The relationship between pain intensity and blood pressure after femur fracture surgery

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Abstract

Background: Fracture is a continuous disruption of bone structure, either completely or partially. The incidence of closed fractures increases annually by around 15 million per year with a prevalence rate of 3.2%. In people with fractures, one of the common clinical symptoms is pain. Inability to cope with pain can cause anxiety and increased blood pressure.

Purpose: To determine the relationship between pain intensity and blood pressure in patients following near lower extremity fracture surgery.

Method: Quantitative research with a cross sectional approach. Data collection uses documentation studies in the form of medical records. Sample data was taken using a quota sampling technique of 200 data from the category of patients with post-operative fractures near the femur at the Prof. Dr. R. Soeharso Orthopedic Hospital, Surakarta in January-December 2023.

Results: Analysis of 200 data showed that the highest pain intensity was mild, 112 people (56%) and the highest blood pressure data was pre-hypertension, 81 people (40.5%). The results of the Chi-Square statistical test produced a p-value of 0.01 ($p < 0.05$), meaning that there was a significant relationship between pain intensity and blood pressure.

Conclusion: There is a significant relationship between pain intensity and blood pressure in patients after femur fracture surgery.

Keywords: Blood Pressure; Fracture; Pain Intensity.

INTRODUCTION

A fracture is a disruption in the continuity of the bone structure in whole or in part. Increased human activity and mobility often results in an increase in the number of accidents. Work and traffic accidents are the main triggers for injuries and fractures. (Nurnaningsih, Romantika, & Indriastuti, 2021; Bigham-Sadegh, & Oryan, 2015). Closed fractures occur when a bone is broken as a result of an accident, fall, muscle damage or osteoporosis. Closed fractures can pose a real potential threat to individuals, considering the possibility of physiological and psychological disorders (Erhan, & Ataker, 2020).

According to the World Health Organization (WHO) in 2019, the incidence of closed fractures increases every year to around 15 million cases with a prevalence rate of 3.2%. In Indonesia, based on data from the Ministry of Health in 2018, there were approximately 1 million cases of bone fractures with a prevalence rate of 9.2%. Based on this number, around 92,976 people experienced closed fractures with a prevalence of 5.5%. According to Basic Health Research in 2018, the part of the body most frequently affected by closed fractures is the lower extremities at 67%, followed by the upper extremities at 32%, head injuries at 11.9%, chest injuries at 2.6%, back injuries

at 6 .5%, and abdominal injuries at 2.2% (World Health Organization, 2019; Ministry of Health of the Republic of Indonesia, 2018).

Femur fractures in Indonesia are the most common, reaching 39%, followed by humerus fractures (15%), and tibia-fibula fractures (11%). Traffic accidents, especially those involving cars, motorbikes or recreational vehicles, accounted for 62.6% of the causes of femur fractures, followed by falls at 37.3%. The majority of cases involved men, namely 63.8%. Femur fractures most often occur in the adult age group (15-34 years) and the elderly (above 70 years) reaching the peak age distribution (Andri, Febriawati, Padila, Harsismanto, & Susmita, 2020).

If the patient experiences a femur fracture, severe bleeding can occur which has the potential to cause shock. Femur fractures can result in complications, morbidity and prolonged disability if not treated appropriately (Indrawan, & Hikmawati, 2021; Weber, Lefering, Dienstknecht, Kobbe, Sellei, Hildebrand, 2016). Pain perception varies greatly between individuals, this is because pain is a very subjective experience. Likewise, reports of postoperative pain vary between patients and each patient experiences different sensations, despite sharing some characteristics. This shows that pain perception is highly dependent on several factors. Factors that are believed to be fundamental in explaining differences in the intensity of pain experienced include gender and age (Wiguna, Aribawa, Aryabiantara, & Senapathi, 2020; Lautenbacher, Peters, Heesen, Scheel, & Kunz, 2017).

Patah tulang femur yang tidak mendapat penanganan memadai dapat menimbulkan komplikasi serius, morbiditas berkepanjangan, dan berpotensi menimbulkan kecacatan (Indrawan, & Hikmawati, 2021; Fischer, Maleitzke, Eder, Ahmad, Stöckle, & Braun, 2021). Pada penderita patah tulang, salah satu gejala klinis yang sering muncul adalah nyeri (Hayani, Zulkarnaini, Azwarni, Irwani, & Zakirullah, 2023). Pasca operasi, pasien biasanya mengalami sensasi nyeri yang dikenal dengan istilah nyeri pasca operasi (Permatasari, & Rosyid, 2020; Tano, Apiribu, Tano, Boamah Mensah, Dzomeku, & Boateng, 2021).

Fractures can cause various problems, including signs of deformity, bruising, swelling, crepitus (a grinding or bruising sound when the broken end of the bone is moved), sudden muscle contractions, muscle tension, shock, loss of body function, neurovascular and sensation. pain (Nurhasanah, Inayati, & Fitri, 2021; Al-Taki, & Nahle, 2016). Pain symptoms that commonly occur in musculoskeletal disorders need to be understood thoroughly, especially the characteristics of pain that may arise in fractures, such as sharp and stabbing pain (Andri, Panzilion, & Sutrisno, 2019).

The inability to cope with pain can trigger anxiety, increased blood pressure, and exacerbation of pain intensity, especially in the elderly (Rispawati, Halid, & Supriyadi, 2020; Dagnino, & Campos, 2022). If pain is not treated effectively, it can increase sympathetic activity, stimulate the autonomic nervous system, and trigger the release of epinephrine. The impact is an increase in blood pressure and pulse (Cahyati, 2018).

RESEARCH METHOD

Descriptive research with a cross-sectional design approach. The sampling technique used in this study was quota sampling and data was collected from secondary sources through medical records from 200 patients with post-operative femur fractures. The research was conducted at the Prof. Orthopedic R. Soeharso Surakarta hospital in November 2023-January 2024.

The independent variable in this study was the patient's pain intensity, while the dependent variable was the patient's blood pressure after close femur fracture surgery. The instrument in this research used a questionnaire sheet. The pain intensity variable is measured using a numerical scale (NRS) with a measurement value of no pain being 0, mild pain on a scale of 1-3, moderate pain on a scale of 4-6, severe pain on a scale of 7-9, and very severe pain is on a scale of 10. Blood pressure variables are measured using a stethoscope and tensimeter in mmHg units. The measurement results are divided into several types, namely, systolic numbers <90 and diastolic <60 are hypotension, systolic numbers 90-120 and diastolic 60-80 are normal, systolic numbers 120-140 and diastolic 80-90 include prehypertension, systolic numbers 140-160 and a diastolic number of 90-100 is stage 1 hypertension, a systolic number of 160-180 and a diastolic number of 100-120 is stage 2 hypertension.

The instruments used have gone through validity and reliability tests. The validity test is used to

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determine whether each instrument item is valid or not by correlating the score of each item and its reliability. The r-calculated results are compared with the r-table (df=n-2) with a mark value of 5%, if r table < r calculated then it is valid. Reliability test with a p-value of 0.001 (0.001>0.05) means that there is a significant relationship between the two variables. The data analysis used is univariate and bivariate. Univariate analysis includes patient demographic data such as patient age, categories toddler (<5 years), children (5-9 years), teenagers (10-18 years), adults (19-59), and elderly (>60). Bivariate analysis uses the Spearman test with the condition that the data is not normally distributed.

This research has received ethical approval from the Health Research Ethics Team, Prof. Dr. R. Soeharso Orthopaedic Hospital, Surakarta with number IR.03.01/D.XXV.2.3/215/2023.

RESEARCH RESULTS

Table 1. Distribution of Demographic Characteristics of Respondents (N=200)

Variables	Results
Age (Mean±SD)(Range)(Years)	(60.24±4.164)(3-77)
Toddler	2/1.0
Children	4/2.0
Teenagers	17/8.5
Adults	86/43.0
Elderly	91/45.5
Gender (n/%)	
Male	109/54.5
Female	91/45.5
Pain Intensity (n/%)	
No Pain	0/0
Mild Pain	112/56.0
Moderate Pain	88/44.0
Severe pain	0/0
Blood Pressure (n/%)	
Normal	47/23.5
Prehypertension	80/40.0
Stage 1 Hypertension	51/25.5
Stage 2 Hypertension	22/11.0

Table 1 shows the data that is most often categorized into the elderly group over 60 years, namely 91 patients (45.5%). Most patients were male with a significant number of 109 people (54.5%). Most of the pain scale data fell into the mild pain category, namely 112 patients (56%), while 88 patients (44%) fell into the moderate pain category. It should be noted that the results of the analysis show that there is no data that falls into the categories of no pain and severe pain in post-operative femur fracture patients. The highest blood pressure was in the prehypertension category, namely 80 patients (40.0%).

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Table 2. Analysis of the Relationship between Pain Intensity and Blood Pressure

Variables	Blood Pressure				p-value
	Normal (n=47)	Prehypertension (n=80)	Stage 1 Hypertension (n=51)	Stage 2 Hypertension (n=22)	
Pain Intensity (n/%)					
Mild Pain	28/59.6	54/67.5	20/39.2	10/45.5	0.01
Moderate Pain	19/40.4	26/32.5	31/60.8	12/54.5	

The results of the analysis of pain intensity with blood pressure showed a test result of 0.01 (p<0.05). This study showed that of 200 patients after surgery for femoral fractures in the normal blood pressure category, 28 patients (59.6%) experienced mild pain, 54 patients (67.5%) experienced prehypertension, 54 patients had stage 1 and 2 hypertension. 31 patients (60.8%) and 12 patients (45.5%) experienced moderate pain respectively.

DISCUSSION

Based on the Chi-Square statistical test data, a p-value was obtained of 0.01 (p<0.05), this shows that there is a significant relationship between pain intensity and blood pressure. The highest total pain intensity results were recorded in the mild pain category, 112 patients (56.0%), while the highest blood pressure category was in the prehypertension range, namely 80 patients (40.0%).

The majority of patients with closed femoral fractures after surgery were elderly aged over 60 years, with 91 patients (45.5%). This is in line with the theory that after the age of 40 years, bone density generally decreases gradually. Aging causes a decrease in bone mass, thereby contributing to an increased risk of bone fractures, especially in the elderly group. Fractures experienced by this age group are often called geriatric fractures. The risk of fractures in the elderly is generally associated with decreased bone mineral density, muscle weakness, and an increased risk of falls. Therefore, understanding the characteristics of geriatric fractures is very important in efforts to prevent and treat bone disease in the elderly population (Sjahriani, & Wulandari, 2018; Harvey, McCloskey, Mitchell, Dawson-Hughes, Pierroz, Reginster, & Kanis, 2017).

Based on the data and statements above, elderly people are very susceptible to bone fractures, especially thigh bone fractures. In old age, there is a decrease in overall bone mass due to the body's inability to regulate the mineral content in bones accompanied by damage to bone architecture, resulting in reduced bone strength and an increased risk of fractures (Kepel, & Lengkong, 2020; Boskey, & Imbert, 2017).

The majority of patients undergoing surgery for femur fractures were men, namely 109 patients (54.5%). This phenomenon is in line with the general view that bone fractures occur more often in men than women. In the age group under 45 years, bone fractures in men are often associated with sports activities, certain types of work, or injuries resulting from motor vehicle accidents. These factors can increase the risk of injury and fracture in the male population in this age range (Alfarisi, Rihadah, & Anggunan, 2018). It can be concluded that men are more susceptible to femur fractures, most likely due to physically demanding work (Roberts, Gebhardt, Gaskill, Roy, & Sharp, 2016).

The number of patients in the mild pain category was 112 patients (56%). It should be noted that the pain experienced by post-operative patients with fractures near the femur does not always reflect the actual intensity because the patient has been given post-operative pain medication. Based on joint assessments with patients, many stated that the pain was not too severe because the fracture had already been operated on. The patient also stated that the severe pain he experienced generally occurred before surgery. Although the pain is less severe after surgery, some patients still experience some degree of pain. This highlights the complexity of the pain experience in postoperative patients, where medical interventions can influence pain perception although not always eliminate it completely.

Unpleasant sensory and emotional experiences resulting from actual or potential damage cause pain. This is one of the reasons why individuals seek health

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services because pain can be more disturbing and debilitating than many diseases (Tanoto, 2022). The common pain symptoms found in musculoskeletal disorders highlight the importance of a comprehensive understanding of the characteristics of sharp and stabbing pain, as well as bone fractures (Andri et al., 2019). Elderly individuals are believed to have a higher pain threshold, so the intensity of pain felt is lower.

Many data were found with blood pressure in the pre-hypertension category, namely 80 people (40.0%). Postoperative blood pressure is influenced by the combination of drugs given after surgery. Although the data includes some patients with high blood pressure, the majority also show blood pressure within the normal range.

Based on joint assessments with patients, most high blood pressure patients complain of difficulty sleeping after surgery because they still feel pain from the operated fracture. This provides evidence of a complex relationship between pain, blood pressure, and post-operative psychological impact that can impact a patient's overall comfort and recovery. Pain or discomfort may occur after the surgical procedure. This important process can cause a temporary increase in blood pressure. However, the increase in blood pressure is only temporary and will return to normal after pain medication.

CONCLUSION

There is a significant relationship between pain intensity and blood pressure in patients undergoing near femur fracture surgery. The most common characteristic of pain intensity is mild pain, while the most common characteristic of blood pressure is prehypertension. It should be noted that the pain experienced by patients after thigh bone surgery is not always the same intensity because the patient has been given post-operative pain medication. However, the increase in blood pressure is only temporary and will return to normal after pain reliever treatment, for example pain relievers.

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