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Original Article

Characteristics of Patients with Thoraco-Lumbar Fractures at Dr. M. Djamil Padang Central General Hospital in 2018-2022

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ABSTRACT

Background: Vertebral fracture is one of the traumas that results in the highest rates of disability and death. Vertebral fractures can occur in various regions, but more than 50% of cases occur in the thoracolumbar region T10-L2. This can be caused by several factors, such as age, gender, and BMI**.** More than 30% of patients have symptoms of chronic back pain accompanied by neurological deficits. This study discussed the characteristics of patients with thoracolumbar fractures at Dr. M. Djamil Padang Central General Hospital.
Methods: This research is an observational descriptive study with a cross-sectional design. Research data were obtained from patient medical records, and the total inclusion sample is 139 patients with thoracolumbar fracture at Dr. M. Djamil Padang Central General Hospital in the 2018-2022 period. The data were processed and displayed as frequency distributions.
Results: This research showed that the incidence of thoracolumbar fractures is found in 72 patients, with 72 being women. Mainly occurred between 15-64 years of age (73.4%), with 61.2% of cases caused by low energy trauma. As many as 62.6% of the patients received conservative management accompanied by surgery.
Conclusion: This study concluded that thoracolumbar fractures often occur in women of reproductive age. The most common etiology is a fall from a height of less than three meters.

Keywords: Age; Causal factors; Gender; Human and medicine; Thoracolumbar fracture

INTRODUCTION

Advances in science and technology have provided many benefits to human life, including advances in the field of transportation. The current increase in community activity and mobility has impacted the increasing use of transportation and motorized vehicles. The increased use of transportation will undoubtedly increase the risk of accidents. In 2019, the number of traffic accidents in Indonesia reached 116,411, and in West Sumatra it was 3,336. The number of accidents has increased every year by 4.87%.[1] Accidents are the leading cause of fractures.[2] Basic Health Research (Riskesdas) data in 2018 illustrate that the incidence of fractures in Indonesia has a prevalence of 5.5% of all existing injury cases. The incidence of fractures in West Sumatra is 5.6%.[3]

A fracture is a condition in which the continuity of bone tissue is broken, caused by excessive pressure that exceeds the elasticity of the bone, such as during a vehicle accident, and

substantial impacts, such as falling from a height. Apart from external pressure, other things that can cause fractures are internal factors such as decreased bone density, which causes bones to become brittle.[4]

Fractures can occur in all parts of the bone, including the vertebrae. Fractures that occur in the spine are one of the traumas that will result in the highest disability and death.[5] The spine plays many roles in human life, namely protecting the spinal cord and nerve fibers, supporting body weight, and playing a role in changing body position. The vertebrae are divided into five regions: cervical region, thoracic region, lumbar region, sacral region, and coccygeal region.[6] The global prevalence of vertebral fractures is 25-50%. In men aged 65-74 years, it is 15%, and in men aged >74 years, it is 20%. The incidence rate in women aged 65-74 years is 7.6% and increases at age >74 to 13%.[7]

Factors causing thoracolumbar fractures are influenced by age. According to data from Statistical Indonesia in 2019, age is divided into three categories according to productivity, namely the age group <15 years old as unproductive age, 15-64 years old as productive age, and >64 years old as unproductive age.[1] The selection of the age categories was also based on the fact that for 15-64 years old, road trauma was the most common mechanism of injury, while for >64 years old, falls, low energy trauma, and degenerative disease were the most dominant mechanism of injury. Thoracolumbar fractures can occur due to various factors, but one of the most common causes is trauma. For younger ages, it is usually caused by high energy trauma, and for older ages usually 58% is caused by low energy trauma.[8] High energy trauma is most often caused by traffic accidents (36.7%), and second most is due to falls from a height (31.7%).[2] In addition, as many as 8.7% of cases of thoracolumbar fractures were caused by sports accidents such as playing football, surfing, ballet and horse riding.[9-11] Meanwhile, low energy trauma was caused by falling from a low height, such as falling while standing or falling from a height of less than one meter. A study conducted by Hall et al. (2018) stated that of 229 patients with a history of falls from low heights, 143 patients experienced fractures in the thoracolumbar region.[12,13]

Malignancy can cause thoracolumbar fractures. Secondary tumors are more often the cause of fractures than primary tumors. In men, it is more often caused by lung cancer metastasis, and in women, it is more often caused by breast cancer. Bone metastases are mainly caused by hematogenous spread. Metastasis usually occurs because the tumor is located close to the vertebrae, making it easier for fractures.[14]

A study conducted in China stated that the factors causing thoracolumbar fractures were associated with a person's gender.[15] High energy trauma, such as traffic accidents and falls from heights, occurs more often in men than in women. Meanwhile, low-energy trauma, such as falling from a low height, occurs more often in women. This is associated with lower bone mineral density in women due to decreased estrogen levels in postmenopausal women. This decrease in estrogen levels will result in increased bone resorption so that even a low amount of pressure can cause a fracture.[14]

The diagnosis of this fracture can be made based on the results of anamnesis and physical examination, and it can be supported by supporting examinations. Physical examination can be performed by assessing the patient's motor movements and muscle strength. Supporting examinations include X-rays, CT scans, and MRI. A CT scan provides a more precise assessment of bone structure, and MRI is the best method for evaluating soft tissue. MRI is used to view ligaments, nerves, and disc structures. MRI helps in the diagnostic assessment of fractures with neurological deficits.[16] Thoracolumbar fractures can cause a decrease in a person's productivity and are also associated with quite expensive treatment costs. The outcome and prognosis of patients with thoracolumbar fractures depend on their neurological condition. Patients without neurological deficits or with partial deficits generally have a good prognosis.[10,11] With the high

prevalence of thoracolumbar fractures, an average of 174 patients in 5 years, in Dr. M. Djamil Padang Central General Hospital, the author is interested in researching the characteristics of thoracolumbar fracture patients at the Orthopedic and Traumatology Outpatient Clinic, Dr. M. Djamil Padang Central General Hospital in 2018 – 2022.

MATERIAL AND METHODS

Research Design

This study employed a descriptive study with a cross-sectional design. This approach aimed to describe the characteristics of patients diagnosed with thoracolumbar fractures at Dr. M. Djamil Padang Central General Hospital within a specific timeframe. The cross-sectional design involved retrospectively collecting data at a single point in time from existing medical records.

Study Setting and Period

The study was conducted using data obtained from the medical records of Dr. M. Djamil Padang Central General Hospital. The data collection period spanned from May 2023 to August 2023. However, the analyzed patient data covered the period from 2018 to 2022.

Study Population and Sampling

The target population for this research consisted of all patients diagnosed with thoracolumbar fractures at the Orthopedic and Traumatology Outpatient Clinic at Dr. M. Djamil Padang Central General Hospital during the 2018 – 2022 period who met the inclusion criteria. Owing to the feasibility of accessing all eligible records, the entire population meeting the inclusion criteria was intended to be used as research subjects.

The total population (N) of patients with thoracolumbar fractures at Central General Hospital Dr. M. Djamil Hospital between 2018 and 2022 was 174. The calculated minimum sample size (n) for this study was 119, which was determined using the following formula:

$$n = \frac{\left(Z_{1-a/2}\right)^2 P \cdot Q \cdot N}{d^2 \cdot \left(N-1\right) + \left(Z_{1-a/2}\right)^2 \cdot P \cdot Q}$$

Information:

$Z^2_{1-a/2}$ = the z-score for a 95% confidence interval = 1.96
P = 0.5
Q = 1-P = 0.5
d = sampling error = 5%
n = total minimum sample
N = the total population of patients with thoracolumbar fractures at Central General Hospital Dr. M. Djamil Hospital in 2018-2022 = 174

Inclusion and Exclusion Criteria

The following criteria were used to determine the eligibility of patient records for inclusion in this study:

Inclusion Criteria:

- Patients diagnosed with thoracolumbar fractures at the Orthopedic and Traumatology Outpatient Clinic at the Central General Hospital. M. Djamil Padang during the 2018 – 2022 period.
- Medical records with complete data according to the studied variables (age, gender, causal factors, motor characteristics, and fracture location).

Exclusion Criteria:

- Patients diagnosed with thoracolumbar fractures of more than one etiology.
- Patients diagnosed with thoracolumbar fractures of unclear etiology were documented in their medical records.

Sampling Technique

The sampling technique employed in this study was consecutive sampling. This non-probability sampling method involved selecting all patient medical records that met the inclusion criteria in the order they were encountered until the desired sample size of 119 was reached.

Data Collection Procedure

Data were collected retrospectively by reviewing the medical records of patients diagnosed with thoracolumbar fractures between 2018 and 2022 at Dr. M. Djamil Padang Central General Hospital.

Researchers extracted relevant information based on the study variables: age, gender, causal factors, motor characteristics, and fracture location.

Data Analysis

The collected data were initially entered into Microsoft Excel 2019. Subsequently, univariate analysis was performed using SPSS version 29.0. The results of the univariate analysis are presented as frequency and percentage distributions for each of the research variables. These findings are displayed in the form of distribution tables.

RESULTS

In Table 1, most patients with thoracolumbar fractures at Dr. M. Djamil Padang Central General Hospital in 2018-2022 were in the 15-64 year old range with 102 patients (73.4%). In this study, the youngest patient was 15 years old and the oldest was 85 years old. Patients age range 15-64, frequently found at the age of 51 years. As shown in Table 1, 72 patients (51.8%) were female. The age group for thoracolumbar fractures that more frequently affects men and women is 15-64 years old.

Table 2 presents the patient characteristics based on the mechanism of fracture. The results showed that the most common fracture mechanism was a fall from a height of less than 3 m in 81 patients (58.27%), followed by traffic accident in 32 patients (23.02%), fall from a height of more than 3 m in 20 patients (14.39%), malignancy in four patients (2.88%), and sport injuries in two patients (1.44%). From the fracture mechanism, it was a fall from a height of less than 3 m, the highest age being 65 years (6.17%). If we look at the gender of patients who experienced thoracolumbar fractures due to falls from a height of <3 meters, the majority were found in women, as many as 54 people (66.67%).

As shown in Table 3, the majority of cases were caused by low-energy trauma (85 patients, 61.2%). The research results also showed that 102 patients (73.4%) aged 15-64 years experienced thoracolumbar fractures at Dr. M. Djamil Padang Central General Hospital in 2018-2022 with details

Table 1. Distribution of patients based on age

Age	Men		Women		Total
	n	%	n	%	
<15 years old	0	0	0	0	0
15-64 years old	54	38.85	48	34.53	102
>64 years old	13	9.35	24	17.27	37
Total	67	48.2	72	51.8	139

Table 2. Distribution of patients based on fracture mechanism

Fracture Mechanism	Frequency (n)	Percentage (%)
Traffic accident	32	23.02
Fall from a height of >3 m	20	14.39
Sports injuries	2	1.44
Malignancy	4	2.88
Fall from a height <3 m	81	58.27
Total	139	100

Table 3. Frequency distribution of causative factors on age

Causative factor	<15 years old		15-64 years old		>64 years old		Total
	n	%	n	%	n	%	
High Energy Trauma	0	0	49	35.25	5	0.6	54
Low Energy Trauma	0	0	53	38.13	32	2.02	85
Total	0	0	102	73.4	37	26.6	139

Table 4. Frequency distribution of causative factors on gender

Causative factor	Men		Women		Total
	n	%	n	%	
High Energy Trauma	39	28.06	15	10.79	54
Low Energy Trauma	28	20.14	57	41.01	85
Total	67	48.2	72	51.8	139

Table 5. Distribution of thoracolumbal fracture patients

Treatment	Frequency (n)	Percentage (%)
Conservative	52	37.4
Conservative and Operative	87	62.6
Total	139	100

of 49 patients (32.25%) experiencing fractures caused by high energy trauma. Among those aged >64 years, 32 patients (23.02%) experienced fractures caused by low-energy trauma.

Table 4 shows the number of genders based on causal factors. In men, more thoracolumbar fractures occur due to high-energy trauma, and in women, more thoracolumbar fractures occur due to low-energy trauma.

Patient characteristics based on the treatment obtained are presented in Table 5. 87 patients (62.6%) who received conservative and operative treatment obtained the highest results.

DISCUSSION

The results of research on patient age showed that 102 patients (73.4%) were aged 15-64 years and 37 patients (26.6%) were >64 years old, so the majority of thoracolumbar fracture patients at Dr. M. Djamil Padang Central General Hospital in 2018-2022 is aged 15-64 years, which is included in the productive age group with the highest age being 51 years. This study's results align with research conducted by Glennie et al. on 390 thoracolumbar fracture patients at Thomas Jefferson University Hospital, Philadelphia, stating that the average age of thoracolumbar fracture patients was 44 years.[15] Other research that aligns with this is research conducted by Dai et al., which concluded that the average age of thoracolumbar fracture patients was 35.6 years.[17] However, some studies are not in line, namely research conducted by Jansson et al. which concluded that thoracolumbar fractures most often occur in patients aged > 69 years (56.72%).[18] Another study conducted by Oudshoorn et al. stated an increase of 81.7% in thoracolumbar fracture patients aged >65 years who came to the ER starting from 2012-2017.[19]

Thoracolumbar fractures are directly related to increasing age and the incidence of osteoporosis. Bone density decreases with increasing age. Bone density will begin to decline at the age of 40 years in both women and men, and this process will occur more rapidly in postmenopausal women.[20]

In the 15-64 year age group in this study, the number of male patients was higher than that of female patients (38.85 %). Female patients were more common in the > 64 years age group in this study (17.27%). These results are in line with research conducted by Wakim et al., which stated that women of older age had a higher proportion of thoracolumbar fractures compared to men. It is related to women being at higher risk of experiencing osteoporosis and decreased bone density compared to men.[21] Other aligned research was conducted by Ensrud et al., which states that the risk of women experiencing thoracolumbar fractures increases by 5-10% in those aged 50 to 59 years and increases by 30% in women aged >64 years.[22]

In this study, 67 patients (48.2%) were male and 72 (51.8%) were female. In the present study, the number of female patients was higher. This research aligns with Jansson et al.'s research on 13,496 thoracolumbar fracture patients in Sweden during 2013-2016, concluding that most

thoracolumbar fracture patients were female (57.82%).[18] However, this research is not in line with research conducted by Dai et al. on 147 thoracolumbar fracture patients at Xinhua Hospital, Shanghai, which stated that most thoracolumbar patients were male, 97 patients (65.99%).[17]

According to Bella et al., women are more at risk of experiencing fractures because there is a decrease in bone mass, which is associated with a decrease in estrogen hormone levels during menopause, which results in an imbalance between osteoblasts and osteoclasts.[23] Women who have experienced menopause have a 5.6 times risk of developing osteoporosis.[24] During menopause, osteoclasts will be more dominant than osteoblasts, resulting in a decrease in bone mass, which can cause women to tend to fracture more easily when experiencing light impacts.[25]

Research conducted by Rinonapoli et al. stated that men have a lower percentage of thoracolumbar fractures, namely around 5-6%.[26] This is different from women who have a percentage of 16-18%.[26] Another reason this fracture occurs more often in women is because of differences in spinal anatomy. Boechat et al. stated that the diameter of vertebral bodies differs between women and men. Women have a smaller transverse diameter and antero-posterior diameter compared to men.[27]

In men, testosterone levels are inversely correlated with the risk of thoracolumbar fracture. This hormone causes an increase in bone size and strength. In addition, testosterone has an important effect on muscle mass and balance, reducing the risk of falls. The decline in testosterone levels in men occurs more gradually than that in estrogen levels in women. This causes men to experience a decrease in bone mass 5-7 years slower than women.[26]

The perception of pain is higher in women than in men. Women will also be more aware of the importance of preventive healthcare and more likely to undergo regular check-ups. Apart from that, data from Statistical Indonesia states that women have a longer life expectancy than men, so the risk of thoracolumbar fractures will also increase. Women also often have greater awareness of their health and are more likely to seek medical care when they perceive a health problem.

The results of research on factors causing fractures showed that 54 patients (38.8%) had thoracolumbar fractures caused by high energy trauma, and 85 patients (61.2%) were caused by low energy trauma, so that low energy trauma is a causative factor of thoracolumbar fractures at Dr. M. Djamil Padang Central General Hospital 2018-2022. The results of this study are in line with research conducted by Almigdad et al., which stated that the most common factor causing thoracolumbar fractures is low energy trauma.[28] The results of this study are not in line with research conducted by Glennie et al., which concluded that the factors causing thoracolumbar fractures the most common were high energy trauma (55.7%).[15] Another study that is not in line with this research is that conducted by Widhiyanto et al. on 442 vertebral fracture patients, including 199 thoracolumbar fracture patients at Dr. Soetomo in 2013-2017, which concluded that the factors causing thoracolumbar fractures were falls from heights and traffic accidents, both of which are types of high energy trauma.[5]

The results of the study concluded that the most common causal factor was low-energy trauma because there were more female patients than male patients. Research conducted at the Royal Rehabilitation Center in Jordan in 2018-2021 stated that in men, more high thoracolumbar fractures occur due to high energy trauma, while in women, it is usually caused by low energy trauma.[28] A person is said to experience low energy trauma if fallen from a height of around 1 to 3 meters. Fractures caused by low energy trauma are related to weak bone components or bone density, so that slight pressure can cause fractures.[2] In women, there is weakness in bone components in the form of lower bone mass compared to men,

especially if women have entered menopause due to a decrease in the blood levels of the estrogen hormone.[17]

If it is related to the age of the sufferer, low-energy trauma occurs more often at the age of 15-64 years compared to high-energy trauma. However, this happens because, in this age range, most people are 51 years old. By the time a person reaches the age of 50 years, bone density has decreased; therefore, a fall from a low height can cause the patient to experience a thoracolumbar fracture. For those aged >64 years, only a few fractures are caused by high-energy trauma because many people are no longer working and the level of mobility has decreased, so that the most common cause is falls due to daily activities.

Young people or those of productive age have high levels of activity outside the home accompanied by high levels of mobilization; therefore, the risk of collisions, whether due to accidents while driving or falling from a height, is higher than that of older people. This is because activities outside the home are less common in old age or at an age that is no longer productive. High-intensity activities cause bones to continuously experience pressure beyond their normal capacity, increasing the possibility of bone fractures. Age is a risk factor for thoracolumbar fractures, which is associated with a degenerative process, namely osteoporosis, so minor impacts and low activity make it easier for fractures to occur.[24]

Based on the results of this study, falls from a height <3 m mainly occurred in women and were dominated by those aged 65 years. Apart from being related to a decrease in bone density levels that have entered the osteoporosis period, this is also caused by differences in body anthropometry between women and men. In women, having a larger pelvis with shorter leg lengths than men will increase the risk of women falling from low heights due to a low center of gravity, which can also result in women's balance being lower than men.[29]

Research results on the treatment of thoracolumbar fracture patients showed that 52 (37.4%) received conservative treatment and 87 (62.6%) received conservative and operative treatment. So, thoracolumbar patients at Dr. M. Djamil Padang Central General Hospital in 2018-2022 received the most conservative treatment accompanied by operative treatment. This research aligns with Glennie et al., who found that the most common treatment received by patients was operative treatment, namely 276 patients (70.8%) out of 390 patients.[15] Another similar study by Dai et al. concluded that operative treatment is the most common treatment for thoracolumbar fracture patients (63.63%).[17] However, some studies are not in line, namely research conducted by Jansson et al., which concluded that only a small number of patients received operative treatment for 856 patients (6.34%) of the 13,496 patients involved in their research.[18] According to Jansson et al., operative treatment is carried out if there is a strong indication that the patient has an unstable thoracolumbar fracture which is usually caused by high energy trauma, otherwise the possibility of operative treatment can performed on young patients and patients who have fractures in the lumbar spine because it is associated with the function of the lumbar spine as support for the upper body.[18]

In this study, most patients aged 15-64 years were classified as young or productive. Most of the fractures occurred in the lumbar region, so it is thought that this is the reason why many patients received conservative treatment accompanied by operative treatment and were strengthened by the discovery of fractures caused by high-energy trauma, even though the cause is dominated by low-energy trauma. Operative treatment is indicated when an unstable fracture occurs or affects the posterior column, causing neurological deficits. Vertebroplasty or kyphoplasty can be considered in patients who do not improve when given painkillers or the pain continues to arise so that it can interfere with the quality of life.[30] Operative treatment is carried out to overcome neurological deficits, provide stability to the spine and restore the patient's motor condition.[21]

Researchers realize that this study has many limitations. Therefore, researchers have proposed several avenues for future inquiry. First, Future research can further examine the relationship between variables, such as the relationship between age and factors causing thoracolumbar fractures, and analysis of the relationship between other factors. Second, Regular exercise can increase a person's muscle strength, thereby reducing the risk of falls, which is the cause of thoracolumbar fractures.

However, this study still has limitations. First, this research is a retrospective study that uses secondary data, so there are no detailed data related to causes other than the history of the disease in the medical record. Second, some of the data in the medical record were incomplete, such as the absence of casual factors and motor features; therefore, these data must be excluded from this research. Third, this study is still descriptive, and there is no analysis regarding the description of the characteristics of thoracolumbar fracture patients at Dr. M. Djamil Padang Central General Hospital.

CONCLUSION

Based on the results of research that has been carried out, regarding the description of the characteristics of thoracolumbar fracture patients at the orthopedic and traumatology outpatient clinic at Dr. M. Djamil Padang Central General Hospital for 2018-2022 there are several conclusions were obtained. The age of most sufferers is the productive age group aged 15-64 years, with the highest age being 51 years. The most common gender in this study was female. The most common causal factor is low-energy trauma. Patients with thoracolumbar fractures in this study received the most treatment, namely, operative and conservative.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ETHICAL APPROVAL

This study was approved by the Ethics Committee of Dr. M. Djamil Central General Hospital (Approval No. LB.02.02/5.7/251/2023). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

DATA AVAILABILITY

Owing to privacy restrictions, raw data cannot be made publicly available. However, aggregated and anonymized data are available from the corresponding author upon request.

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