, low GCS value with value 3, rapid pulse of 144/min and rapid breathing of 48/minute or slow by 16/min. The occurrence of mortality in head trauma patients also caused by the quite severe trauma experienced while the patient is unconscious. It was found that head trauma patients who died were mostly classified as severe head trauma. Whereas, patients with mild head trauma, the most patients who came to Ulin Hospital, could be caused by only blisters. Besides, the patient came to a state conscious and able to explain the reason why to experience head trauma. First handling given by health team at Ulin Hospital is good so that mortality rate in the head trauma patient is low.

This result is in line with the results of Rawis *et al* (2016) study that most of the head trauma patients who died were the severe head trauma of 18 people with a percentage of 45% (Rawis *et al*, 2016). This follows the theory that the mortality of a head trauma patient

depends on the severity of the illness (Jennet, 2005).

### The Association between Systolic Blood Pressure and Mortality in Head Trauma Patients in Ulin Hospital, Banjarmasin

Systolic blood pressure and mortality in a head trauma patient in Ulin Hospital, by using Chi-Square test, does not have an association. The research used the independent variable, systolic blood pressure, which was divided into four categories namely hypotension, normotension, prehypertension, and hypertension. The dependent variable, which is mortality, was also used and was divided into two categories namely life and death. In the Chi-Square test, the researchers get cell value >20% and the expected frequency <5, so that the researcher cannot use Chi-Square test and re-grouping into 2 groups with a 2x2 table using Fisher Exact test. When grouped into 2, there are 2 tables to be tested namely normotension and prehypertension with mortality and normotension and hypertension with mortality in the head trauma patient.

**Table 4.**  
**The Association between Systolic Blood Pressure (Normotension and Prehypertension) and Mortality in Head Trauma Patients in Ulin Hospital, Banjarmasin**

Variable	Mortality		N (%)	P Value
	Life N (%)	Death N (%)		
<b>Systolic Blood Pressure</b>				
Normotension	7 (33,3%)	0 (0%)	21 (100%)	1.000
Prehypertension	13 (61,9%)	1 (4,8%)		

Table 4 shows that there is no association between systolic blood pressure (normotension and prehypertension) with mortality in head trauma patients in Ulin Hospital with a significance value of 1.000 which means  $p \text{ value} > \alpha = 0,05$ . 7 people had the systolic blood pressure of normotension and they all were alive. On the other side, 14 people had prehypertension and one of them was having mortality.

**Table 5.**  
**The Association between Systolic Blood Pressure (Normotension and Hypertension) and Mortality in Head Trauma Patients in Ulin Hospital, Banjarmasin**

Variable	Mortality		N (%)	P Value
	Life N (%)	Death N (%)		
<b>Systolic Blood Pressure</b>				
Normotension	7 (30,4%)	0 (0%)	23 (100%)	0,273
Hypertension	12 (52,2%)	4 (17,4%)		

With significance value 0,273 which means  $p \text{ value} > \alpha = 0,05$ , table 5 shows that there is no association between systolic blood pressure (normotension and hypertension) and mortality in head trauma patients in Ulin Hospital. 7 people had the systolic blood pressure of normotension and they all were alive. On the other side, 16 people had hypertension and four of them were having mortality.

From both table 4 and 5, it can be concluded that the cause of the absence of systolic blood pressure relationship with mortality in head trauma patients due to the average type of head trauma experienced by many minor head traumas. 24-hour mortality incidence obtained from 38 patients, it appeared

that 'only' 5 who died while 33 people live. In addition, the time to observe the mortality is only 24 hours. It is explained that moderate and severe head trauma are the highest risk for mortality and most mortality occurs within 48 hours (Rawis *et al*, 2016).

However, the results of this research are not in accordance with the research conducted by Widyaswara *et al*, (2016). With title "Factors Analysis Related to Outcome Patients Head Injury in A&E Prof. Dr. Margono Soekardjo Purwokerto Hospital", the research result of  $p \text{ value} = 0,000$ , where  $p < \alpha = 0,05$ , therefore, systolic blood pressure is related to the outcome of the head trauma patients. This study is a prospective quantitative study with an observational analytic design where the study started from May 15 to June 15, 2016. Also, this research correlates some risk factors from head trauma to the outcome of head trauma patients (Widyaswara *et al*, 2016). In contrast, the results of this research are different from the researchers probably because researchers used the minimum sample regardless of the time period while in the above study using time without specifying the sample.

A study conducted by Süt & Memiş, (2010) on 126 head trauma patients in ICU of Trakya University Hospital found that 63 patients died while in ICU, where 17 patients (27%) of these died in the first 48 hours and 46 patients (73%) died more than 48 hours in ICU (Süt and Memiş, 2010). That was similar to a research conducted by Rawis *et al*. (2016) in which head trauma patients who died more than 48 hours in ICU are more than those who died less than 48 hours (Rawis *et al*, 2016). Once again, the results of this study are different from the researchers and it is probably because the researchers only follow up the patient

during 24 hours of treatment while from some of the above studies follow up patients for 1-7 days of treatment.

In this research, the researchers took only systolic blood pressure of head trauma patients and observed mortality for 24 hours. As explained in AHA 2011, blood pressure is not only systolic but also diastolic (AHA, 2011). Diastolic blood pressure is the amount of blood pressure (below number) which shows the pressure in the arteries when the heart is resting or relaxing (Potter and Perry, 2005). There is a mean arterial pressure (MAP) value between systolic and diastolic blood pressure. Generally, the MAP has a closer value to the diastolic blood pressure value than systolic blood pressure by diastolic blood pressure multiplied by 2, plus systolic blood pressure, and divided by 3 for finding MAP). A study by Rawis *et al.* (2016) found out that mortality rates in severe and moderate head trauma patients were higher than in patients with mild head trauma (Rawis *et al.*, 2016). This is likely due to the general condition of patients with severe and moderate head trauma worse than patients with mild head trauma. From the level of consciousness using GCS measurements, severe head trauma with GCS 3-8 and moderate with GCS 9-12 had a worse level of consciousness compared to patients with mild head trauma with GCS 13-15 (Süt and Memiş, 2010). Severe head trauma patients with GCS 3-8 significant structural and brain metabolic dysfunction are more at risk for secondary brain injury and brain damage (Süt and Memiş, 2010).

Both systolic and diastolic blood pressure are different in Hartoyo *et al* research (2012). The results of their research related to mortality in severe head trauma patients because the researchers used descriptive correlation

with cross-sectional design by looking at the medical record of patients with severe head trauma from November 2010 to October 2011. On the other hand, the research conducted by the researchers were using analytic survey research method with a cohort design or prospective study using mild, moderate, and severe head trauma. Furthermore, from the research results conducted by the researchers, most of the respondents experienced mild head trauma which is likely to cause no association between systolic blood pressure and mortality.

## CONCLUSIONS

From the research on systolic blood pressure relation with mortality in head trauma patients at Ulin Banjarmasin Hospital, it can be concluded that for the distribution of systolic blood pressure, it was found that 1 person (2,6%) of head trauma patients experienced hypotension, 7 people (18,4%) of head trauma patients had normotension, 14 people (36,9%) of head trauma patients had prehypertension, and 16 people (42,1%) of head trauma patients had hypertension. For the mortality incidence distribution, 33 people (86,6%) of patients with head trauma are alive and 5 (13,2%) of patients with head trauma died. There was no significant association between systolic blood pressure (normotension and prehypertension) and mortality in head trauma patients in Ulin Hospital with p-value value of 1,000. The same result was applied to the association between systolic blood pressure (normotension and hypertension) and mortality in the head trauma patients in Ulin Hospital with p-value equal to 0,273.

Suggestions in this study should be for nurses and health institutions in providing professional health services for head trauma patients. It is expected

for them to have more emphasis on patients with severe head trauma since the average patient who experienced mortality is a severe head injury. In the future, the researchers hope that the action can reduce mortality in head trauma patients. As for head trauma patients, they are expected to pay more attention to themselves to avoid head trauma that can cause mortality. Further research can be done with the same design but with a > 24-hour mortality timing and a sample that focuses on moderate and severe head trauma. Also, further research is expected to control the factors that affect blood pressure, namely head trauma patients who experience stress. This may also be done by different designs e.g. experimental methods. Hopefully, there is a research focuses on diastolic blood pressure mortality, systolic and diastolic blood pressure mortality, or MAP with mortality in head-traumatic patients.

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