

Volume: 11  
Issue: 04  
Years: 2021

Review Paper

## Improved Hemodynamic Status of Head Injured Patients in the Emergency Unit (ER): Literature Review

Dadi Hamdani<sup>1</sup>, Fida Husain<sup>2</sup>

<sup>1</sup>Keperawatan STIKes Muhammadiyah Ciamis

<sup>2</sup>Keperawatan Universitas 'Aisyiyah Surakarta

Jl. K.H. Ahmad Dahlan No.20, Ciamis, Kec. Ciamis, Kabupaten Ciamis, Jawa Barat 46216

Email: dadi\_ham@yahoo.co.id



Editor: ks

Received: 01/11/2021

Accepted: 26/12/2021

Published: 30/12/2021

Available Article :

10.33221/jiiki.v11i03.1372

Copyright : ©2021 This article has open access and is distributable under the terms of the Creative Commons Attribution License, which permits un- restricted use, distribution and reproduc- tion in any medium, provided the name of the author and the original source are included. This work is licensed under a **Creative Commons Attribution-Share Alike 4.0 International License**

Conflict of interest statement : The author has received funding from STIKes Muhammadiyah Ciamis. In this regard, I certify as the author that I have fully disclosed this interest to the Indonesian Nursing Science Journal, and I have an approved plan to manage any potential conflicts arising from (the involvement).

Funding : This research was fully funded by STIKes Muhammadiyah Ciami.

### Introduction

Head injury is a severe community problem that can lead to disability and even death if not given proper and fast management. Head injury is the most common head trauma globally as an epidemic in the life of vehicle users.<sup>1</sup> Head injuries occur in the world every year as many as 500,000 cases out of

### Abstrak

**Background:** Head injury is a serious problem that can lead to death and even death. Handling of head injuries starts from protecting the brain with blood flow to the brain so that hypoxia or brain ischemia does not occur. Hemodynamics is the result of measuring systolic and diastolic blood pressure, pulse rate, and respiratory rate.

**Objectives:** This literature review aims to find out what interventions can be done when there is an increase in hemodynamic status in head injury patients

**Methods:** This database search was conducted by searching on google scholars with the keywords head injury, hemodynamics. The inclusion criteria of this literature review are articles that were researched within the last 5 years with the year published 2015-2020, full text, using the Indonesian language, the article that used is the article.

**Results:** Interventions that can be done when there is an increase in hemodynamic status in head injury patients are giving oxygen and increasing 30°, giving oxygen through a simple mask and head position 30°, giving head-up position 30° compared to 15° position, giving nasal prong oxygenation therapy and murotal therapy Al-Qur'an for 30 minutes 3 times/day.

**Conclusion:** All interventions resulting from this literature review were in the form of giving oxygen and increasing the head 30°, giving oxygen through a simple mask and head position 30°, giving the head position 30° compared to 15° position, giving nasal branch oxygenation therapy, and murotal Al-Qur'an therapy for 30 minutes 3 times/day.

**Keywords:** head injury, hypoxia, ischemia, hemodynamics, literature review.

10% die before arriving at the hospital and patients who arrive at the hospital, and 80% are classified as minor head injuries, 10% including moderate head injury, 10% severe head injury.<sup>2</sup> WHO, 2004 The highest Case Fatality Rate (CFR) of injuries due to traffic accidents was found in several Latin American countries (41.7%), South Korea (21, 9%). Traffic accidents with head injuries are common in developing countries such as Indonesia, recorded from the data of the Indonesian National Police in 2011 reached 108,696 the number of accidents with 31,195 deaths, 32,285 suffered severe injuries, and 55.1% suffered head injuries. Head injury ranks as the second most common disease in hospitals in Indonesia, which causes death with a Case Fatality Rate (CFR 4.37%).<sup>3</sup>

Head injury is a brain disorder and is not a degenerative or congenital process that causes cognitive, physical, and psychosocial functions to be impaired. Head injury can be defined as a complex pathophysiological process that affects the brain caused by biomechanical forces. (Glow Coma Scale) which consists of 15 points. Suwandewi's research in 2017 explained that the brain is a vital organ for all body activities and functions because there are various control centres such as physical, intellectual, emotional, social, and skill control.<sup>4</sup> The brain can be damaged caused by trauma, or known as head injury, and can be caused by brain ischemia, resulting in decreased cerebral blood flow causing irreversible damage.<sup>5,10</sup> Brain protection can be achieved by freeing the airway and vital oxygenation. Hemodynamics is the result of measuring systolic and diastolic blood pressure, pulse rate, and respiratory rate. Complications of head injury include epidural haemorrhage, subdural haemorrhage, subarachnoid haemorrhage, intraventricular haemorrhage, and vascular malformations, in addition to causing death threats, hemodynamic and respiratory instability.<sup>6</sup>

Handling head injuries starts from protecting the brain by increasing blood flow to the brain so that hypoxia or brain ischemia does not occur. Suwandewi's research in 2017 explained that brain protection using oxygenation using a simple mask and a 30° head position with an elevation position could function for position changes to increase blood flow to the brain and prevent an increase in ICP to prevent brain ischemia and affect the level of consciousness in head injury patients Moderate.<sup>4</sup> Handling head injuries is also explained by the Ginting study in 2020 that patients with head injuries require oxygenation and 30° head elevation to increase awareness and reduce pain to prevent hypoxia in the brain.<sup>2</sup> This study is supported by Pawestri's 2019 study that the head position is 30° more effective than the 15° position in patients with head injuries because it can facilitate venous drainage from the head so that the head condition is stable.<sup>7</sup>

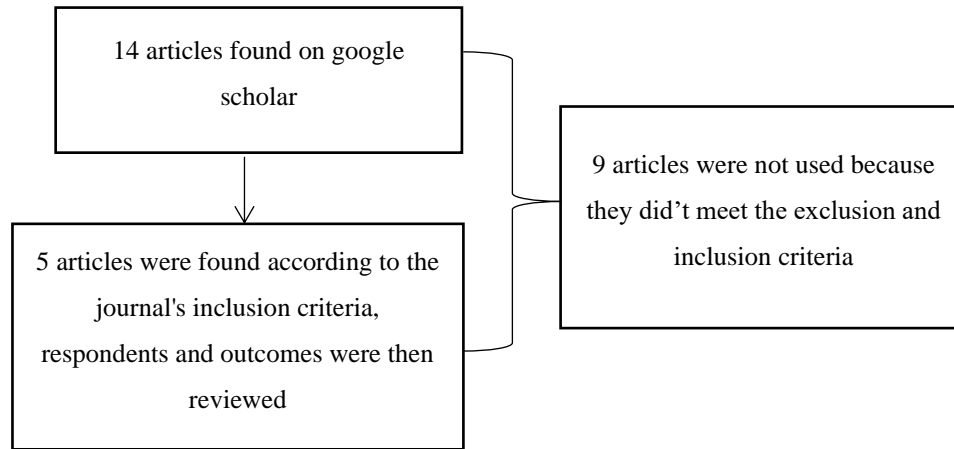
Literature review Suwandewi's previous<sup>4</sup> literature review explained that the administration of oxygen therapy with a simple mask and a 30° head position affected changes in the level of consciousness of moderate head injury patients; Pawestri's study<sup>7</sup> explained that a 30° head position was more effective for head injury patients, Widaryati's study<sup>6</sup> also explained that marital therapy could affect hemodynamics (blood pressure, pulse, and respiration) so that a literature review is needed to find out what interventions can be done when there is an increase in hemodynamic status in head injury patients. The purpose of this literature review is to find out what interventions can be done when there is an increase in hemodynamic status in head injury patients.

## Methods

This database search was conducted by searching on Google Scholar with a head injury, hemodynamics, head elevation, oxygen therapy. This literature review has inclusion criteria and exclusion criteria. The inclusion criteria of this literature review are articles published within the last five years with the year published 2015-2020, full text, using Indonesian, the articles used are experimental. Participants' criteria were patients with head injuries. The exclusion criteria for this study were articles whose contents were incomplete, not in the emergency department, and published before 2015. The study used PICO (Population, Intervention, Comparator, Outcome) to explain the finding of the study in Table 1. The analysis results that will be presented are the title of the article and the researcher, the type of research, research methods, and research results.

## Results

The search results for articles were 14 articles, analyzed as many as five articles according to the inclusion and exclusion criteria presented in a chart.



**Chart 1.** Article search flow

Respondents in this study were specified in patients with head injuries. The outcome of this article is to find out various interventions to improve hemodynamic status in head injury patients.

### Hemodynamic Status Improvement Interventions for Head Injury Patients

The results of a review of data from journals or articles that interventions that affect the improvement of hemodynamic status in head injury patients are giving oxygen and 30° head elevation, giving oxygen with a simple mask and head position 30°, the effectiveness of giving the head-up position 15° and 30°, giving nasal prong oxygenation, Al-Qur'an murotal therapy is summarized in table 1, namely:

**Tabel 1.** Data Extraction Results

Author	Design	Sample	Intervention	Instruments	Results
(Ginting <i>et al.</i> , 2020) <sup>2</sup>	Pre-eksperimen (one group pretest posttest design)	All head injury patients who were hospitalized at Grandmed Lubuk Pakam Hospital from September 2018 to March 2019 totalling 80 people	Administer oxygen and head elevation 30°	GCS assessment observation sheet	<ol style="list-style-type: none"> <li>1. The average value of the level of consciousness before oxygen administration and head elevation was 30o in moderate head injury patients was 10 people, namely 10.10 at a moderate level of consciousness</li> <li>2. The average value of the level of consciousness after giving oxygen and 30° head elevation in moderate head injury patients was 12.90 at a moderate level</li> </ol>

					3. There is a significant effect on the level of consciousness in moderate head injury patients (p-value 0.000)
<b>(Suwandewi, 2017)<sup>4</sup></b>	Pretest posttest control design	There were 30 respondents with a moderate head injury who were treated at the Ulin Hospital in Banjarmasin	Administration of oxygen through a simple mask and head position 30o	GCS assessment observation sheet	<ol style="list-style-type: none"> <li>1. The average GCS value before the intervention of giving oxygen through a simple mask and head position 30o is 10 with a standard deviation of 1.145</li> <li>2. The average GCS value after the intervention of giving oxygen through a simple mask and head position 30o is 11.07 with a standard deviation of 2.766</li> <li>3. There is an effect of giving oxygen through a simple mask and 30o head position on changes in the level of consciousness with a p-value of 0.009</li> </ol>
<b>(Pawestri, et al., 2019)<sup>7</sup></b>	Quasi Eksperimental with pretest and post-test two design group	Head injury patient at RSUD Dr R. Soedarsono Pasuruan totaled 34 respondents	The effectiveness of giving the head-up position 15° and 30°	Observation sheet	<ol style="list-style-type: none"> <li>1. The mean arterial pressure in patients with head injuries before being given a 15° position has increased, but two hours after being given a 15° position, it has decreased</li> <li>2. The mean arterial pressure in patients with head injuries before being given a 30° position has increased, but two hours after being given a 30° position, it has decreased.</li> </ol>

					<ol style="list-style-type: none"> <li>3. There is an effect of giving a 15° position to the Mean Arterial Pressure in patients with head injuries</li> <li>4. There is an effect of giving a 30° position to the Mean Arterial Pressure in patients with head injuries.</li> <li>5. There is a significant difference in the effect between the head-up position 15° and 30° on the Mean Arterial Pressure with the result <math>p=0.02</math> or <math>p&lt;\alpha=0.05</math></li> </ol>
<b>(Takatelide, et al., 2017)<sup>8</sup></b>	Quasi eksperimen with Time Series	Commotio cerebri head injury (mild to moderate head injury) who received treatment at the ER Prof. RSUP. dr. R. D. Kanduo Manado as many as 16 respondents	Administration of nasal prong oxygenation therapy	An instrument for measuring saturation values using a pulse oximeter  The instrument for collecting data on oxygen saturation values is in the form of an observation sheet	There is an effect of nasal prong oxygen therapy on changes in oxygen saturation of head-injured patients with a p-value = 0.005
<b>(Widaryati, 2016)<sup>6</sup></b>	<i>One group pre-test post-test</i>	Patients diagnosed with a head injury in the ICU room at PKU Muhammadiyah Yogyakarta Hospital amounted to 12 respondents	Al-Quran murotal therapy for 30 minutes 3 times a day	Observation sheet	<ol style="list-style-type: none"> <li>1. There is an effect of Al-Qur'an murotal therapy on GCS values in head injury patients at PKU Muhammadiyah Hospital Yogyakarta</li> <li>2. There is no effect of Al-Qur'an murotal therapy on pulse frequency, respiration, systolic, diastolic blood pressure</li> </ol>

## Discussion

Based on research by Suwandewi<sup>4</sup> in 2017, it was found that the brain is a very vital organ for all body activities and functions; the brain can be damaged caused by trauma or known as head injury and can be caused by brain ischemia, namely hemodynamic disorders that cause a decrease in cerebral blood flow to the brain. A level that causes irreversible damage, brain protection can be done by freeing the airway and intense oxygenation. Widaryati's research (2016) also explains that murotal therapy can affect hemodynamics (blood pressure, pulse, and respiration) and level of consciousness because of reading the Qur'an with a regular rhythm, no striking changes, low tone, and 60-70 tempo so that the same with music therapy, music or Al-Qur'an murotal therapy can have a tremendous effect in providing emotional effects and touching the level of physical awareness that can have a neuroprotective effect or prevent damage to brain cells. Hemodynamics is the result of measuring systolic and diastolic blood pressure, pulse rate, and respiratory rate.<sup>6,9</sup>

The hemodynamic function is to circulate clean blood that contains lots of oxygen and nutrients to produce the energy needed by vital and non-vital organs of the body and to transport metabolic wastes to the venous system. Hemodynamics is said to be good if the blood volume/component is sufficient, cardiac contractility is good, and systemic vascular resistance is good so that all organs of the body can function properly.<sup>9</sup> Suwandewi's research (2017) explains that there is an effect of giving simple oxygen masks and head position 30° to changes in GCS level of consciousness with a value of value  $<0.05$ , brain protection through oxygenation using a simple mask and head position 30° with an elevation position which serves to change a position to increase blood flow to the brain and prevent an increase in ICP to prevent brain ischemia if the head elevation position is more than 30° there can be a decrease in cerebral perfusion pressure and worsen cerebral ischemia.<sup>4</sup> In line with the research of Pawestri<sup>7</sup> (2019) explaining that the 30° head position is more effective than the 15° position in patients with head injuries as evidenced by the Man Whitney U-Test test with a value of = 0.00. The 30° position can increase venous drainage from the head, and elevation of the head can cause a decrease in systemic blood pressure and make blood flow to the brain more stable. The 15° and 30° positions are interventions that are often carried out by nurses to control the increase in ICP and improve hemodynamic parameters. Hemodynamic disorders that can cause death, one of which is brain ischemia, can be protected by freeing the airway and giving oxygenation; nasal prong oxygenation therapy can restore oxygen saturation from moderate to severe hypoxia to mild-moderate hypoxia and mild-moderate hypoxia to severe hypoxia. Normal is significantly proven by the results of the average oxygen saturation in the first 10 minutes and the second 10 minutes being the same, namely value = 0.0008.<sup>8</sup>

Hemodynamic changes are more common in changes in blood pressure and respiratory rate. Changes in the hemodynamic status score in head injury patients can be influenced by the speed in getting treatment, the severity of the head injury, and the speed at which the patient is transported to the medical installation. Changes in hemodynamic scores are more common in changes in blood pressure response and respiratory rate. The severity of the severe head injury supported by the delay in the treatment given can result in a decrease in hemodynamic status scores after 3 hours of observation.<sup>11</sup> Arterial hypotension at the initial phase of head injury is a key issue associated with a poor prognosis at 6 months. The occurrence of episodes of arterial hypotension (systolic blood pressure  $< 90$  mmHg) for at least 5 minutes was associated with a significant increase in neurological morbidity and mortality. The 2014 French Guidelines on hemorrhagic shock recommended maintaining a mean arterial pressure  $\geq 80$  mmHg in severe head injury patients. Hypoxemia occurs in approximately 20% of patients with a head injury. It is associated with increased mortality and aggravated neurological outcome. The presence of hypoxia was significantly associated with poor neurological outcomes at 6 months. Furthermore, the duration of hypoxemic episodes ( $\text{SaO}_2 \leq 90\%$ ) is an important predictor of mortality. The association of arterial hypotension and hypoxemia appears to be particularly deleterious with a 75% mortality rate. Protocols on the detection and correction of these secondary insults are associated with an improvement of the outcome of brain-injured patients. A retrospective study comparing the

before-after implementation of protocols focused on intracranial pressure monitoring and the prevention of secondary insults found a significant reduction in mortality after such implementation.<sup>12</sup>

The priority in a head injury patient must always be to secure, maintain, and protect a clear airway. Remove secretions and foreign bodies by manual extraction or suction, giving oxygen by mask (10–12 l/min). The adequacy of ventilation can be assessed clinically and by arterial blood gas analysis. Pulse oximetry is valuable for indirect measurement of how well the patient is being oxygenated. The patient should be positioned properly with the neck in a neutral position and the head end of the bed elevated to 30°. This facilitates cerebral venous drainage. The head end of the bed should be elevated for patients with CSF, rhinorrhea, and otorrhea. Rigid cervical collars should be loosened or removed to decrease ICP.<sup>13</sup> The management of the severely brain-injured patient requires a systematic approach focused on the avoidance of secondary injury, including hypotension, hypoxia, and hypoglycemia. Most interventions to prevent secondary injury can be implemented at all facility levels.<sup>14,15</sup>

### Conclusion

This literature review found that interventions that can be done when there is an increase in hemodynamic status in head injury patients are giving oxygen and head elevation 30°, giving oxygen through a simple mask and head position 30°, giving head-up position 30° compared to 15° position, giving therapy nasal prong oxygenation and murotal Al-Qur'an therapy for 30 minutes 3 times/day.

### Conflict of Interest Declaration

The author has received funding from STIKes Muhammadiyah Ciamis. In this regard, I certify as the author that I have fully disclosed this interest to the Indonesian Nursing Science Journal, and I have an approved plan to manage any potential conflicts arising from (the involvement).

### Acknowledge

Thanks to STIKes Muhammadiyah Ciamis

### Funding

This research was fully funded by STIKes Muhammadiyah Ciamis.

### References

1. Pramono YS, Mahmudah R. Faktor-Faktor yang Berhubungan dengan Ketepatan Perawat dalam Pemberian Terapi Oksigen pada Pasien Cedera Kepala Sedang di Ruang Bedah RSUD Kabupaten Tanah Bumbu. *Tunas-Tunas Ris Kesehat.* 2019;9(November):325–9.
2. Ginting LR, Sitepu K, Ginting RA. Pengaruh Pemberian Oksigen Dan Elevasi Kepala 30° Terhadap Tingkat Kesadaran Pada Pasien Cedera Kepala Sedang. *J Keperawatan Dan Fisioter.* 2020;2(2):102–12.
3. Depkes RI. *Hospital Preparedness for Emergencies and Disaster (HOPE)*. Jakarta: Direktorat Jenderal Bina Pelayanan Medik; 2007.
4. Suwandewi A, , Dyah Yarlitasari S. Pengaruh Pemberian Oksigen Melalui Masker Sederhana dan Posisi Kepala 30° Terhadap Perubahan Tingkat Kesadaran Pada Pasien Cedera Kepala Sedang Di RSUD Ulin Banjarmasin. *J Keperawatan Suaka Insa [Internet]*. 2016;1(2):1–9. Available from: <http://journal.stikessuakainsan.ac.id/index.php/jksi/article/view/27>
5. Husain F, Purnamasari AO, Istiqomah AR, Putri AL. Management Keperawatan Sesak Nafas pada Pasien Asma di Unit Gawat Darurat : Literature Review. *Aisyiyah Surakarta J Nurs [Internet]*. 2020;1(1):1–10. Available from: <http://jurnal.aiska-university.ac.id/index.php/ASJN/article/view/648>
6. Widaryati W. Pengaruh terapi murotal Al Qur'an terhadap hemodinamik dan GCS pasien cedera kepala. *J Kebidanan dan Keperawatan Aisyiyah.* 2018;12(1):77–83.
7. Pawestri dian widhi, Supono, Mustayah. Head up 30 derajat untuk memperbaiki mean arterial pressure pada pasien cidera kepala. *Pros Semin Nas.* 2019;2007:7–19.
8. Takatelide F, Kumaat L, Malara R. Pengaruh Terapi Oksigenasi Nasal Prong Terhadap Perubahan Saturasi Oksigen Pasien Cedera Kepala Di Instalasi Gawat Darurat Rsup Prof. Dr. R. D. Kandou Manado. *J*

- Keperawatan UNSRAT. 2017;5(1):111716.
9. Robet S. Buku Ajar Pemantauan Hemodinamik Pasien. Jakarta: UKI Press; 2020.
  10. Michael R. Pinsky. Hemodynamic Monitoring. Paris; 2019.
  11. Saputro SD, Afni ACN, Sani FN. Hubungan waktu tempuh dengan status hemodinamik pada pasien cedera kepala. *J Keperawatan*. 2021;13(1):213–26.
  12. Geeraerts T, Velly L, Abdennour L, Asehnoune K, Audibert G, Bouzat P, et al. Management of severe traumatic brain injury (first 24 hours). *Anaesth Crit Care Pain Med*. 2018;37(2):171–86.
  13. Varghese R, Chakrabarty J, Menon G. Nursing management of adults with severe traumatic brain injury: A narrative review. *Indian J Crit Care Med*. 2017;21(10):684–97.
  14. Dixon J, Comstock G, Whitfield J, Richards D, Burkholder TW, Leifer N, et al. Emergency department management of traumatic brain injuries: A resource tiered review. *African J Emerg Med [Internet]*. 2020;10(3):159–66. Available from: <https://doi.org/10.1016/j.afjem.2020.05.006>
  15. Dwiyanto, Yusup, et al. "Phase I Cardiac Rehabilitation In Patients With Coronary Heart Disease." *STRADA Jurnal Ilmiah Kesehatan* 10.1 (2021): 1311-1319.