IMPLEMENTATION OF NURSING CARE IN PROVIDING ANALGESIC THERAPY TO REDUCE PAIN LEVELS IN FRACTURE PATIENTS: SYSTEMATIC REVIEW

Marwasariaty[1], Hardin[2*], Hairuddin Safaat[3], Cici Pratiwi[4], Hardianto Dg. Salimung[5]

[1,2,3,4,5]*DIII Nursing Study Program, Sekolah Tinggi Ilmu Kesehatan Kamus Arunika, Sulawesi Selatan*

Corresponding author: hardin.nunung@gmail.com

Abstract

Background : Fracture is a condition where the continuity of bone and/or cartilage tissue is broken, which is generally caused by force. The purpose of this study was to identify analgesic therapy in reducing pain in fracture patients. **Methods:** The research method used is a systematic Review with struktural analisis sintesis (GRID) with a nursing care process approach. **Results :** The results showed that severe pain was a finding in the nursing assessment of fracture patients so that analgesic administration in the form of ketorolac was most often used in reducing the patient's pain scale. **Conclusions :** Therefore, it is recommended to produce the effectiveness of ketorolac analgesics as a pain reliever in postoperative fracture patients, it should be given before the operation is stopped (completed) at a dose of 60 mg / iv.

Keywords: Care, Nursing, Analgesic Therapy, Fracture.

1. INTRODUCTION

Abnormalities that occur in bones can be caused by several conditions, such as accidents or pathological conditions [1]. The Word Health Organization (WHO) revealed that traffic accidents killed 1.4 million people and in 2016 and ranked eighth out of the ten largest cases of mortality. The impact of accidents is in the form of increased trauma to the body, where two-thirds of the trauma is in the form of musculoskeletal trauma and one of them is a fracture [2].

The results of the report of the Ministry of Health of the Republic of Indonesia in 2017, showed the number of accidents that occurred in Indonesia with a presentation of 5.8% of injury victims or around 8 million people suffered fractures with the most types of fractures occurring in the lower extremities (63.1%) and upper extremities (36.9%). In South Sulawesi, the number of traffic accidents throughout 2017 reached 6,140 cases. Of these, the number of victims reached 9,519 people, of which 824 people were seriously injured, 7,661 people were slightly injured and 1,034 people died with a percentage of fracture cases of 76.56% [3].

Fractures are a potential or actual threat to a person's integrity, so that they will experience physiological and psychological disorders [4]. In patients who experience a fracture, it will be obvious that the position of the bone is not natural, the shift of the fracture causes deformity or changes in place at first. In bone patients, when examined by palpating the fracture, there is crepitus (rattling sound) caused by the shifting of the ends of the fracture or friction between one fragment and another. In addition, there may be impaired sensation or tingling, suggesting nerve damage. Distal loss of pulse describes the condition of compartment syndrome [1].

Fractures caused by transportation accidents or work accidents such as falls can cause traumatic fractures and soft tissue injuries that are usually accompanied by pain. According to Helmi (2013), one of the most prominent clinical manifestations in fracture patients is pain. Acute pain is an unpleasant sensory and emotional experience due to actual or potential tissue damage or described in terms of such damage. Pain in fracture patients is often sharp and stabbing [5].

Pain in fracture patients occurs due to damage to muscle tissue and bone tissue. The damage will activate inflammatory mediators such as peptides (bradykinin), neurotransmitters

(serotonin and ATP), and prostaglandins. The increased release of prostaglandins in dead cells in the fracture area will experience inflammation. With inflammation, the process of inhibiting bone healing is inhibited [6]. In addition, inflammatory mediators will interact with receptors and ion channels on sensory nerve endings (peripheral nociceptors) that will deliver pain impulses to the brain [7].

In fracture patients, pain is no longer seen as a natural condition of injury or trauma that will gradually decrease over time, as unrelieved pain can lead to complications, increased length of hospital stay and distress [8]. Effective pain management is an important aspect of nursing care. Nurses have an important role in providing adequate pain relief, the principles of which include reducing anxiety, assessing pain regularly, giving analgesics appropriately for optimal pain relief, and evaluating their effectiveness [9].

Both pharmacological and non-pharmacological pain management measures are efforts that can be taken to control pain in fracture patients. Pharmacological therapy can be carried out by nurses through nurse-doctor collaboration by administering analgesic drugs both parenterally and orally [10]. However, long-term administration of analgesics will cause side effects such as nausea, vomiting, constipation, respiratory depression, addiction and pruritus. Therefore, non-pharmacological therapy is usually combined with pharmacological therapy to enhance the analgesic effect, such as relaxation techniques, massage, compresses, music therapy, distraction, and guided imagery [11].

Analgesic drugs such as ketorolac are commonly used to manage pain and relieve inflammation caused by fractures. This drug is a non-selective Non-Steroidal Anti-Inflammatory Drug or AINS that can inhibit the biosynthesis of prostaglandins formed due to tissue damage, as well as inhibit cyclo oxygenase (COX) enzymes known in two forms, namely COX-1 and COX-2. COX-1 is found in all tissues and plays a role in hemostatic, cytoprotective and regulatory processes of the digestive tract mucosa and plays little role in inflammatory processes. COX-2 produces prostaglandins that stimulate cytokines and are involved in tissue inflammation and pain [7].

The results of research by Dewo, et al. (2014) showed that immobilization given with ketorolac injection therapy can be used as management in closed fracture cases [12]. While the results of research conducted by Oliveira, et al. (2012), showed that ketorolac as an effective postoperative analgesic was also accompanied by a reduction in postoperative nausea and vomiting. Giving ketorolac at a dose of 60 mg provides more significant effectiveness than giving ketorolac at a dose of 30 mg on the level of pain felt by postoperative patients [13]

2. METHODOLOGY

The research method used is a Systematic Review with struktural analisis sintesis (GRID) with a nursing care process approach, where the provision of analgesic therapy in reducing pain in fracture patients is the focus of study. The data used in this study come from research results that have been conducted and published in national and international online journals. Data retrieval was carried out through searching the results of scientific publications with a range of 2015-2023 using the Garuda portal and onlinelibrary.wiley.com by entering the keywords of each variable that had been selected (Analgesia + Paint + Fracture / Orthophedic). The search results were then further analyzed and concluded. Furthermore, the presentation of data for literature studies is presented textually/ narrative and a GRID synthesis table is made.

3. LITERATURE REVIEW AND DISCUSSION

Based on the 5 articles that have been traced as the focus of this research, the results can be described according to the GRID synthesis analysis in the following table:

Table 1. *Sintesis GRID*

No	Research Title	Objectives	Design, Sample & Data Collection	Results
1	Differences in therapeutic outcomes of ketorolac and fentanyl analgesic administration in orthopedic post operative patients Nurul Irna Windari, Zullies Ikawati, & Eni Purwaningtyastuti (2020) [14]	Knowing the difference in the effect of continuous fentanyl administration and intravenous ketorolac on the achievement of pain targets and LOS of patients after orthopedic surgery.	Analytic descriptive study with prospective cohort research design. Involved 59 patients with inclusion criteria, namely: patients aged ≥ 18 years who underwent orthopedic surgery and felt pain after surgery. Pain intensity is measured using NRS (Numeric Rating Scale). Measurement of the NRS score after orthopedic surgery is done by direct interview to the patient. Patients with adequate pain achievement are patients with a percentage decrease in intensity ≥ 50%.	The results of the analysis showed that the age of respondents after orthopedic surgery was dominated by non-geriatric patients, namely 29 85.3% of the continuous fentanyl group and 80% of the i.v. ketorolac group. While gender is dominated by male patients, namely 73.5% of the continuous fentanyl group and 80% of the i.v. ketorolac group. The achievement of adequate pain targets in post-orthopedic surgery patients occurred as much as 88.2% in the continuous fentanyl analgesic administration group, while in the intravenous ketorolac analgesic administration group the achievement of adequate pain targets in patients was 84%.
2	Effect of intravenous morphine and ketorolac on pain control in long bones fractures Babak Masoumi, Behdad Farzaneh, Omid Ahmadi, & Farhad Heidari (2017) [15]	Comparing the effectiveness of ketorolac with morphine in patients referred to the emergency department with long bone damage or fractures.	The method used was a double-blind clinical trial study conducted from June 2013 to September 2014 on patients referred to the emergency department of Al-Zahra Hospital for long bone fractures. Consisting of 88 patients randomly divided into two groups (morphine and ketorolac groups) by block randomization. Pain scores were assessed by visual analog scale (VAS). In the procedure, intravenous ketorolac with a loading dose of 10 mg was administered to a group within 60 seconds, followed by 5 mg every 5 minutes up to 20 minutes, if necessary (VAS ≥4) and	The mean ages of the ketorolac and morphine groups were 29.1 ± 12.5 and 33.2 ± 11.4, respectively. In the groups, there were 63.6% and 70.5% male patients, respectively. The mean ± SD pain scores before injection in the ketorolac and morphine groups were 7.59 ± 1 and 7.93 ± 1.09, respectively (p=0.13). One hour after injection, the mean ± SD pain scores in both groups were 1.41 ± 0.9 and 1.61 ± 1.17 and the mean pain scores had no significant difference in both groups before injection. Re-measurement using ANOVA test showed that the trend of pain score change had no significant

			intravenous morphine with a loading dose of 5 mg was administered to another group, followed by 2.5 mg every 5 minutes up to 20 minutes, if necessary (VAS ≥4). Pain scores before injection and at 5 minutes, half and 1 hour after injection were measured and recorded for all patients.	difference in the two groups (p=0.08).
3	Comparison of pain relief from different intravenous doses of ketorolac after reduction of mandibular fractures. Saeed Nezafati, Reza Khorshidi Khiavi, Seyyed Sina Mirinejhad, Dawood Aghamoh Ammadi, & Milad Ghanizadeh (2017) [16]	Evaluating the analgesic effect of intravenous injection with ketorolac doses at different intervals in patients undergoing mandibular fracture surgery	The method used was a simple randomized clinical trial conducted from March 2016 to January 2017 at Imam Reza Education/ Treatment center, Tabriz, Iran. The subjects in the study were patients with unilateral fractures of the mandibular symphysis as many as 50 people who were divided into 5 groups. Patients were divided into 5 groups. Group 1 was given 30 mg ketorolac immediately before induction of general anesthesia. Group 2 was given 60 mg ketorolac immediately before induction of general anesthesia. Group 3 was administered 30 mg ketorolac before termination of surgery. Group 4 was administered 60 mg ketorolac before termination of surgery. Group 5 was not given ketorolac. Furthermore, the pain level was measured using VAS instrument within 24 hours with time intervals of 2, 4, 6, 12 and 24 hours.	The results showed that the total score (mean ± SD) of pain severity in 24 hours after ketorolac dosing was the highest in group 5 at 5.03 ± 0.9 and the lowest in group 4 at 3.5 ± 1.9. The results of ANOVA and Post-hoc Tukey tests showed significant differences between groups 3 and 5 (p=0.002), and groups 4 and 5 (p=0.001), while groups 3 and 4 had no significant differences with groups 1 and 2 (p>0.05). The results showed that the highest dose of analgesic drug administration was in group 5 (5.3 ± 1.4 mg) and the lowest in group 4 (1.6 ± 0.6 mg). All control groups received significantly higher analgesic doses than the study groups (p < 0.05). And all patients in groups 1 and 2 received higher analgesic doses compared to groups 3 and 4 (p < 0.05). The analysis found the longest time to request the first dose of analgesic agent after surgery was 73.4 ± 12.03 minutes in group 4. All control groups requested analgesics after surgery at a much shorter time compared to the study group (p<0.05). And all patients in groups 1 and 2 had requested analgesics at a shorter time after surgery compared to subjects in groups 3 and 4 (p<0.05).

| 4 | Review of the use of analgesics in post-surgical fracture patients at the Trauma Center of Dr. M. Djamil Padang Hospital.

Susi Handayani, Helmi Arifin & Menkher Manjas (2019) [17] | Assess the use of analgesics including type, dose, pain reduction, and side effects. | This research is descriptive prospective with observational study design using cross sectional design. There were 45 respondents with inclusion criteria including all post-surgical fracture patients who were admitted to the trauma center surgery room of Dr. M. Djamil Padang Hospital who received analgesic therapy with the age of 17 to 60 years, willing to be interviewed and without comorbidities. Data in the form of sociodemographic characteristics data, and clinical characteristics of patients in the form of age, gender, education, occupation, type of analgesic, dose, pain level, pain characteristics (PQRST method), and side effects caused. Data on side effects were obtained from direct interviews with post-surgical fracture patients who were treated. | The results of the assessment of the highest pain characteristics (PQRST) showed that provocative (P) pain occurred due to movement (60%), quality (Q) pain in the form of stabbing (66.7%), region (R) or pain location occurred in femur fractures (44.4%) and tibia fibula fractures (26.7%), severity (S) or pain felt very disturbing (86.7%), and timming (T) or pain felt intermittent (57.8%) and always or persistent (42.2%). The results of the pain scale assessment before analgesic administration were known to be 28 people with moderate pain and 17 people with severe pain. While the pain scale felt by patients after giving analgesics is known to be 23 people with mild pain, 21 people with moderate pain, and 1 person with severe pain. Of the 45 fracture patients, who used ketorolac injection 30mg/8 hours 31 patients (68.9%), tramadol injection 100mg/8 hours 13 patients (28.9%) and paracetamol 3x500mg tablets 1 patient (2.2%). The results of the analysis showed that the most analgesic ketorolac injection 30mg/8 hours, can reduce pain from moderate to mild 45.2%, 51.6% did not change moderate pain and 3.2% were still in severe pain. Tramadol injection 100mg/8h, reduce pain from severe to moderate 35.5%, severe to mild 61.5%, and paracetamol tablets 3x500mg in mild pain 100%. |
| 5 | Case study: Efforts to reduce pain in postoperative patients with femur fracture | Can understand nursing care in postoperative femur fracture patients on Mrs.T with acute pain | The method used is a descriptive method with a case study approach. The patient taken by the researcher is a postoperative patient with | Nursing assessment showed pain in the right leg, pain felt pulling and increased when moved, scale 5 with a duration of 10-20 minutes. The |

		problems by taking pharmacological and non-pharmacological measures.	a femur fracture named Mrs. T with an age of 74 years who is a farmer. Data used to compile nursing care is obtained from interview methods, observation or examination, implementation, and evaluating the results of actions. Interviews are conducted by asking questions that are open or closed questions that aim to obtain subjective data. Observation or examination which has the aim of obtaining objective data contained in the client which is carried out by inspection, palpation, percussion and auscultation.	results of the physical examination found a fracture in the right thigh that had been operated on and covered with 25 cm of sterile gauze, grimacing facial expression, and tenderness. Installed drain with a volume of 150 ml/24 hours with red color, the patient limits movement in the operated leg, muscle strength in the right leg. The established nursing diagnosis is acute pain associated with physical injury agents (surgical procedures, trauma). Nursing plans and actions that will be carried out to clients are conducting a comprehensive pain assessment, observing verbal and non-verbal reactions to discomfort, using therapeutic communication to find out the pain experience, helping patients and families to seek and find support, control the environment that can affect pain, choose pain management (pharmacology and non-pharmacology), assess the type and source of pain to determine interventions, teach non-pharmacological techniques, evaluate the effectiveness of pain control, increase rest, collaborate with doctors for analgesic administration. Nursing evaluation showed that during the 4 days of implementing nursing actions the pain scale was 2 (mild) and the assessment was stopped.
	Rudi Hermanto, Laily Isro'in, & Saiful Nurhidayat (2020) [18]			

3.1 Nursing Assessment

The results of research by Handayani, et al (2019) show that the highest assessment of pain characteristics (PQRST) in fracture patients is known that provocative (P) or the cause of pain occurs due to movement (60%), quality (Q) or the nature of pain in the form of stabbing (66. 7%), region (R) or the location of pain occurs in femur fractures (44.4%) and tibia fibula fractures

(26.7%), severity (S) or pain feels very disturbing (86.7%), and timming (T) or the time of pain is felt to be intermittent (57.8%) and always or persistent (42.2%). While the pain scale felt before giving analgesics is known to be moderate pain as many as 28 people and severe pain as many as 17 people. This is in line with the research of Hermanto, et al (2020), where nursing assessment data found in fracture patients include pain in the fracture area, pain feels pulled and increases when moved, pain scale 5 with a duration of 10-20 minutes. The results of the physical examination found a fracture in the right thigh that had been operated on and covered with 25 cm of sterile gauze, grimacing facial expression, and tenderness [18].

This assessment of pain characteristics was carried out by researchers with anamnesis through interview techniques in each fracture patient. It can be assumed that to support the results of nursing assessment in fracture patients who experience pain, a nurse needs to understand this data collection technique (PQRST) as a basis for formulating nursing diagnoses. In addition to pain characteristics, no less important is the determination of the patient's pain scale. This pain scale can be measured using a visual analog scale (VAS) or numeric rating scale (NRS) instrument. In addition to helping in the formulation of nursing diagnoses, this pain scale will also guide nurses in determining appropriate nursing actions according to the level of pain experienced by the patient.

According to Helmi (2013), one of the most prominent clinical manifestations in fracture patients is pain [8]. Pain is an unpleasant sensory and emotional experience due to actual or potential tissue damage or described in terms of such damage. Pain in fracture patients is often sharp and stabbing [5]. The results of research by Masoumi, et al (2017) showed that the mean $\pm$ SD value of pain scores before analgesic injection showed the ketorolac group was 7.59 $\pm$ 1 and the morphine group was 7.93 $\pm$ 1.09. This shows that on average fracture patients experience severe pain based on visual analog scale assessment before analgesic therapy is given [15].

3.2 Nursing Diagnosis

Based on the data found in both Handayani, et al (2019) and Masoumi, et al (2017) studies, it can be assumed that the nursing diagnosis that can be established in fracture patients is acute pain associated with musculoskletal trauma [17,15]. This is in accordance with the results of research by Hermanto, et al (2020), it is known that the nursing diagnosis found in fracture patients is acute pain associated with physical agents (surgical procedures, trauma). This nursing diagnosis is supported by various subjective and objective data, including pain characteristics (such as the cause of pain, nature of pain, location of pain, duration and time of pain), and intensity or scale of pain. Some of the results of the literature search found that the determination of the main diagnosis of acute pain is based on the patient's pain scale (pain scale ≥ 7) [18].

Physiologically, pain in fracture patients occurs due to damage to muscle tissue and bone tissue. The damage will activate inflammatory mediators such as peptides (bradykinin), neurotransmitters (serotonin and ATP), and prostaglandins. The increased release of prostaglandins in dead cells in the fracture area will experience inflammation. With inflammation, the process of inhibiting bone healing is inhibited [6]. In addition, inflammatory mediators will interact with receptors and ion channels on sensory nerve endings (peripheral nociceptors) that will deliver pain impulses to the brain [7].

3.3 Nursing Plan and Action

Management of acute pain in fracture patients begins with developing an appropriate nursing plan and carrying out nursing actions in accordance with planning. Analgesic therapy in fracture patients is one of the collaborative actions obtained by nurses and doctors to reduce pain in fracture patients. Based on its classification, this analgesic drug is divided into two, namely narcotic analgesic groups (opioids), and non-narcotic analgesic groups (non-opioids) or commonly referred to as nonsteroidal anti-inflammatory drugs or abbreviated as NSAIDs [19].

The results of research by Windari, et al (2020) showed that the achievement of adequate pain targets in post-orthopedic surgery patients occurred as much as 88.2% in the group giving continuous fentanyl analgesics, while in the group giving intravenous ketorolac analgesics the achievement of adequate pain targets in patients was 84%. The dose of each analgesic given after orthopedic surgery, namely continuous fentanyl 500 µg in 50 cc NaCl 0.9%, while the dose of ketorolac given was 30 mg/8 hours intravenously. This shows that there is no significant difference between continuous fentanyl analgesics and ketorolac analgesics in reducing pain in

post-orthopedic surgery patients. Both analgesic groups have an adequate effect to reduce pain [14].

The same study by Masoumi, et al (2017) which compared the effectiveness of ketorolac with morphine in fracture patients found the mean ± SD value of pain scores before injection in the ketorolac and morphine groups was ketorolac 7.59 ± 1 and morphine 7.93 ± 1.09. One hour after injection, the mean ± SD of pain in both groups was ketorolac 1.41 ± 0.9 and morphine 1.61 ± 1.17. The results of re-measurement using ANOVA test showed that the trend of pain score change did not have a significant difference in both ketorolac and morphine groups with a p value = 0.08 [15].

When compared with the results of the two studies mentioned above, it shows that the use of analgesic drugs both narcotic and non-narcotic groups has the same effectiveness in reducing pain in fracture patients. However, in the research of Masoumi, Farzaneh, Ahmadi & Heidari (2017) it was explained that the use of morphine as an analgesic drug has more severe side effects than ketorolac. Most patients who received morphine injection experienced nausea and vomiting after injection. In contrast to patients who received ketorolac injection, only a small proportion experienced nausea and vomiting after injection [15].

According to Tjay & Rahardja (2012), some of the side effects that can occur after taking morphine are drowsiness, itching, sweating, rashes and skin redness, dizziness and headache, nausea and vomiting, constipation, and difficulty urinating [19]. Long-term use of narcotic drugs can be fatal as they can cause side effects such as respiratory depression and cardiac arrest. Therefore, clinical monitoring of vital signs needs to be done regularly to avoid these side effects [20].

Another study related to analgesic therapy was also conducted by Handayani, Arifin & Manjas (2019) which found that fracture patients who used analgesics such as ketorolac injection 30 mg/8 hours were 31 patients (68.9%), tramadol injection 100 mg/8 hours were 13 patients (28.9%), and paracetamol tablets 3x500 mg were only 1 patient (2.2%). From the results of this assessment, analgesic administration can be done if the patient's pain scale shows moderate to severe pain. In this case, analgesic drugs can be given if non-pharmacological measures are considered unable to reduce or control the patient's pain [17].

Ketorolac is an anti-pain medication that is widely used in patients after fracture surgery. This study explains that the average use of ketorolac injection for 3 days. The use of ketorolac for short therapeutic management (no more than 5 days) in moderate pain and acute pain. Because side effects have been reported such as gastrointestinal bleeding especially in elderly patients associated with the use of more than 5 days. The use of ketorolac carries some serious risks and side effects, especially if used inappropriately. It is not indicated for chronic pain conditions [21]. Because post-surgical fracture pain is acute pain, this drug has been used appropriately. Based on the suitability of drug use, the use of ketorolac is appropriate for indication, dose and duration of administration.

The same research conducted by Nezafati, at al (2017) found that the administration of ketorolac analgesics most effectively controls pain in postoperative patients with mandible fractures when given at a dose of 30 mg or 60 mg before surgery ends. In addition, the longest time to request the first dose of analgesic agent after surgery was 73.4 ± 12.03 minutes in group 4 (given 60 mg ketorolac injection before the end of surgery), while the fastest time was in group 5 (no ketorolac injection), followed by groups 1 and 2 (given ketorolac before induction of anesthesia) [22].

Based on this study, it can be assumed that the administration of ketorolac before the end of surgery is most effective in controlling pain in postoperative patients in the first 24 hours. The high effectiveness of ketorolac administration before the operation ends compared to administration before anesthesia affects the length of drug reaction in the patient's body. In patients who received ketorolac before anesthesia, the drug had begun to react before the operation ended, while patients who received ketorolac before the operation ended only began to react after a few minutes after surgery. So that the time interval of drug reaction to pain control in 24 hours postoperatively will be more effective in the group that gets ketorolac before the operation ends.

According to Kneale & Davis (2011), the intensity and duration of pain in postoperative patients varies according to the degree of tissue damage [7]. Inappropriate use of analgesics can lead to complications in the healing process, immune function, and autonomic dysfunction. Post-fracture surgical pain if not properly addressed can also lead to chronic pain that is very difficult

to manage. The impact of this pain usually disrupts sleep patterns, activity and appetite. Other causes include increased patient suffering, risk of postoperative complications, prolonged hospital stay, and increased cost of recovery. Therefore, proper administration of analgesics needs to be considered to minimize pain in fracture patients.

3.4 Nursing Evaluation

The results of research by Handayani, et al (2019) showed a comparison of the decrease in pain levels before being given analgesics, 28 patients suffered from moderate pain and 17 people suffered from severe pain, then changed after being given analgesics to mild pain as many as 23 people, moderate pain as many as 21 people and only 1 person who still felt severe pain [17]. The same study by Masoumi,et al (2017) found that the mean ± SD value of pain scores before injection in the ketorolac and morphine groups was ketorolac 7.59 ± 1 and morphine 7.93 ± 1.09. One hour after injection, the mean ± SD pain in both groups was ketorolac 1.41 ± 0.9 and morphine 1.61 ± 1.17 [15]. This is in line with the results of research by Hermanto, et al (2020), that after the implementation of nursing actions for 4 days the pain decreased with a scale of 2 (mild) [18].

Based on the results of these studies, it can be assumed that analgesic therapy can reduce fracture pain from severe to moderate to mild scale. Morphine analgesics are narcotic analgesic drugs that work directly on the central nervous system by interacting with opioid receptors, while ketorolac analgesics are a class of non-narcotic drugs or nonsteroidal anti-inflammatory drugs (NSAIDs) that work by reversibly inhibiting prostaglandin synthesis in the periphery without interfering with opioid receptors in the central nervous system. Although the mode of action is different, both morphine and ketorolac are able to reduce pain adequately.

4. CONCLUSIONS

The results showed that analgesic drug therapy that was effective in reducing pain in fracture patients included narcotic analgesic drugs such as morphine and fentanyl, and non-narcotic analgesic drugs, namely ketorolac, tramadol and paracetamol. So that to produce the analgetic effectiveness of ketorolac as a pain reliever in postoperative fracture patients, it should be given before the operation is stopped (completed) at a dose of 60 mg / IV.

ACKNOWLEDGEMENTS

REFERENCES

[1] Muttaqin, A. (2011). Buku Saku Gangguan Muskuloskeletal: Aplikasi pada Praktik Klinik Keperawatan. Jakarta: Salemba Medika.

[2] World Health Organization (2018). The Top 10 Causes of Death 2016 (on-line) Availabel at https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death; diakses tanggal pada 15 Mei 2023.

[3] Dinkes Sul-Sel. (2018). Profil Kesehatan Provinsi Sulawesi Selatan 2017 (on-line) Available at http://profil.dinkes.com; diakses tanggal 15 Mei 2023.

[4] Mediarti, D., Rosnani & Seprianti, S.M. (2015). Pengaruh Pemberian Kompres Dingin Terhadap Nyeri pada Pasien Fraktur Ekstremitas Tertutup di IGD RSMH Palembang Tahun 2012. Jurnal Kedokteran dan Kesehatan; 2(3).

[5] Nurarif, A.H. & Kusuma, H. (2015). Aplikasi Asuhan Keperawatan Berdasarkan Diagnosa Medis dan NANDA NIC-NOC. Jogyakarta: Mediaction Publishing.

[6] Dimmen, S. (2011). Effects of COX Inhibitors on Bone and Tendon Healing. Acta Orthopaedica Supplementum; 342(82): pp. 1-22.

[7] Kneale, J. & Davis, P. 2011. Keperawatan Ortopedik dan Trauma. Jakarta : EGC.

[8] Helmi, Z.N. (2013). Buku Ajar Gangguan Muskuloskleletal. Jakarta: Salemba Medika.

[9] Kozier, B., & Erb,G., (2009). Buku Ajar Praktik Keperawatan Klinis. Jakarta: EGC.

[10] Potter, P.A. & Perry, A.G. (2015). Buku Ajar Fundamental Keperawatan (Konsep, Proses, dan Praktik), Edisi 4, Volume 3. Jakarta: EGC.

[11] Price, S.A & Wilson, L. (2015). Patofisiologi (Konsep Klinis Proses-Proses Penyakit). Jakarta: EGC.

[12] Dewo, P., Magetsari R., Hidayat L., Ismoyo, K. & Lanodiyu, Z. (2014). The Decrease of Pain Severity Among Patients With Isolated Closed Fractures of Extremity and Clavicle in Emergency Department. Journal Pain Relief; 3(4): pp. 1-4.

[13] Oliveira G.S.D, Aqarwal, D. & Benzon, HT. (2012). Perioperative Single Dose Ketorolac to Prevent Postoperative Pain: A Meta-Analysis of Randomized Trials (on-line) Availabe at http://www.ncbi.nlm.nih.gov/pubmed/ 21965355; diakses pada tanggal 15 Mei 2023.

[14] Windari, N.I., Ikawati, Z. & Purwaningtyastuti, E. (2020). Perbedaan Luaran Terapi Pemberian Analgetik Ketorolak dan Fentanyl Pada Pasien Pasca Operasi Ortopedi. JMPF, 10(1); DOI : 10.22146/jmpf.53313.

[15] Masoumi, B., Farzaneh, B., Ahmadi, O. & Heidari, F. (2017). Effect of Intravenous Morphine and Ketorolac on Pain Control in Long Bones Fractures. Advanced Biomedical Research.

[16] Nezafati, S., Khiavi, R.K., Mirinejhad, S.S., Ammadi, D.A. & Ghanizadeh, M. (2017). Comparison of Pain Relief from Different Intravenous Doses of Ketorolac after Reduction of Mandibular Fractures. Journal of Clinical and Diagnostic Research, 11(9); PC06-PC10.

[17] Handayani, S., Arifin, H. & Manjas, M. (2019). Kajian Penggunaan Analgetik Pada Pasien Pasca Bedah Fraktur di Trauma Centre RSUP DR. M. Djamil Padang. Jurnal Sains Farmasi & Klinis, 06(02); 113-120.

[18] Hermanto, R., Isro'in, L. & Nurhidayat, S. (2020). Studi Kasus: Upaya Penurunan Nyeri Pada Pasien Post Operasi Fraktur Femur. Health Sciences Journal, 4(1); 9 0-111: ISSN 2598-1196.

[19] Tjay, T.H. & Rahardja, K. (2012). Obat-Obat Penting Kasiat, Penggunaan dan Efek-efek Sampingnya. Jakarta: Gramedia.

[20] Joyce, L.K & Evelyn, R.H. (2013). Farmakologi: Pendekatan Proses Keperawatan. Jakarta: EGC.

[21] Krueger, M. (2017). Martindale: The Complete Drug Reference. London: Pharmaceutical Press.

[22] Nezafati, S., Khiavi, RK., Mirinejhad, SS., Ammadi, DA., & Ghanizadeh, M. (2017). Comparison of Pain Relief from Different Intravenous Doses of Ketorolac after Reduction of Mandibular Fractures. Journal of Clinical and Diagnostic Research, 11(9); PC06-PC10.