Journal of Islamic Nursing, 2024, 9(1), 24-30
DOI : https://doi.org/10.24252/join.v9i1.46568
Received April 2024, Revised August 2024, Accepted August 2024, Published August 2024

pISSN 2528-2549; eISSN 2545127

EFFECT OF 30° HEAD LEVEL POSITION INTERVENTION IN A PATIENT WITH INEFECTIVE CEREBRAL PERFUSION: A CASE STUDY

Vica Cahya Ningrum[1] Maria Komariah[1] Rian Hara Permana[1]
[1]Faculty Of Nursing, Padjadjaran University, Bandung, Indonesia
*E-mail: vica18001@mail.unpad.ac.id

Abstract

Meningitis is an infectious disease affecting the membranes surrounding the brain and spinal cord, often presenting with fever, headache, and stiff neck. Effective nursing interventions are crucial for managing the symptoms and improving patient outcomes. This case study examines the impact of positioning a patient with ineffective cerebral perfusion in a 30° semi-Fowler position. The research adopts a case study design using a nursing process approach, which involves monitoring vital signs, respiratory status, neck stiffness, and administering pharmacological treatments in collaboration with healthcare providers. Significant improvements were observed following the intervention. By the fifth day, the patient's consciousness had improved to a Glasgow Coma Scale (GCS) score of 15, indicating a state of compos mentis, with no confusion, headaches, or fever. These findings suggest that the 30° semi-Fowler position can effectively alleviate symptoms and improve cerebral perfusion in patients with meningitis. The analysis indicated a partial resolution of nursing problems, with plans to maintain the patient's hemodynamic status and continue appropriate drug therapy for optimal recovery. The study highlights the importance of proper patient positioning and collaborative care in managing meningitis and improving patient outcomes

Keywords*: Meningitis, Nursing Care, Semi Fowler Position, Consciousness Status*

Introduction

Meningitis is a global public health problem. In general, meningitis is an infectious disease that occurs in the lining of the brain and spinal cord with symptoms such as fever, headache, and stiff neck. Viruses, bacteria, fungi, and parasites cause meningitis (CDC, 2019). Globally, it is estimated that 500,000 cases are recorded with 50,000 deaths each year (Borrow, 2017). WHO reported that up to October 2018, there were 19,135 suspected cases of meningitis with 1,398 deaths along the meningitis belt (Case Fatality Rate/CFR 7.3%).

Meningitis is generally caused by viruses and bacteria, but rickettsia, fungi, worms, and protozoa can also cause meningitis. In Indonesia, there are efforts to detect suspected meningitis in the community, namely by using the Early Alert and Response System (SKDR). SKDR data for the last 3 years states that the number of suspected meningitis cases in 2015 was 339 cases, in 2016 there were 279 cases, and in 2017 there were 353 cases (RI Ministry of Health, 2019).

Haemophilus influenzae type B (Hib) and Streptococcus pneumoniae are organisms that cause meningitis in children (Alam, 2016). In immunocompromised adults, Streptococcus pneumoniae and Neisseria meningitidis are the main causes of bacterial meningitis, both bacteria can colonize the nasopharynx and invade the nasopharyngeal blood-brain barrier (Meisadona 2015). Meningitis is grouped into two groups based on changes that occur in brain fluid, namely serous meningitis and purulent meningitis. An increase in the number of cells and proteins accompanied by clear cerebrospinal fluid is a sign of serous meningitis. Viruses and tuberculosis are the most common causes of serous meningitis. Purulent meningitis is acute meningitis that is not caused by specific bacteria or viruses and produces pus as an exudate. Meningococcal meningitis is the most common purulent meningitis (Markam, 1992 in Maisuri, 2021).

Symptoms of meningitis are generally characterized by fever, lethargy, vomiting, and seizures and in certain cases can cause loss of consciousness and lead to coma. Complications of meningitis include increased intracranial pressure, hydrocephalus, cerebral infarction, brain abscess, and seizures (Ratniasih, 2017). Management that can be given to clients with meningitis includes pharmacological and non-pharmacological. In pharmacological management, intravenous administration of broad-spectrum antibiotics is the main thing in the treatment of meningitis. In this case, antibiotics play

a deadly and inhibitory role by penetrating the cerebrospinal fluid (CSS). Empiric antibiotics, third-generation cephalosporins, namely cefotaxime and ceftriaxone, and carbapenems are commonly used in the treatment of meningitis.

The treatment of meningitis can be supported by non-pharmacological therapy, namely by monitoring vital signs regularly because meningitis patients are usually found to experience Cheyne-Stokes breathing patterns, administering oxygen, 30o semi-fowler head position to increase oxygen and circulation to the brain, thereby helping to increase consciousness, administering intravenous fluids according to indications, and reducing body temperature with warm compresses (Rossetyowati et al., 2021). Management of the 30 semi-fowler head position technique or lying with the head at 30 degrees is a non-pharmacological therapy that is easy to apply and quite effective in increasing oxygen to the brain, increasing consciousness, and increasing perfusion of brain tissue in meningitis sufferers (Wahidin, Ngabdi Supraptini, 2020). The act of positioning the head upright at 30 degrees does not cause side effects and it is known that this intervention can be applied independently by the patient's family by raising the patient's bed as high as 30 degrees.

Nurses are providers of health services and play an important role in promotive, preventive, curative, and rehabilitative aspects in patients with serous meningitis as an effort to prevent further complications such as hydrocephalus, cerebral infarction, septic shock, cranial nerve deficits, brain abscesses, encephalitis, intellectual deficits, and intracranial enhancement. Therefore, as an effort to improve the condition of patients with serous meningitis, appropriate management is needed by medical personnel including nurses who provide holistic nursing care, one of which is by applying the 30-degree semi-fowler position technique to the patient. In previous research there was a case study that discussed the 30-degree semi-fowler position in meningitis patients, however, the progress of the implementation carried out was not explained from day to day, so researchers were interested in finding out more clearly the daily progress of the implementation carried out over 5 day.

One of the serious meningitis patients is Mr. R, who is being treated in the internal medicine room at a Bandung hospital and is in a state of decreased consciousness. Therefore, a nursing care approach is needed starting from the assessment, intervention, implementation, to evaluation stages to resolve complaints felt by patients, so that the hope is that patients can return to prosperity. Based on the description of the phenomenon above, researchers are interested in conducting a case study regarding 30-degree semi-Fowler position intervention in patients with ineffective cerebral perfusion.

Methods

The research method used is descriptive in the form of a case study. A case study is a research design that includes an in-depth study of a focused research unit such as a client, family, group, or community (Nursalam, 2016). This case study aims to provide an overview of 30-degree semi-Fowler position intervention in patients with ineffective cerebral perfusion. The subjects of this research were clients with meningitis health problems which were then managed in detail and depth.

In this case study, the data analysis used is a nursing process approach model consisting of the stages of nursing assessment, analysis of problem formulation and nursing diagnosis, intervention, implementation, evaluation, and nursing documentation. Data collection is carried out through observation and interviews with patients and families, then completed by carrying out physical examinations on patients. The assessment instrument used a medical-surgical patient assessment questionnaire from the Faculty of Nursing, Padjadjaran University. Nursing implementation is carried out for 5 hours every day for 5 days of treatment.

The ethical principle that must be considered in this case study is informed consent. Informed consent is a form of agreement with the family to accept the procedure after obtaining complete information from health professionals, including the risks of the procedure and the facts related to the procedure. Previously, participants were given an explanation in advance about what would be asked, how the data would be used, what actions would be taken, what the benefits would be, what the risks would be, and what might happen (Suprajitno, 2016). All participants' names in this study were given codes/initials that cannot be used to identify the participant's identity. This Study was approved by research ethic commitee of padjdjaran university No. 556/UN6.C1.3.2/KEPK/PN/2023.

Results

Based on the results of the study in October, the following data was obtained. The patient is named Mr. R, male gender, patient age 31 years. The patient was medically diagnosed as having Serous Meningitis ec TB gr 2. The patient came with

complaints of headache accompanied by chills and fever, there was vomiting and occasional coughing. When the patient was first admitted, he was still conscious but rambling, he had had headaches that had been intermittent for 5 months and felt worse in October, so the patient and his family decided to go to the hospital. Headaches are felt in the morning and have been getting worse lately, headaches on a scale of 7 (1-10).

Table 1 Nursing Diagnosis according to Indonesian Nursing Diagnosis Standards (SDKI)

Data Analyze	Etiology	Diagnosis
Subjective: - Objective: - The patient appeared weak and decreased consciousness with a GCS of 9 (E3M4V2). - Blood pressure: 113/64 mmHg - MAP: 79 - Respiration: 30 x/minute - Pulse: 104x/minute - The client experiences stiff neck. - Upper extremity muscle strength is 3/3 and lower extremity muscle strength is 1/1 - Leukocytes increased to 12,370 U/L	Mycobacterium tuberculosis enters the meninges ↓ Adrenal Damage ↓ Collapsed blood vessels ↓ Cerebral hypoperfusion ↓ Oxygen in the brain decreases ↓ Cerebral perfusion is ineffective	Cerebral perfusion is ineffective (D.0017)

Tabel 2. Monitoring vital sign

Day	Day -1	Day -2	Day -3	Day -4	Day -5
BP	113/64	125/80	120/76	113/64	115/70
MAP	79	95	91	80	85
HR	104	100	103	96	93
RR	30	24	24	23	22
Temp	37	37,6	37,3	37,3	37
SpO2	99	99	99	99	99

Currently, the patient experiences decreased consciousness and responds to sound stimuli. No fever but chills in the morning. The patient had an NGT installed and a 3 lpm nasal cannula. Experiencing neck stiffness which is characterized by Mr. R having difficulty moving his neck so he always sleeps on his back. Mr. R has no family history of illness and no family members experience the same health problems as Mr. R. The results of the physical examination showed that the patient's general condition was neatly dressed, weak, and had decreased consciousness. The results of the vital signs examination were blood pressure 113/64 mmHg, MAP 79, RR 30x/minute, HR 104x/minute, SpO2 99%, and temperature 37°C.

The results of the physical examination focused on the Musculoskeletal and Neurological systems, the Musculoskeletal system showed upper extremity muscle strength 3/3 and lower extremity muscle strength 1/1, Delirium Patient with GCS 9 (E3M4V2). The patient's neurological system opens his eyes when called upon, avoids painful stimuli, and occasionally opens his eyes slightly while groaning. The patient's hearing functions normally because the patient can still respond when someone whispers into his ear by moving his fingertips. When it can be assessed for neck stiffness, the patient is stiff and has difficulty moving his neck. The upper extremity had an infusion of 0.9% NaCl 20 tpm in the left hand. Then the results of supporting examinations showed that the leukocyte value had increased, namely 12,370 U/L, as seen from the results of laboratory examinations and radiology results showing the impression of suspected TB meningitis.

The data from the assessment was analyzed, so that a formulation of the patient's nursing problem was obtained, namely ineffective cerebral perfusion. The data obtained to confirm the diagnosis of ineffective cerebral perfusion include blood pressure 113/64 mmHg, MAP 79, RR 30x/minute, and HR 104x/minute, the client appears to have decreased consciousness and experiences a stiff neck. The headache is felt to be severe and hampers daily activities and activities so nursing action is needed to improve the patient's condition.
Management plans to overcome the problem of ineffective cerebral perfusion nursing is monitoring confusion, changes in thinking, complaints of dizziness, monitoring vital signs, monitoring respiratory status, recording patient changes to stimulus, monitoring temperature and leukocyte count, periodically checking for stiff neck and collaboration in administering pharmacology such as antibiotics and so on. Another intervention that can be given is positioning the patient at a 30° semi-Fowler position so that oxygen flows smoothly to the brain, thus helping to increase awareness among meningitis sufferers.

Nursing implementation is carried out for 5 hours every day. Nursing actions taken include monitoring vital signs, monitoring respiratory status, periodically checking for neck stiffness, and collaborating in administering pharmacology such as antibiotics and so on. The focus of the implementation is to position the patient at a semi-fowler angle of 30°, and collaborate in administering pharmacology including Omeprazole 2x40 mg/IV, KSR 1x200 mg, Dexamethasone 1x25 mg/IV, Citicolin, Gluceta, Ceftriaxone, OAT 1x25 mg/IV, Paracetamol 4x1 gr/ IV. After carrying out nursing actions in the form of giving the patient a 30° semi-fowler's position for 5 days, it was found that the patient's consciousness status was getting better day by day.

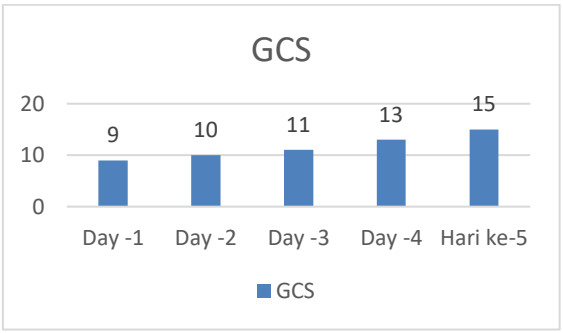

Figure 1. Evaluation of the patient's consciousness status during 30° semi-fowler positioning

Based on the data in Figure 1, shows that there has been an improvement in the status of consciousness as seen from the patient's Glow Coma Scale (GCS) value since day 1, namely Delirium (GCS 9), day 2 Somnolence (GCS 10), day 3 Somnolence (GCS 11), day 4 Apathy (GCS 13) and finally day 5 Composmentis (GCS 15).

The results of the case study after implementing nursing by providing a 30° semi-fowler position for 5 days showed an improvement in the patient's consciousness status. Then the patient no longer lost consciousness, there was no stiff neck, he no longer looked confused, and the patient complained of occasional headaches. Thus, providing nursing interventions can be continued to overcome the problem of ineffective cerebral perfusion in patients with serous Meningitis ec Tuberculosis gr 2.

Discussions

In this case, it is known that there is a neurological deficit in the form of decreased consciousness. Before entering the hospital, the patient had been sleeping a lot, and complained of a headache accompanied by chills and a fever of 38.9°C, there was vomiting and occasional coughing. Currently, at the end of October 2023, the patient's condition is experiencing a decline in consciousness. The headache had been felt for 5 months and had come and gone, and felt worse during October, so the patient and family decided to go to the hospital. Headaches are felt in the morning and have been getting worse lately, headaches on a scale of 7 (1-10). Experiencing neck stiffness which is characterized by Mr. R having difficulty moving his neck so he always sleeps on his back. The results of the physical examination which focused on the musculoskeletal and neurological systems, showed upper extremity muscle strength 3/3 and lower extremity muscle strength 1/1, patient with delirium with GCS 9 (E3M4V2). The patient's Neurological System opens its eyes when called upon and occasionally opens its eyes slightly while groaning. Pathological (Babinsky) reflexes in both limbs. The data from the history and physical examination above fulfill the triad of meningitis, namely headache, fever, and stiff neck.

Most patients with tuberculous meningitis have a history of headaches with atypical complaints for 2-8 weeks before symptoms of meningeal irritation appear. These nonspecific symptoms include malaise, anorexia, fatigue, fever, myalgia, and headache. In adults, there are usually classic symptoms of meningitis, namely fever, headache, and stiff neck accompanied by focal neurological deficits, changes in behavior, and decreased consciousness (Pemula, 2016).
Some of the symptoms that were present in the patient included a headache at the start of admission, on the first day of study the patient had decreased consciousness, experienced a stiff neck, upper extremity muscle strength was 3/3, and lower extremity muscle strength was 1/1, the patient was somnolence with a GCS of 9 (E3M4V2). blood pressure 113/64 mmHg, MAP 79, RR 30x/minute, HR 104x/minute, SpO2 99%, and temperature 37°C with administration of paracetamol, positive Babinski reflex. On the 4th day the patient was confused and spoke incoherently, these symptoms led to a nursing diagnosis of ineffective cerebral perfusion (PPNI, 2016).

The intervention plan that will be given to the patient is to monitor confusion, changes in thoughts, complaints of dizziness, monitor vital signs, monitor respiratory status, record patient changes to stimuli, monitor temperature and leukocyte count, periodically check for stiff necks, and collaborate with pharmacological administration such as antibiotics and so on. Another intervention that can be given is positioning the patient at a 30° semi-Fowler position so that oxygen flows smoothly to the brain, thus helping to increase awareness among meningitis sufferers.

Nursing implementation is carried out for 5 hours every day. Nursing actions taken include monitoring vital signs, monitoring respiratory status, periodically checking for neck stiffness, and collaborating in administering pharmacology such as antibiotics and so on. The focus of the implementation is positioning the patient at 30° semi-fowler. Nursing actions taken include observation and collaboration. Nurses carry out observations including monitoring vital signs, monitoring respiratory status, periodically checking for neck stiffness, and evaluating after nursing actions are carried out (PPNI, 2018). The therapeutic action that has been taken is positioning the patient in a semi-Fowler's 30° position, which can maximize oxygen entry to the brain. Collaborative drug administration also needs to be carried out as a treatment in healing.

The 30-degree semi-Fowler position is done by raising the head from the bed at an angle of around 30 degrees and following this with the body position parallel to the patient's head (Bahrudin, 2008). Brain oxygen balance is known to be influenced by cerebral blood flow. Brain protection is a series of actions taken to prevent or reduce damage to brain cells caused by ischemia. Brain ischemia is a hemodynamic disorder that causes a decrease in cerebral blood flow to a level that causes irreversible brain damage. The basic method for protecting the brain is by clearing the airway and providing adequate oxygenation (Wahidin, 2020).

The 30-degree semi-Fowler position aims to meet oxygenation needs in the brain to avoid hypoxia in the patient, and intracranial pressure becomes stable within normal limits. In addition, this position is more effective for maintaining the level of consciousness because it corresponds to the anatomical position of the human body which then influences the patient's hemodynamics (Batticaca FB, 2008). The semi-Fowler head position is a position to increases blood flow to the brain, improves the patient's level of consciousness, and prevents an increase in ICP. Increased ICP is a serious complication due to pressure on vital centers in the brain (herniation) and can result in brain cell death (Rosjid & S, 2014). Theoretically, a semi-fowler head position of 30o indicates that the return flow of blood from the inferior part to the right atrium is quite good because the blood vessel resistance and right atrial pressure are not too high, so the volume of blood entering (venous return) to the right atrium is quite good and the ventricular filling pressure right (preload) increases, which can lead to increased stroke volume and cardiac output. The 30o semi-fowler position will increase blood flow to the brain and maximize cerebral tissue oxygenation (GM et al., 2014; Oktavianus, 2014).

The 30-degree semi-Fowler position used in this study is a standard type of comfort intervention, which means that the action is carried out to maintain or restore the body's function provide comfort, and prevent complications. The 30° semi-Fowler position can increase perfusion to and from the brain so that oxygen demand and metabolism increase, marked by an increase in conscious status and followed by vital signs within the normal range (Wahidin, 2020). Non-pharmacological therapy is carried out by carefully monitoring vital signs because breathing in meningitis patients usually experiences a Cheyne-Stokes pattern, administering intravenous fluids according to indications, reducing body temperature with warm compresses, administering oxygen, and a semi-fowler head position of 30° to increase oxygen. circulation to the brain, thereby helping increase consciousness (Rossetyowati et al., 2021).
Apart from that, the nurse collaborated in administering additional oxygen with a nasal cannula at a speed of 3 liters/minute. Oxygen therapy is given to meet the body's oxygen needs so that it is adequate and oxygen saturation values above 95% can be maintained (Khazanah & Agustin, 2022).

Other collaborative actions include pharmacological administration including Omeprazole 2x40 mg/IV, KSR 1x200 mg, Dexamethasone 1x25 mg/IV, Citicolin, Gluceta, Ceftriaxone, OAT 1x25 mg/IV, Paracetamol 4x1 gr/IV. Pharmacological therapy given to patients aims to prevent complications, and reduce and alleviate the symptoms experienced (Doenges et al., 2014). Meningitis therapy is carried out by administering broad-spectrum antibiotics intravenously. This method is expected to work effectively to kill and inhibit by penetrating the Blood Brain Barrier (BBB), and can enter the cerebrospinal fluid (CSS). The antibiotic ceftriaxone is used as the empirical antibiotic of first choice for bacterial meningitis which is effective in improving the clinical condition of adult patients, usually combined with dexamethasone (Griffiths et al, 2018). Nursing implementation has been carried out for 5 days, and the results show significant improvement in terms of the patient's consciousness status. The patient's Glow Coma Scale (GCS) values from day 1 were Delirium (GCS 9), day 2 Somnolence (GCS 10), day 3 Somnolence (GCS 11), day 4 Apathy (GCS 13), and final day 5 of Composmentis (GCS 15).

Then the patient no longer looked confused, had no headaches, muscle strength in the upper extremities was 5/5 and lower extremities 4/4, no fever, and consciousness status was Compos Mentis. Thus, nursing problem analysis with cerebral perfusion is not effective in partially resolved cases. The next plan is to maintain the patient's hemodynamic status and not stop drug therapy according to indications to achieve optimal treatment. The limitation of this research is that the implementation was monitored by researchers only during office hours and was not monitored continuously, so when the family bathed the patient the patient's position changed to supination and not semi-fowler's, this made the implementation action ineffective.

Conclusions

In this case study, the main nursing problem raised was ineffective cerebral perfusion. The intervention and implementation carried out was the 30° semi-fowler position technique. Nursing care carried out for 5 days showed an improvement in the patient's condition as evidenced by the Composmentis consciousness status value (GCS 15) where the results of the consciousness status were within the normal range. Then the patient no longer appeared to be moaning because of the headache, was no longer confused, and had no loss of consciousness. The implications of this research can be used as a basic reference for nurses in carrying out nursing actions in grade II TB serous meningitis ec patients with ineffective cerebral perfusion problems.

References

Alam, A. (2016). Kejadian Meningitis Bakterial pada Anak usia 6-18 bulan yang Menderita Kejang Demam Pertama.Sari Pediatri,13(4),293. https://doi.org/10.14238/ sp13.4.2011.293-8

Batticaca FB. (2008). Asuhan Keperawatan Pada Klien dengan Gangguan Sistem Persarafan. Jakarta: Salemba Medika.

Borrow, et al. 2017. Meningococcal disease in the Middle East and Africa: Findings and updates from the Global Meningococcal Initiative. Journal of Infection (2017), doi: 10.1016/j.jinf.2017.04.007

Brunner, & Suddarth. (2016). Keperawatan Medikal Bedah Edisi 8. Jakarta: EGC.

Bulechek, G. M., Butcher, H. K., Dochterman, J. M., & Wagner, C. M. (2016). Nursing Interventions Classification (NIC). 6th edn. Philadelpia: Elsevier.

Doenges, M. E., Moorhouse, M. F., & Murr, A. C. (2014). Nursing Care Plans: Guidelines for Individualizing Client Care Across the Life Span. In F. A. Davis Company Philadelphia (9 th).

Goetz CG. Textbook of clinical neurology. Edisi ke-3. Philadelphia: Elsevier; 2007.

Griffiths, M. J., McGill, F., & Solomon, T., 2018. Management of acute meningitis. Clinical Medicine, 18(2), 164.

Herdman, T. (2018). Nanda Internasional Diagnosis Keperawatan: Definisi dan Klasifikasi 2018-2020 Edisi 11. Jakarta: EGC.

Isabel BE, Rogelio HP. Pathogenesis and immune response in tuberculous meningitis. Malays J Med Sci. 2014; 21(1): 4-10.

Kemenkes, RI. (2015). Profil Kesehatan Indonesia. Jakarta: Kemenkes RI.

Khazanah, N., & Agustin, W. R. (2022). Pengaruh High Flow Nasal Cannula Terhadap Saturasi Oksigen Pasien Gagal Nafas Akut di Intensive Care Unit.

Kozier, B., Erb, G., Berman, A., & Snyder, S. J. (2011). Buku ajar Fundamental Keperawatan, Konsep, Proses dan Praktik. Ed. 7.Vol. 1. Jakarta: EGC.

Mace, S. E., 2008. Acute bacterial meningitis. Emergency medicine clinics of North America, 26(2), 281-317

Maisuri, N. (2021). Karakteristik Pasien Meningitis di RSUD. Labuang Baji dan RSUP Dr. Wahidin Sudirohusodo Makassar Tahun 2018-2021. Tugas Akhir

Mediarti, D. (2022). Ilmu keperawatan medikal bedah dan gawat darurat. Bandung: Media Sains Indonesia.

Meisadona, G., Soebroto, AD, & Estiasari, R. (2015). Diagnosis dan Tatalaksana Meningitis Bakterialis. Cdk-224, 42(1), 15–19

Naïve Bayes Berbasis Web, Konferensi Nasional Sistem & Informatika2017, ISSN: 1979-9845, Hal 699-704

Nursalam. (2016). Metodologi Penelitian Ilmu Keperawatan Pendekatan Praktis Edisi.4. Jakarta: Salemba Medika.

Pemula, G., Et all. 2016. Penatalaksanaan yang tepat pada Meningtis Tuberkulosis. J Medula Unila. Vol 6 (1). y.

PPNI. (2016). Standar Diagnosis Keperawatan Indonesia: Definisi Dan Indikator Diagnostik. Edisi 1. Jakarta DPP PPNI.

PPNI. (2018a). Standar Intervensi Keperawatan Indonesia: Definisi Dan Tindakan Keperawatan, Edisi 1. Jakarta: DPP PPNI.

PPNI. (2018b). Standar Luaran Keperawatan Indonesia: Definisi Dan Kriteria Hasil Keperawatan, Edisi 1. Jakarta: DPP PPNI.

Purnajaya, H., & Erwanto, F. (2017). Akurasi Pemasangan Nasal Kanul Berhubungan Dengan Perubahan. Media Ilmu Kesehatan, 3(3), 159–166.

Rahmasuli, R., et all. Efektivitas Teknik Head Up 30 derajat dengan masalah perfusi serebral tidak efektif pada klien meningitis. Kian Journal. Vol 2 (1).

Ratniasih, Ni Luh, 2017, Rancang Bangun Sistem Pakar untuk Mendiagnosa Penyakit Meningitis Menggunakan Metode

Rossetyowati, et all. 2021. Kajian Penggunaan Antibiotik pada Pasien Meningitis dan Ensefalitis Bakteri di Bangsal Rawat Inap Rumah Sakit Rujukan Utama. : Jurnal Farmasi Indonesia. Vol 18, No 2, (2021). ISSN 1411-4283.

Suprajitno. (2016). Modul Bahan Ajar Cetak Keperawatan Pengantar Riset Keperawatan. Jakarta Selatan: Pusat Pendidikan Sumber Daya Manusia Kesehatan.

Török ME. Tuberculous meningitis: advances in diagnosis and treatment. British Medical Bulletin. 2015; 113:117-31

Wahidin., Supraptini, W., 2020. Penerapan Teknik Head Up 30 derajat terhadap peningkatan Perfusi Jaringan Otak pada Pasien yang mengalami cedera Kepala Sedang. Nursing Science Journal. Vil 1 (1). Hal 7-13. E-ISSN 2722-5054