JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

RELATIONSHIP BETWEEN AGE AND GENDER WITH SPECIFIC LOW BACK PAIN IN PKU MUHAMMADIYAH BANTUL HOSPITAL

Aulia Nissa Dewantari[1*], Rahma Greta Perdana Putri[2], Ana Budi Rahayu[3], Elvina Prisila[4]
[1]Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
[2]Department of Anatomical Pathology, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta
[3]Department of Neurology, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta
[4]Department of Radiology, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta

Keywords:
Age,
gender,
risk factor,
specific low back pain

Received: 6 February 2025
Revised: 15 April 2025
Accepted: 16 April 2025
Available online: 1 July 2025

Corresponding Author:
E-mail: aulia1800034049@webmail.uad.ac.id

ABSTRACT

Background: Low back pain is defined as pain localized below the 12th costal margin to the lower gluteal fold. Specific low back pain is caused by pathological mechanisms as the cause of complaints. Age and gender are risk factors for low back pain. **Objective**: to find out the relationship between age and gender with specific low back pain at PKU Muhammadiyah Hospital Bantul. **Method:** This study used a cross-sectional design with the Chi-Square analysis test. Data were taken from the medical records of PKU Muhammadiyah Bantul Hospital in October - November 2021 with a sample of 96 respondents. **Results:** Specific low back pain was more common in aged ≥ 35 years were 50 persons (98.0%), while aged <35 years was 1 person (2%). Among them, women were the majority (64.7%), while the men only 35.3%. The underlying diagnosis of specific low back pain included 42 people (82.4%) experiencing intervertebral disc disorder, spondylolisthesis as many as 4 people (7.8%), scoliosis as many as 2 people (3.9%), fracture compression as many as 2 people (3.9%), and spondylolysis as many as 1 person (2%). Bivariate analysis obtained p value = 0.003. While the gender factor with specific low back pain showed p value = 0.968. **Conclusion:** This study shows that there is a significant relationship between age and specific low back pain and there is no relationship between gender and specific low back pain.

INTRODUCTION

Musculoskeletal disorders are physical complaints that arise or influenced by many factors and causes. One manifestation caused by musculoskeletal disorders is musculoskeletal pain. This pain is based on disorders in the musculoskeletal system consisting of bones, joints, muscles, nerves, cartilage, tendons, ligaments, and joint bursae.[1] Based on The Global Burden of Disease, Injury, and Risk Factors Study 20121, low back pain is the largest contributor to disability to Years Lived with Disability (YLD).[2] In 2020, low back pain affected 619 million people worldwide and the number of cases is estimated to increase to 843 million cases by 2050. This is largely due to population expansion and aging. The prevalence of this disease increases with age up to 80 years, while the highest number of cases of low back pain occurs at the age of 50-55 years. Non-specific low back pain is the most common (around 90% of cases).[3] The prevalence of low back pain in Indonesia as a whole reaches 49% and is the most common musculoskeletal complaint.[4]

In Yogyakarta, there was an increase in productive age and elderly age reaching 70.04% in 2020 and population age ≥35 years has a 4.583 times risk of experiencing low back pain. The female gender in Yogyakarta is 50.45% and women will be 2.053 times more at risk of experiencing low back pain.[5] Around 80% of low back pain due to degeneration processes, incorrect positions, and sudden movements in work activities is a risk of trauma to the intervertebral discs, facet joints,

JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

muscles, and ligaments so that it can cause changes in the musculoskeletal anatomical structure. The incidence of non-specific low back pain in primary health facilities reaches around 90% of all cases of low back pain.[6] In secondary health facilities, the results obtained showed that specific causes of low back pain included Herniated Nucleus Pulposus at 55.9%, followed by lumbar spondylosis at 29.4%, and spondylolisthesis at 14.7%.[7] This study aims to determine the relationship between age and gender with specific low back pain at PKU Muhammadiyah Hospital Bantul.

METHODS

This study was conducted after obtaining permission from the ethics committee of PKU Muhammadiyah Bantul Hospital number: F11/364/H.1/XI/2021. This type of research is an analytical observational study with a cross-sectional research design. The sampling technique in this study was carried out by purposive sampling. The population in this study was taken from low back pain patients at the PKU Muhammadiyah Bantul Hospital, neurology clinic in October - November 2021. The minimum sample size was calculated using the Slovin formula and the results were 96 respondents. The inclusion criteria used were low back pain patients who visited the PKU Muhammadiyah Bantul Hospital neurology clinic in October - November 2021. Meanwhile, low back pain patients who had visceral diseases (kidney disease, pelvic organ disease, aortic aneurysm, gastrointestinal disease) and psychogenic diseases would be excluded as research samples.

This research was carried out through a comprehensive assessment of clinical signs, reported symptoms, and relevant supporting investigations documented in the medical records. Based on these findings, cases were subsequently classified into non-specific and specific categories. Specific low back pain arises due to an identifiable disease or structural issue in the spine, such as herniated disc, spinal stenosis, vertebral fractures, infections (e.g., osteomyelitis), tumors, inflammatory diseases (e.g., ankylosing spondylitis). Specific low back pain has abnormal findings on imaging. The patient in this study underwent X-ray, MRI, and CT scan. Whereas nonspecific low back pain is frequently associated with soft tissue strain, improper posture, mechanical causes, or lifestyle factors. They show no red flag symptoms and have no abnormal findings suggestive of structural or systemic causes on examination or imaging. However, if red flag symptoms are present but subsequent supporting examinations do not confirm any serious pathology, the condition is still classified as non-specific low back pain.

Data collection used secondary data sources in the form of medical records of low back pain patients at the PKU Muhammadiyah Bantul Hospital, neurology clinic. Data was collected in a medical record. Determination of the diagnosis of low back pain is seen based on the diagnosis stated in the medical record. After completing the data collection, data analysis was carried out. Data analysis in this study consisted of univariate and bivariate analysis. The univariate analysis of this study aims to determine the characteristics of the research respondents and the diagnosis of specific low back pain. While the bivariate analysis aims to analyze the relationship between age and specific low back pain and the relationship between gender and specific low back pain. Bivariate analysis was performed using the Chi-Square test with a significance level of 0.05 ($\alpha = 0.05$).

The result of this study may be influenced by confounding variables such as physical activity levels, psychosocial factors (anxiety, stress, or depression), occupational risks, lifestyle habits (smoking, sedentary behavior). The design of this study has limitations in comprehensively controlling for confounding variables, including comorbid conditions such as diabetes mellitus, obesity, depression/anxiety, or chronic pain syndrome.

RESULTS

Respondent Characteristics

The characteristics of respondents in this study provide an overview of the frequency distribution of respondents based on age, gender, and cause of low back pain. in patients at PKU Muhammadiyah Bantul Hospital which can be seen in table 1.

JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

Table 1. Characteristics respondent study

Variables	Frequency (n)	Percentage (%)	p value*
Age			
< 35	12	12.5	0,000
≥ 35	84	87.5	
Gender			
Male	35	36.5	0.008
Female	61	63.5	
Causes of Low Back Pain			
Non- specific	45	46.9	0.540
Specific	51	53.1	

*Data tested using normality test Chi-Square

The basic characteristics of the frequency distribution of respondents have been tested for normality using the Chi-square method. In the calculation of data for the age variable, the p value was obtained 0.000 (p value <0.05), meaning that the frequency distribution of respondents is not normal. Meanwhile, the calculation of the normality test on gender data obtained a p value of 0.008 (p value <0.05), meaning that gender data is not normally distributed. However, for the frequency distribution of respondents according to the cause of low back pain, a normal data distribution was obtained with a p value of 0.540 (p value > 0.05).

Table 2. Distribution frequency of pain patients low back specific based on diagnosis

Diagnosis	Frequency (n)	Percentage (%)
Spondylolisthesis	4	7.8
Spondylolysis	1	2.0
Intervertebral disc disorder	42	82.4
Scoliosis	2	3.9
Fracture Compression	2	3.9
Total	51	100%

Table 2, show that the 51 cases of specific low back pain, the underlying diagnosis of specific low back pain in patients at PKU Muhammadiyah Bantul Hospital included 42 people (82.4%) experiencing intervertebral disc disorder, followed by spondylolisthesis in 4 people (7.8%), scoliosis in 2 people (3.9%), fracture compression in 2 people (3.9%), and spondylolysis in 1 person (2%).

Bivariate Analysis

Based on table 3, the number of patients aged ≥ 35 years who experienced specific low back pain was 50 people (98.0%), while patients aged ≥ 35 years who experienced non-specific low back pain were 34 people (75.6%). Then for patients aged <35 years who experienced specific low back pain, there was 1 person (2.0%), while patients aged <35 years who experienced non-specific low back pain were 11 people (24.4%).

Chi-Square test shows that the p value is 0.003 which means it is smaller than the significance value of 0.05 (p <0.05), so there is a significant relationship between age and specific low back pain. In this study, the Prevalence Ratio (PR) value was 7.143 (PR = 7.143) and the confidence interval range was 1.085-47.036 (CI = 1.085-47.036) which means that age is a risk factor for specific low back pain. Based on the PR results, it can be stated that age ≥ 35 years has a 7.143 higher chance of experiencing specific low back pain compared to age <35 years.

In table 3, it is known that the number of female patients who experienced specific low back pain was 33 people (64.7%), while female patients who experienced non-specific low back pain were 28 people (62.2%). Male patients who experienced specific low back pain were 18 people (35.3%), while male patients who experienced non-specific low back pain were 17 people (37.8%).

Chi-Square test obtained a p value of 0.968 which means it is greater than the significance value of 0.05 (p>0.05), meaning that there is no relationship between gender and specific low back pain. In this study, the Prevalence Ratio value was 1.052 (PR=1.502). These results indicate that female gender is not necessarily a risk factor for specific low back pain.

JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

Table 3. Relationship between age and gender with specific low back pain

		Low Back Pain				Total		p value	PR (95% CI)
		Specific		Non- specific					
		(n)	(%)	(n)	(%)	(n)	(%)		
Age	≥ 35	50	98.0	34	75.6	84	87.5	0.003	7,143 (1,085-47,036)
	< 35	1	2.0	11	24.4	12	12.5		
Gender	Female	33	64.7	28	62.2	61	63.5	0.968	1.052 (0.708-1.564)
	Male	18	35.3	17	37.8	35	36.5		

DISCUSSION

Respondents in this study were predominantly aged ≥35 years (87.5%). This study can be said to be in line with the study conducted by Hasyim & Triastuti that low back pain is mostly experienced by people aged ≥35 years (73.2%).[8] The study by Pandjukang et al also showed that low back pain is more often experienced by patients aged 35 years and over (94.9%).[9] In another study, the most cases of low back pain occurred in the 41-50 year age group and were not found in the 0-10 year and 11-20 year age groups.[10] This is because at the age of 35 years, tissue damage and fluid reduction in the intervertebral disc structure begin to occur so that bone and muscle stability decreases. It can be said that the older the age, the higher the risk of decreased elasticity in the muscles and bones which triggers musculoskeletal symptoms.[4] The results of another study conducted by Akbar & Ardiansyah (2015) stated that the age of 51-60 years experienced the most low back pain with non-traumatic.[10] This study is in line with the study conducted by Rosari on computer users at PDAM Tirta Asasta (p value = <0.05).[11] In fact, a study conducted by Syuhada et al with bivariate analysis of the relationship between age and low back pain obtained a p value = 0.777 (OR = 0.725; 95% CI = 0.237- 2.218).[12] In this study, the results showed that those aged 35 years and over had a 7.143 higher chance of experiencing specific low back pain. However, until now researchers have not found other studies that really discuss the relationship between age and the incidence of specific low back pain.

Female gender is more numerous with a percentage of 63.5%. This is in line with research conducted by Umboh et al that low back pain is mostly experienced by people with female gender (88.7%).[13] In another study, the number of low back pain patients with female gender is also more than male with a percentage of 54.16%.[14] Akbar & Ardiansyah's research also shows that low back pain is mostly experienced by female patients (63.5%).[10] This is because men have a greater amount of muscle than women, which contributes to greater maximal strength. In terms of muscle metabolism during exercise, women oxidize more fat but less carbohydrates and amino acids than men. Male muscles show a faster relaxation rate than female muscles.[15] This can be supported by the theory that explains that sex hormones in women plays an important role in the etiology and pathophysiology of various musculoskeletal degenerative diseases that cause specific low back pain. The underlying mechanism of sex differences in pain perception is associated with the influence of sex hormones. After menopause, women experience greater disc space narrowing than men of the same age. This is related to physiological changes due to the relatively lower levels of sex hormones after menopause in women.[16] Another theory is pain coping strategies have been found to differ between men and women. Men tend to use problem-focused strategies to manage pain, while women tend to need social support and emotion-focused techniques.[17]

Until now, researchers have not found any other research in Indonesia related to the causes of low back pain with non-specific and specific categories. Thus, this study is the only study that categorizes low back pain into 2 groups, non-specific and specific. However, there is another study that discusses the causes of low back pain with non-trauma and trauma categories. The study was conducted by Akbar & Ardiansyah (2015) which showed that the most common cause of low back pain was due to trauma, which was 51.9%.[10]

JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

Based on table 2, it can be seen that specific low back pain is caused by several underlying diagnoses. Increasing age is closely related to the emergence of various musculoskeletal diseases such as osteoporosis, degenerative disc disease, narrowing of the intervertebral disc, and others. The causes of specific low back pain in this study are vary, including spondylolisthesis, spondylolysis, intervertebral disc disorder, scoliosis, and fracture compression.[18]

Degeneration can arise related to age, among others, due to dry discs, fissures, disc narrowing, the presence of osteophytes, inflammatory changes, and subchondral sclerosis. Intervertebral disc disorder characterized by degeneration of one or more of the discs that separate the bones of vertebra. Degenerated discs are prone to herniation, disc can tear so that the nucleus prolapses out into the spinal canal, the protruding disc can press the spinal nerves that can cause numbness and weakness from the spinal cord affected.[19] Spondylolysis is an anatomical abnormality of the vertebra or fracture of the pars interarticularis vertebra that can occur in the lumbar vertebrae, 85% L5 and 15% L4. Spondylolysis can occur due to a degenerative process that will disrupt the function and structure of the vertebrae and can develop into spondylolisthesis.[20] Spondylolisthesis is a condition where the position between adjacent vertebrae shifts, causing pain. The degeneration process continues slowly until it causes pain that can interfere with activities. The vertebrae degenerate with the formation of osteophytes on the edges of the joints, causing narrowing of the intervertebral discs.[21]

Although the introduction of this study notes that non-specific low back pain accounts for the majority of cases in the general population, the findings of this study revealed that most patients experienced specific low back pain. This apparent discrepancy may be attributed to the study setting, which was conducted in a type C hospital. Some of the patients in this study were referrals from primary healthcare facilities due to unresolved symptoms or the presence of serious signs, requiring further evaluation. As a result, the potential for specific causes was more likely to be detected through additional examinations. However, there were also patients who presented with already severe symptoms. This referral pattern and availability of diagnostic resources introduce a selection bias that likely contributed to the higher proportion of specific low back pain cases observed in this study.

This study uses a cross-sectional design, which is only studied in a short period of time and only to prove the conditions that occurred at the time of the study. The completeness of the data depends on the availability of information from the data sources used in this study, namely medical records. This study cannot include variables such as length of service, length of service, work position, physical activity, Body Mass Index (BMI), and smoking habits to be studied because these variables are not recorded in medical records.

CONCLUSION

The incidence of specific low back pain in PKU Muhammadiyah Bantul was found that specific low back pain in respondents aged ≥ 35 years was 50 people (98.0%) and women were more than men, namely 33 people (64.7%). The underlying diagnosis of specific low back pain included 42 people (82.4%). There is a relationship between age and specific low back pain and there is no relationship between gender and specific low back pain.

This study highlights the high prevalence of specific low back pain among patients in a type C hospital setting, particularly among those referred from primary care or presenting with severe symptoms. These findings emphasize the importance of early identification and management of specific causes of low back pain to prevent progression and reduce the burden on tertiary care facilities.

It is recommended that primary healthcare providers be trained to recognize early signs of specific low back pain and improve referral practices. In addition, further longitudinal studies are needed to explore long-term outcomes and to evaluate the effectiveness of early interventions at the primary care level.

A recommendation for future research is to conduct the study in primary healthcare facilities, with follow-up on examination results if respondents are referred to secondary healthcare facilities. This aims to prevent discrepancies in the proportion of non-specific and specific cases, as secondary healthcare facilities generally accumulate patients who have not shown improvement, leading to a dominance of specific low back pain cases.

JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

ETHICAL APPROVAL

An ethical clearance was obtained from the Health Research Ethics Commission Universitas Ahmad Dahlan with No. 012111082.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING

No specific funding was provided for this article.

AUTHOR CONTRIBUTIONS

Conceptualization, AND and RGPP; methodology, EP; software, AND; validation, RGPP, and ABR; investigation, RGPP; data curation, EP, RGPP, AND; writing—review and editing, RGPP and ABR; supervision, RGPP; project administration, EP.

ACKNOWLEDGMENTS

This research was supported by the Department of Neurology, faculty Medicine, Universitas Ahmad Dahlan, and PKU Muhammadiyah Bantul Hospital.

REFERENCES

1. Ardyatma C, Romadho YA, Dewi LM. Perbedaan Angka Kejadian Nyeri Muskuloskeletal Antara Pria dan Wanita pada Kelompok Tani Nira di Dusun Ngudi Mulyo Pajangan Bantul. Univ Muhammadiyah Surakarta. 2015.
2. GBD 2021 Low Back Pain Collaborators. Global, regional, and national burden of low back pain, 1990–2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. Lancet Rheumatol. 2023;5:e316-29.
3. WHO. Low Back Pain [Internet]. 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/low-back-pain
4. Kreshnanda IPS. Prevalensi dan Gambaran Keluhan Low Back Pain (LBP) pada Wanita Tukang Suun di Pasar Badung, Januari 2014. E-Jurnal Med. 2016;5(8).
5. Sinaga TA, Makkiyyah FA. Faktor Yang Mempengaruhi Nyeri Punggung Bawah Pada Usia Dewasa Madya di Jakarta dan Sekitarnya Tahun 2020. Semin Nas Ris Kedoktran. 2021;2(1):44–52.
6. Bardin LD, King P, Maher CG. Diagnostic triage for low back pain: a practical approach for primary care. Med J Aust. 2017;206(6):268–73.
7. Goin ZZ, Pontoh LM, Umasangadji H. Karakteristik Pasien Nyeri Punggung Bawah di Poliklinik Rehabilitasi Medik Rumah Sakit Daerah Kota Tidore Kepulauan Periode Januari-Juni 2019. Kieraha Med J. 2019;1(1):44–53.
8. Hasyim R, Triastuti N. Hubungan Usia, Masa Kerja, Merokok dan IMT dengan Kejadian Low Back Pain (LBP) pada Penjahit Konveksi. Fak Kedokt Univ Muhammadiyah Surakarta [Internet]. 2020.
9. Pandjukang AP, Hutasoit RM, Damanik EMB. Hubungan Usia dan Jenis Kelamin pada Penderita Nyeri Punggung Bawah (Low Back Pain) dengan Komorbid Diabetes Melitus di RSUD Prof. Dr. W. Z. Johannes Kupang Tahun 2018. Cendana Med J. 2020;(1):9–15.
10. Akbar SMS, Ardiansyah M. Profil Distribusi Nyeri Punggung Bawah Di RSU PKU Muhammadiyah Yogyakarta Tahun 2005-2007 Ditinjau Dari Berbagai Faktor. J Kedokt Yars. 2015;23(1):35–44.
11. Rosari ET. Hubungan Posisi Duduk dan Karakteristik Individu terhadap Keluhan Low Back Pain Pada Karyawan Pengguna Komputer di PDAM Tirta Asasta Tahun 2019. UPN Veteran Jakarta Fak Ilmu Kesehat. 2019;
12. Syuhada AD, Suwondo A, Setyaningsih Y. Faktor Risiko Low Back Pain pada Pekerja Pemetik Teh di Perkebunan Teh Ciater Kabupaten Subang. J Promosi Kesehat Indones. 2018;13(1):91–100.
13. Umboh B, Rattu JAM, Adam H. Hubungan Antara Karakteristik Individu dengan Keluhan Nyeri Punggung Bawah pada Perawat di Ruangan Rawat Inap RSU GMIM Pancaran Kasih Manado. Kesmas. 2017;6(3).
14. Olanda O, Arina CA. Prevalensi dan Karakteristik Low Back Pain pada Karyawan Bank BNI Cabang Kawasan Industri Medan. Dr Diss Univ Sumatera Utara. 2021.
15. Ansdell P, Thomas K, Hicks KM, Hunter SK, Howatson G, Goodall S. Physiological sex differences affect the integrative response to exercise : acute and chronic implications. Exp

JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : 10.14710/jkd (dmj).v14i4.49322
JKD (DMJ), Volume 14, Number 4, July 2025 : 176-182

Physiol. 2021;105(12):2007–21.
16. Wáng YXJ, Wáng J q, Káplár Z. Increased low back pain prevalence in females than in males after menopause age : evidences based on synthetic literature review. Quant Imaging Med Surg. 2016;6(2):199–206.
17. Meints SM, Edwards RR. Evaluating Psychosocial Contributions to Chronic Pain Outcomes. Prog Neuropsychopharmacol Biol Psychiatry. 2018;87(Pt B):168–82.
18. Riningrum H, Widowati E. Pengaruh sikap kerja, usia, dan masa kerja terhadap keluhan low back pain. 2016;6(2):91–102.
19. Wu A, March L, Zheng X, Huang J, Wang X, Zhao J, et al. Global low back pain prevalence and years lived with disability from 1990 to 2017 : estimates from the Global Burden of Disease Study 2017. Ann Transt Med. 2020;8(6).
20. Shamrock AG, Donnally CJ, Varacallo MA. Lumbar Spondylolysis and Spondylolisthesis. In: StatPearls [Internet] [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK448122/
21. Gagnet P, Kern K, Andrews K, Elgafy H, Ebraheim N. Spondylolysis and spondylolisthesis : A review of the literature. J Orthop. 2018;15(2):404–7.