



## Radiographic images of lumbosacral photos in patients of low back pain in RSUD pasar minggu period of july 2016-july 2017

Richard Yan Marvellini

Medical Faculty, Indonesian Christian University, Jakarta, Indonesia

### Abstract

This thesis discusses radiographic images of lumbosacral photos in patients with low back pain in Pasar Minggu Hospital in the period July 2016 - July 2017. Complaints of lower back pain are a symptom and are not a diagnosis where the causes are spondylolisthesis, osteoarthritis, fracture, sacralization. Several risk factors can cause complaints of lower back pain, namely age and sex. The purpose of this study was to determine radiographic images of lumbosacral photos in patients with low back pain in Pasar Minggu Hospital in the period July 2016 - July 2017. This study used a retrospective descriptive study using secondary medical data in patients with low back pain and 121 at Pasar Minggu Hospital. From this study, most low back pain patients were found in the age group > 45 years (100 or 82.6%), the highest sex was experienced by women (74 or 61.2%), most people with low back pain were caused by osteoarthritis (72 or 62.0%) in the age group > 45 years (59 or 48.8%) and often experienced by women (46 or 36.0%).

**Keywords:** low back pain, description, spondylolisthesis, osteoarthritis, fracture, sacralization

### Introduction

Low back pain or commonly called Low Back Pain (LBP), is a pain in the lower part of the spine or back, and it is a common disease. Low back pain is a symptom and not a diagnosis. Almost everyone has experienced low back pain in their lifetime. Pain experienced can be local pain or radicular pain, or both <sup>[1]</sup>. In some cases, the symptoms match the pathological diagnosis with high accuracy, but the diagnosis is uncertain and long-lasting <sup>[2]</sup>. In daily practice, patients often find complaints of low back pain, a problem for health in the community. The World Health Organization (WHO) states that approximately 150 types of musculoskeletal disorders are suffered by hundreds of millions of people that cause long-lasting pain and inflammation and disability or functional limitations, causing psychological and social disturbances for sufferers. One of the causes of pain is low back pain, the most common complaint among other pain complaints <sup>[3]</sup>. This report relates to the designation of the 2000-2010 decade by WHO as the bone and joint decade (Bone and Joint Decade 2000-2010), where musculoskeletal disorders have become a common problem in health care centres around the world. Almost 70-80% in developed countries have experienced low back pain. Every year 15-45% of adults suffer from low back pain, and one in 20 sufferers must be hospitalized for acute attacks. LBP often occurs at the age of 35-55 years, and almost 80% of the population in industrialized countries have experienced it. In developed countries such as the United States, the prevalence in one year ranges from 15-20%, while based on patient visits to the doctor is 14.3% <sup>[4]</sup>. Research in the pain study group of the Indonesian Neurologist Association (PERDOSSI) in May 2002 showed the number of sufferers of low back pain was 18.37% of all pain patients. Population studies in the northern coast of Java Indonesia found an incidence of 8.2% in men and 13.6% in women. In Jakarta, Yogyakarta and Semarang hospitals, the incidence is around 5.4 – 5.8%, and the

highest frequency is 45-65 years <sup>[1]</sup>. Epidemiological data regarding low back pain in Indonesia is still incomplete <sup>[5]</sup>. It is estimated that 40% of the population of Central Java aged over 65 years have suffered from low back pain, and the prevalence in men is 18.2% and in women is 13.6%. This prevalence increases according to the increasing age of incidence based on patient visits in several hospitals in Indonesia, ranging from 3-17%.

Low back pain can occur if the individual has several risk factors such as age, gender, occupation, education and lifestyle such as smoking, weight, and others. If low back pain has occurred for more than six weeks, it is necessary to enforce a red flag or a red flag for low back pain because 80-90% of cases of low back pain can heal in less than six weeks. Red flags are danger signs that appear in people with low back pain that must be considered. There are several red flags to watch out for, such as pain duration lasting more than six weeks, the onset of pain at the age of fewer than 18 years or over 50 years, weight loss, presence of fever, night sweats, and pain worsening when coughing, sitting or sitting and swallow <sup>[6]</sup>.

Supporting examinations can be carried out in radiological examinations through X-rays, CT scans, MRIs, myelograms, or discograms to diagnose low back pain. CT scans and MRIs have good results but are also relatively expensive. Myelogram examination can also be used for low back pain. Lumbar plain radiographs are the most widely used investigation for low back pain because there are many tools and relatively cheap prices <sup>[7]</sup>.

Based on the description above, the researcher wanted to know more about the radiographic picture of the lumbosacral photo in patients with low back pain at Pasar Minggu Hospital. It is hoped that through this research, relevant and valuable data will be obtained to add insight, and of course, for further consideration in making better and objective medical decisions in the future, especially for people with low back pain. Based on the background above,

the problem can be formulated as follows "How is the radiographic picture of the lumbosacral photo in patients with low back pain at Pasar Minggu Hospital for the period July 2016 - July 2017?" to know the radiographic picture of lumbosacral photos in patients with low back pain at Pasar Minggu Hospital for the period July 2016 to July 2017.

### Literature Review

Low back pain is a pain in the back area between the lower costal angle (ribs) to the lumbosacral (around the tailbone). Pain may also radiate to other areas such as the upper back and groin [8]. Low back pain is one of the musculoskeletal disorders caused by poor body activities [9], and low back pain is also defined as acute pain in the fifth lumbar and sacral segments (L5-S1). Pain in the lower back felt by the patient can occur clearly or vaguely and diffuse or localized [10].

Based on the clinical course, low back pain is divided into three categories, namely: a) Acute Low Back Pain - Acute low back pain is characterized by pain that attacks suddenly and lasts for a short time, from a few days to a few weeks less than six weeks. Low back pain can be caused by a traumatic injury such as a car accident or a fall, and the pain may go away after a while. This incident can damage tissue but can also injure muscles, ligaments and tendons. In more severe accidents, fractures of the lumbar and spinal regions may still heal on their own; b) Subacute Low Back Pain - Subacute low back pain is pain that is felt for 6 to 12 weeks [11], and c) Chronic Low Back Pain - Pain in chronic low back pain can last for more than 12 weeks. This pain can be repeated or recur. This phase usually has an insidious onset and resolves over a long period [11].

In general, spondylolisthesis describes a condition where the vertebrae move anteriorly or posteriorly from the vertebra below. It occurs because of a defect between the superior and inferior facet joints in the interarticular. The pars interarticularis is the vertebral plate that connects the superior and inferior articular facets of the vertebrae. Unilateral or bilateral defects in lesions or fractures in the pars interarticularis area without causing displacement are known as spondylolysis. Spondylolysis and spondylolisthesis most commonly involve the L5 vertebra, although L4 can also be affected and rarely occurs at a more proximal level [12, 13].

Based on the cause, spondylolisthesis is classified into five types: Dysplastic, Isthmic, Degenerative, Traumatic, and Pathological.

Osteoarthritis (OA) is a chronic degenerative disorder with multifactorial causes of articular cartilage breakdown, subchondral bone changes, synovial inflammatory response, and cartilage overgrowth. In the spine, intervertebral disc degeneration and osteophyte formation at the same vertebral level have been used to define OA of the lumbar spine, otherwise known as spondylosis. OA can cause joint pain, is usually worse with weight-bearing and activity and can manifest with stiffness after inactivity. Primary osteoarthritis is mainly related to ageing, whereas secondary osteoarthritis is caused by other diseases or conditions [14, 15]. The sacralization of the lumbar vertebra, commonly referred to as the lumbosacral vertebral transition (LSTV), occurs due to congenital anomalies in the segmentation of the lumbosacral spine. LSTV includes the involvement of L5 at the sacrum or S1 to the lumbar vertebra. Sacralization means the addition of a sacral element by the fusion of the

fifth lumbar vertebra. Fusion of the fifth lumbar vertebra with the sacrum may be unilateral or bilateral in producing partial or complete sacralization. Complete sacralization consists of a complete bony union between the abnormal curvature of the process and the sacrum [16].

Spinal fractures can range from relatively mild ligament and muscle strains to fractures and dislocations of the vertebral bones that cause injury to the spine. Spinal fractures and dislocations can pinch, compress and even tear the spinal cord. Fractures can occur anywhere along the spine and are most common in the thoracolumbar region (T12-L1) [17].

There are many classifications for the incidence of fractures, but spinal fractures are generally divided into three categories: fractures, dislocations, and fractures-dislocations. It occurs when the bone has been damaged, and ligaments are torn. These fractures are usually unstable, tend to be very debilitating, and are most often treated with surgery [17]. Several risk factors can influence the onset or aggravation of low back pain, namely age, gender, and occupation [18].

Smokers are more at risk of developing low back pain than nonsmokers.

It is thought to be caused by a decrease in the oxygen bound supply to haemoglobin and a reduction in blood oxygen due to nicotine narrowing arteries. Smoking habits can cause back pain because smokers have blood circulation problems, including the spine [19]. Smoking habits will reduce lung capacity due to the content of carbon monoxide so that the ability to consume oxygen decreases, and as a result, the level of freshness decreases. If the person concerned performs a task that requires exertion, he will quickly get tired because the oxygen content in the blood is low, carbohydrate burning is inhibited, lactic acid buildup occurs, and eventually, muscle pain occurs [20]. The habit of drinking alcohol, coffee and cigarettes is associated with osteoporotic events, while lack of movement or exercise causes poor tissue flexibility [21].

Pain is a very subjective feeling, and its severity is greatly influenced by personal opinion and the circumstances under which back pain can vary significantly from one person to another. Symptoms include pain, stiffness, numbness/numbness, leg weakness, tingling sensations (such as pins and needles) [22, 23]. The pain can start from the back, but the pain can radiate down the buttocks, legs and even feet. Typical myofascial pain is characterized by pain and tenderness in the area concerned (trigger points), loss of range of motion of the involved muscle group (range of motion) and radicular pain limited to the peripheral nerves. The pain itself often goes away when the muscle group is stretched.

Pain-sensitive structures contain nociceptive (pain) receptors stimulated by various local stimuli (mechanical, thermal, chemical). This stimulus will be responded to by releasing various inflammatory mediators that will cause pain perception. Pain mechanism is protection that aims to prevent movement so that the healing process is possible. One form of protection is muscle spasm, which in turn can cause ischemia [24]. Pain that arises can be inflammatory in the tissue with inflammatory mediators or neuropathic pain caused by a primary nervous system lesion.

Neuropathic irritation of nerve fibres can cause two possibilities. First, the suppression occurs only on the nociceptor-rich nerve sheathing nerve nevorum, which causes inflammatory pain. Pain is felt along the nerve fibres

and increases with stretching of the nerve fibres, for example, due to movement. In this condition, biomolecular changes occur where the accumulation of Na ion channels and other ions occurs. This buildup causes the emergence of mechano-hot spots that are very sensitive to mechanical and thermal stimuli [25].

Pain stimuli can be mechanical, thermal or thermal stimuli, chemical and mixed, received by receptors consisting of accessible nerve endings with specifications. Here an action potential occurs, and these impulses are transmitted to the pain centre. Nerve fibres originating from the receptor to the ganglion enter the posterior horn and change neurons. Here there are two neuro groups: (a) the alternating neurons in lamina I, which then cross the linea media to form an anterolateral pathway that goes directly to the thalamus, and this system is called the neospinothalamic system, which delivers pain stimuli quickly. Group (b) synapses in lamina V and then crosses the median line to form anterolateral pathways and synapses in the reticular substance of the brainstem and the thalamus. This system is called the paleospinothalamic system, which delivers chronic, less localized pain [26].

Experiments of the last decade have demonstrated the existence of a descending pain system, which inhibits pain. The periaqueductal area and nucleus raphe Magnus are essential parts of this system. Stimulation in this place will inhibit pain.

The patient's active movement should be assessed, paying attention to which movements are causing pain and also the shape of the vertebral column, reduced lordosis and the presence of scoliosis. Reduction to loss of lumbar lordosis may be due to paravertebral muscle spasm [25]. Movements that need attention in patients: a) Limited movement on one side or direction; b) Extension to the back often causes pain in the legs when there is stenosis of the intervertebral foramen in the lumbar and lumbar arthritis because this movement will cause narrowing of the foramen causing a compression of the spinal nerves; c) Forward flexion typically causes leg pain in the presence of a herniated nucleus pulposus, due to tension on the inflamed nerve above a protruding disc, thereby increasing pressure on the spinal nerve by increasing pressure on adjacent fragments; d) The location of the herniated nucleus pulposus can usually be determined if the patient is asked to bend forward to the right and left laterals and flexion forward, to one side or laterally causing pain in the ipsilateral leg indicates a herniated nucleus pulposus on the same side; e) Pain on the back extension in a young adult suggests a possible spondylolysis or spondylolisthesis, but this is not pathognomonic [25].

The presence of tenderness in the skin can indicate a possible underlying psychological condition. Sometimes it can be determined the location of the segment causing pain by pressing on the intervertebral space or by moving the spinous process to the right while observing the patient's response. In severe spondylolisthesis, a step-off may be felt on palpation at the affected site/level. Pressing with the thumb on the spinal process is done to look for fractures in the vertebrae. Other physical examinations focus on neurological abnormalities. Symmetrically diminished or absent reflexes are not very useful in diagnosing low back pain, nor can they be used to localize the level of the abnormality, except in the cauda equina syndrome or the presence of concomitant neuropathy. The patellar reflex

mainly indicates disturbance of the L4 root and less than L2 and L3. The heel reflex is predominant from S1. In addition to that, pathological reflexes such as Babinski should be sought, especially if hyperreflexia indicates an upper motor neuron disorder.

Laseque sign: indicates tension in the spinal nerves, especially L5 or S1. Clinically, the laseque sign is performed by flexing the knee first, then at the hip until 90°, then slowly and gradually doing knee extension and this movement will produce pain in the patient's leg, especially in the calf (positive test) and the pain will decrease when the knee is flexed. This test is modified by elevating the leg with the knee in a state of extension (straight leg rising). The other laseque sign modifications were all considered positive if they caused radicular pain. The laseque method that causes pain in the contralateral leg is a sign of possible disc herniation. In laseque's sign, the smaller the angle made to cause pain, the more likely root compression is to cause it, likewise, with the contralateral laseque sign. The laseque sign is the best preoperative sign for a herniated nucleus pulposus, seen in 96.8% of 2157 patients who were surgically proven to have a herniated nucleus pulposus and in large and complete hernias, this sign was positive in 96.8% of patients. It should be noted that the Laseque sign is age-related and is less common in the elderly than in the young (< 30 years).

The contralateral laseque sign is performed in the same way, but when the painless leg is elevated, it elicits a positive response in the affected contralateral leg and indicates the presence of a herniated nucleus pulposus.

Bragard test is a more sensitive modification of the laseque test. The method is the same as the laseque test with added dorsiflexion of the foot. Sicard test: Same as laseque test, but with added dorsiflexion of the big toe. Valsalva test: The patient is asked to strain/cough, and the test is said to be positive if pain occurs [25].

On routine laboratory examination, it is essential to see erythrocyte sedimentation rate (ESR) and peripheral blood morphology (important to identify infection or myeloma), calcium, phosphorus, uric acid, alkaline phosphatase, acid phosphatase, prostate-specific antigen (if prostate carcinoma metastases are suspected), and serum protein electrophoresis (myeloma protein). In exceptional cases, the tuberculin test or Brucella test, rheumatoid factor test, and Human Leukocyte Antigen classification (if ankylosing spondylitis is suspected) can be checked [26].

X-rays (preferably if the patient is standing) in the anteroposterior, lateral, and oblique positions are often performed for routine examination of low back pain and sciatica. The radiological picture often looks normal, or sometimes there is the narrowing of the intervertebral disc space, osteophytes in the facet joints and calcium deposition in the vertebrae, shifting of the vertebral bodies (spondylolisthesis), bone infiltration by tumours. Narrowing of the intervertebral space is occasionally seen with a tense and straightened position and scoliosis due to paravertebral muscle spasm [27].

CT scan is an effective diagnostic tool when the vertebral and neurologic levels are apparent due to bone abnormalities. MRI (73-80% accuracy) is usually empathetic in herniated nucleus pulposus and will show multiple prolapses. However, neurosurgeons and orthopaedic surgeons still need electromyography (EMG) to determine the most affected disc.

**Research Methodology**

The method used in this research is the descriptive-analytical method. Retrospective data collection in July 2016 – July 2017 using secondary data taken from medical records at Pasar Minggu Hospital, DKI Jakarta. This research was conducted in the medical record section of Pasar Minggu Hospital, DKI Jakarta. The time required to conduct this research and writing is September 2017 – November 2018. The population in this study is medical record data obtained at the Radiology section of Pasar Minggu Hospital from July 2016 – July 2017. The sample in this study is the medical record data of back pain patients in the Radiology section of Pasar Minggu Hospital for July 2016 – July 2017. The sample required in this study is 10% of the total population. The sampling technique was carried out randomly using a simple random sampling technique. Data collection was carried out using secondary medical record data obtained from the Radiology section at Pasar Minggu Hospital. Data processing is done by using the SPSS version 24.0 program. Data is presented in graphical form.

**Result and Discussion**

This study was conducted by taking secondary data on low back pain patients treated at Pasar Minggu Hospital in July 2016 – July 2017. The medical record data used were patients with complaints of low back pain with an age limit of 25-65 years, both outpatients and outpatients at Pasar Minggu Hospital in July 2016 – July 2017. The total low back pain population was 1,214 cases at Pasar Minggu Hospital from July 2016 to July 2017. Sampling was 10% using a simple random sampling method from 1,214 data. One hundred twenty-one data were obtained randomly that entered the inclusion criteria.

In this study, the radiographic examination results of lumbosacral photos were spondylolisthesis, osteoarthritis, sacralization, and fracture. Of the 121 samples that participated in this study, the respondents' ages ranged from 25 years to 65 years. The age group of respondents was divided into young adults (< 35 years), adults (35-44 years) and the elderly (> 45 years).

The overall picture is found in low back pain patients with clinical symptoms, namely pain, stiffness, numbness, weakness, and tingling. From the data collection results, a description of the characteristics of the respondents included the results of the radiographic image of the lumbosacral photo, age and gender.

**Table 1:** Results of Radiography Based on Age Frequency Distribution

Age (year)	Frequency	%
< 35	4	3,3
35-44	17	14,0
> 45	100	82,6
Total	121	100,0

Based on age in this study, there were four people in the age group < 35 years (3.3%), the age group 35-45 years as many as 17 people (14.0%), the age group > 45 as many as 100 people (82.6%), where the youngest patient was 26 years old, and the oldest was 64 years old.

**Table 2:** Results of Radiography Based on Frequency Distribution of Sex

Age (year)	Frequency	%
Male	47	38,8
Female	74	61,2
Total	121	100,0

Based on the sex of the 121 respondents, 47 people (38.8%) were male, and 74 (61.2%) were female.

**Table 3:** Frequency Distribution of Lumbosacral Photo Radiography Results

Lumbosacral radiography results	F	%
Spondylolisthesis	21	17,4
Osteoarthritis	75	62,0
Sacralization	3	2,5
Fracture	22	18,2
Total	121	100,0

From the table above, the data obtained from the results of the lumbosacral radiography in patients with low back pain are osteoarthritis as many as 75 people (62.0%), followed by fractures as many as 22 people (18.2%) and spondylolisthesis as many as 21 people (17.4%) then the last sacralization was only three people (2.5%). The results of the lumbosacral radiographic images in patients with low back pain were the highest for osteoarthritis.

Following previous research conducted by Mutmainna *et al.* in 2014 in Manado, the highest radiographic data results were in patients with osteoarthritis as many as 55 people (42.96%). Some of the risk factors for osteoarthritis are lousy posture habits, stress, body type and lumbar vertebral degeneration. Degenerative changes in the lumbar spine can be asymptomatic and symptomatic.

**Table 4:** Results of Cross-Age Tabulation with Lumbosacral Photo Radiography

Age (Year)	Lumbosacral Photo Radiography Results								Total	
	Spondylolisthesis		Osteoarthritis		Sacralization		Fracture			
	F	%	F	%	F	%	F	%	F	%
< 35	1	0,8	2	1,7	0	0,0	1	0,8	4	3,3
35-44	1	0,8	14	11,6	2	1,7	0	0,0	17	14,0
> 45	19	15,7	59	48,8	1	0,8	21	17,4	100	82,6
Total	21	17,4	75	62,0	3	2,5	22	18,2	121	100,0

From the cross-tabulation results of age with lumbosacral radiographs, the highest spondylolisthesis was 19 people (15.7%) in the age group > 45 years ago. 0.8%), as well as the highest osteoarthritis in the age group > 45 years, were 59 people (48.8%) followed by the age group 35-44 years were 14 people (11.6%) and age <35 years were two people (1.7%). In the table above, the results show the highest

sacralization at the age of 35-44 years were two people (1.7%) and the lowest in the <35 years age group were 0 people (0.0%), while the highest fracture was 21 people (17, 4%) in the age group > 45 years and the lowest was at the age of 35-44 years were 0 people (0.0%). The largest group being the results of radiographic images of lumbosacral osteoarthritis were 75 people (62.0%).

These data follow the theory previously described, that patients who are over 35 years of age will be more at risk of suffering from back pain because the level of complaints will continue to increase in line with increasing age. It happens because muscle strength and endurance begin to decrease in old age, so the risk of muscle complaints increases.<sup>20</sup> When viewed from the table above were 100 people (82.6%) aged > 45 years suffer the most from low back pain, especially in osteoarthritis were as 75 people (62.0%). This finding is similar to the research conducted by

Kiranjat Kaur in 2015 in Gianyar, which showed that of the 70 samples studied, the most respondents were aged > 45 years, totalling 30 people (42.9%), while for the age group 35-44. years old amounted to 26 people (37.1%), for the age group <35 years there were 14 people (20.0%).<sup>38</sup> Based on the results of Adelia's research in 2007, it was found that complaints of low back pain were increasing until the age of about 55 years. Age is a factor that supports the occurrence of low back pain.

**Table 5:** Results of Sex Cross Tabulation with Lumbosacral Photo Radiography

Gender	Lumbosacral Photo Radiography Results								Total	
	Spondylolisthesis		Osteoarthritis		Sacralization		Fracture		F	%
	F	%	F	%	F	%	F	%		
Male	11	9,1	29	24,0	2	1,7	5	4,1	47	38,8
Female	10	8,3	46	38,0	1	0,8	17	14,0	74	61,2
Total	21	17,4	75	62,0	3	2,5	22	18,2	121	100,0

Based on the results above, the respondent's data shows that spondylolisthesis in men is 11 people (9.1%) with a not too much difference in women as many as ten people (8.3%), then the highest incidence of osteoarthritis in women is 46 people (38.0%), and men as many as 29 people (24.0%). The highest incidence of sacralization was experienced by two men (1.7%) and one person (0.8%), and men experienced the lowest data as many as five people (4.1%). In the table above, the highest frequency data is experienced by women as many as 74 people (61.2%).

In a study conducted by Purnamasari *et al.* at Margono Soekarjo Hospital, Purwokerto, in 2010, 50 cases of low back pain were found in women (60.98%) and 32 people (39.02%) in men <sup>[28]</sup>. Men and women had the same risk of low back pain complaints until 60 years. Things that can trigger complaints of low back pain in women are, among others, during the menstrual cycle. In addition, the menopause process can also cause a decrease in bone density due to a decrease in the hormone estrogen, allowing for back pain.

**Conclusion**

From the results of a retrospective descriptive study conducted at Pasar Minggu Hospital for the period July 2016 - July 2017 the following conclusions can be drawn: a) The number of low back pain patients with lumbosacral radiographs at Pasar Minggu Hospital for the period July 2016 - July 2017 which included the inclusion criteria were as many as 121 people; b) The age group > 45 years is the age group that often complains of low back pain as many as 100 people (82.6%); c) From the gender of the sufferers, the most experienced by women as many as 74 people (61.2%); d) It was found that the majority of low back pain patients with lumbosacral radiographs at Pasar Minggu Hospital for the period July 2016 - July 2017 were caused by osteoarthritis as many as 72 people (62.0%); e) From the results of the lumbosacral radiographs in patients with low back pain caused by osteoarthritis as many as 72 people (62.0%) and experienced by the age group > 45 years as many as 59 people (48.8%); and f) The sex that often suffers from low back pain with a lumbosacral radiograph is women as many as 74 people (61.2%) with the highest cause being osteoarthritis as many as 46 people (36.0%).

**References**

1. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q,

Ferreira ML, Genevay S *et al.* What low back pain is and why we need to pay attention. The Lancet,2018;391(10137):2356-2367.  
 2. D'Souza N, Delisle TG, Chen M, Benton S, Abulafi M. Faecal immunochemical test is superior to symptoms in predicting pathology in patients with suspected colorectal cancer symptoms referred on a 2WW pathway: a diagnostic accuracy study. Gut,2021;70(6):1130-1138.  
 3. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S *et al.* What low back pain is and why we need to pay attention. The Lancet,2018;391(10137):2356-2367.  
 4. Youlden DR, Cramb SM, Yip CH, Baade PD. Incidence and mortality of female breast cancer in the Asia-Pacific region. Cancer biology & medicine,2014;11(2):101.  
 5. Novitasari DD, Sadeli HA, Soenggono A, Sofiatin Y, Sukandar H, Roesli RM. Prevalence and characteristics of low back pain among productive age population in Jatiningor. Althea Medical Journal,2016;3(3):469-476.  
 6. Della-Giustina D. Evaluation and treatment of acute back pain in the emergency department. Emerg Med Clin North Am,2015;33(2):311-326.  
 7. Ahidjo A, Ayough SN, Nwobi IC, Garba I, Njiti MM, Abdullahi A. Common Radiographic Findings in Patients with Low Back Pain a Major Nigerian Teaching Hospital. Common Radiographic Findings in Patients with Low Back Pain a Major Nigerian Teaching Hospital,2012;26:1-7.  
 8. Towfigh S. Obscure groin pain in women. In The Art of Hernia Surgery. Springer, Cham, 2018, 183-186.  
 9. Beck A, Fleming III JF, Rolfe KW. Right Groin Pain and Limp 28. Surgery: A Case Based Clinical Review, 2015, 299.  
 10. Kadry HM, El Sharkawy O, El Essawy N, Taha AA. Back to Groin; Re-Knocking the Door.... The Egyptian Journal of Plastic and Reconstructive Surgery,2020;44(4):487-494.  
 11. Romero-Muñoz LM, Barriga-Martín A, Segura-Fragoso A, Martín-Gonzalez C. Are Modic changes in patients with chronic low back pain indicative of a worse clinical course? 10 years of follow-up. Revista Española de Cirugía Ortopédica y Traumatología (English Edition),2018;62(4):274-281.

12. Celestre PC, Montgomery SR, Kupperman AI, Aghdasi B, Inoue H, Wang JC. Lumbar clinical adjacent segment pathology: predilection for proximal levels. *Spine*,2014;39(2):172-176.
13. Stanitski CL. Spondylolysis and spondylolisthesis in athletes. *Operative Techniques in Sports Medicine*,2006;14(3):141-146.
14. Ostalowska A, Birkner E, Wiecha M, Kasperczyk S, Kasperczyk A, Kapolka D *et al.* Lipid peroxidation and antioxidant enzymes in synovial fluid of patients with primary and secondary osteoarthritis of the knee joint. *Osteoarthritis and cartilage*,2006;14(2):139-145.
15. Engesæter LB, Engesæter IØ, Fenstad AM, Havelin LI, Kärrholm J, Garellick G *et al.* Low revision rate after total hip arthroplasty in patients with pediatric hip diseases: Evaluation of 14,403 THAs due to DDH, SCFE, or Perthes' disease and 288,435 THAs due to primary osteoarthritis in the Danish, Norwegian, and Swedish Hip Arthroplasty Registers (NARA). *Acta orthopaedica*,2012;83(5):436-441.
16. Mahato NK. Variable positions of the sacral auricular surface: classification and importance. *Neurosurgical focus*,2010;28(3):E12.
17. Buchowski JM, Kuhns CA, Bridwell KH, Lenke LG. Surgical management of posttraumatic thoracolumbar kyphosis. *The Spine Journal*,2008;8(4):666-677.
18. Serranheira F, Sousa-Uva M, Heranz F, Kovacs F, Sousa-Uva A. Low Back Pain (LBP), work and absenteeism. *Work*,2020;65(2):463-469.
19. Sandén B, Försth P, Michaëlsson K. Smokers show less improvement than nonsmokers two years after surgery for lumbar spinal stenosis: a study of 4555 patients from the Swedish spine register. *Spine*,2011;36(13):1059-1064.
20. Anekwu EM. Responses of Lactic Acid, Blood Pressure And Blood Oxygen Saturation to Aerobic Exercise Among Amateur Athletes and Non-Athletes (Doctoral dissertation, University of Nigeria), 2016.
21. Forstein DA, Bernardini C, Cole RE, Harris ST, Singer A. Reducing the Risk of Osteoporotic Fracture. *Journal of Osteopathic Medicine*,2013;113(s21):5-24.
22. Ling CY, Loo FC, Hamedon TR. Playing-related musculoskeletal disorders among classical piano students at tertiary institutions in Malaysia: proportion and associated risk factors. *Medical problems of performing artists*,2018;33(2):82-89.
23. Borenstein DG. *Back in Control!: A Conventional and Complementary Prescription for Eliminating Back Pain.* Rowman & Littlefield, 2003.
24. Gillani S, Cao J, Suzuki T, Hak DJ. The effect of ischemia reperfusion injury on skeletal muscle. *Injury*,2012;43(6):670-675.
25. Paredes JI, Villar-Rodil S. Biomolecule-assisted exfoliation and dispersion of graphene and other two-dimensional materials: a review of recent progress and applications. *Nanoscale*,2016;8(34):15389-15413.
26. Dorsher P. *Fibromyalgia: A Unifying Neuroendocrinologic Model for Understanding Its Pathophysiology.* Nature Precedings, 2008, 1-1.
27. Borenstein D, Calin A. *Fast facts: low back pain.* Karger Medical and Scientific Publishers, 2012.
28. Purnamasari H, Gunarso U, Rujito L. Overweight sebagai faktor resiko low back pain pada pasien Poli Saraf RSUD Prof. Dr. Margono Soekarjo

Purwokerto. *Mandala of Health*,2010;4(1):26-32.