# THE ASSOCIATION BETWEEN DEGENERATIVE SPINE DISEASE ON MRI OF THE LUMBAR SPINE AND FUNCTIONAL DISABILITY

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DISCLAIMER

I declare that this dissertation records the results of the study performed by me and that it is of my own composition.

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(MEOR AHMAD TERMIZI BIN TAJRI)
Date:

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| | |
|---|---|
| FJOA | Facet joint arthropathy |
| DDD | Disc degenerative disease |
| LBP | Low back pain |
| MRI | Magnetic resonance imaging |
| PDI | Pain disability index |
| ODI | Oswestry disability index |
| PACS | Pictures archiving and communication system |

**HUBUNGAN ANTARA PENYAKIT TULANG BELAKANG DEGENERATIF PADA MAGNETIC RESONANCE IMAGING (MRI) TULANG BELAKANG LUMBAR DAN KETIDAKUPAYAAN FUNGSI.**

## ABSTRAK

**Pengenalan:** Penyakit tulang belakang degeneratif adalah salah satu penyakit tulang belakang yang boleh menyebabkan ketidakupayaan berfungsi seseorang. Pelbagai bentuk soal selidik terdapat didalam menentukan ketidakupayaan berfungsi seseorang. Tujuan kajian ini adalah untuk menyelidik dan menentukan hubungan antara penyakit tulang belakang degeneratif pada MRI tulang belakang lumbar dan ketidakupayaan berfungsi. Terdapat pelbagai sebab penyakit tulang belakang degeneratif. Didalam kajian ini, kami ingin menyelidik tentang penyakit yang melibatkan penyakit arthropati sendi facet, cakera degeneratif, dan pelanggaran akar saraf.

**Kaedah**: Pesakit dengan penyakit tulang belakang degeneratif telah menjalani Magnetic Resonance Imaging (MRI) dan imej yang telah diambil dilihat pada Sistem Pengarkiban dan Komunikasi Gambar (PACS). Imej MRI pesakit yang menunjukkan sendi faset dengan penyakit cakera degeneratif / pemampatan akar saraf pada tahap vertebra L4 / L5 atau L5 / S1 dipilih dalam untuk kajian ini. Pesakit ini diberikan salinan soal selidik. Soal selidik ini dijawab oleh pesakit terpilih dalam masa satu jam. Setiap salinan soal selidik menghasilkan tahap (gred) kecacatan, iaitu, kecacatan minimum (0-20%), kecacatan sederhana (21-40%), kecacatan teruk (41-60%), lumpuh (61-80%) , dan pesakit tidak tidur (81-100%).

**Keputusan:** Sejumlah 137 subjek kajian direkrut dalam kajian ini. Peserta berumur

lebih dari 40 tahun merangkumi sekitar 82% subjek kajian dimana jumlah lelaki dan wanita hampir sama. Manakala sebahagian besar subjek kajian adalah dari kalangan kaum Melayu, diikuti oleh kaum Cina dan India. Peratusan pesakit dengan pesakit osteoartritis sendi facet pada MRI pada aras L4/L5 dan L5/S1 masing-masing 51 (37%) dan 86 (63%). Dari analisis regresi logistik, penyakit cakera degeneratif pada MRI pada aras L4/L5 dan L5/S1 tidak menunjukkan interaksi yang signifikan dengan kecacatan fungsi menggunakan Pain Disability Index (PDI) pada pesakit dengan osteoartritis sendi facet. Analisis regresi logistik gred PDI berbanding berbanding kemampatan akar saraf, tidak menunjukkan interaksi yang signifikan antara satu sama lain. Walau bagaimanapun, terdapat interaksi yang signifikan antara PDI dan tahap vertebra yang terlibat.

**Kesimpulan:** Kajian kami telah menunjukkan bahawa sendi faset dengan cakera degeneratif/mampatan akar saraf tidak mempunyai kaitan yang signifikan dengan kecacatan fungsi. Walau bagaimanapun, tahap vertebra L5/S1 memberikan tahap PDI yang signifikan.

**Kata kunci:** Osteoartritis sendi facet, vertebra tulang belakang lumbar, kecacatan fungsi, indeks kecacatan kesakitan.

**THE ASSOCIATION BETWEEN DEGENERATIVE SPINE DISEASE ON MRI OF THE LUMBAR SPINE AND FUNCTIONAL DISABILITY**

## ABSTRACT

**Introduction:** Degenerative spinal disease is one of the spinal conditions that can cause a person to be unable to work. Various forms of questionnaires are available in determining the lack of function. The purpose of this study was to investigate and determine the relationship between degenerative spinal diseases on MRI lumbar spine and work disability. Various causes of degenerative spine disease. In this study, we wanted to investigate the different such as facet joint arthropathy, degenerative disc disease, and nerve root impingement.

**Methodology:** Patients with degenerative spine disease were undergone a Magnetic Resonance Imaging (MRI) and Images that have been taken were viewed on Pictures Archiving and Communication System (PACS). The patient's MRI images showed facet joint with degenerative disc disease/nerve root compression at the level of L4/L5 or L5/S1 vertebra were requirted. This patient were given a copy of the questionnaire. This questionnaire were answered by the selected patients within one houre. Each copy of the questionnaire produced the degree (grade) of disability, i.e., minimum disability (0-20%), moderate disability (21-40%), severe disability (41-60%), crippled (61-80%), and the patient is bedbound (81-100%). Using logistic regression analysis, the associations between the functional disability (PDI score) and the binary outcomes of the three study focuses were analysed.

**Results:** A total of 137 study subjects were recruited in this study. The participants over 40 years old constitute about 82% of the study subjects. The proportion of male to female was almost similar. At the sa me time, the majority of the study subject was Malays, followed by Chinese and Indians. The proportion of the patient with facet joint osteoarthritis patients on MRI at the level L4/L5 and L5/S1 were 51 (37%) and 86 (63%), respectively. From the logistic regression analysis, the degenerative disc disease on MRI at the level L4/L5 and L5/S1 showed no significant interaction with the functional disability using Pain Disability Index (PDI) in a patient with facet joint osteoarthritis. On the other hand, the logistic regression analysis of PDI grades versus nerve root compression in patient with facet joint osteoarthritis also shows no significant interaction with each other. However, there is significant interaction between the PDI and level of vertebral involved.

**Conclusions:** Our study shows that facet joint with degenerative disc disease/nerve root compression has no significant association with functional disability. However, the different level of vertebral involved gives a significant level of PDI.

**Keywords:** Facet joint osteoarthritis, lumbar spine vertebra, functional disability, pain disability index (PDI), association.

# CHAPTER 1: BACKGROUND

## 1.1 INTRODUCTION

Approximately 15% of cases in a younger patient and about 30% of patients older than 60 years old are suffer from lower back pain due to facet joint arthropathy. Facet joint pain is the second most common cause of chronic lower back pain. The facet joints are the hinge joints in the spine that allow trunk flexion and resist extension and rotation. Facet joints are synovial joints and as such, have the same essential parts as the other mobile joints in the human body such as the knee, shoulder, hip, and finger. This is the reason their technical name in the spine is zygapophyseal joints. These paired diarthrodial joints in the vertebral column's posterior aspect are the only true synovial joints between adjacent spinal levels in humans.

Facet joint arthropathy is the most common causes of low back pain, which in turn has an enormous impact on the healthcare systems and functional disability [Suri P *et al.,2013*]. Many risk factors for facet joint osteoarthritis have been proposed, including age, sex, overweight, physical trauma, occupational factors, and smoking [Atsushi Fujiwara et al., 1999]. In the lumbar region, age is strongly associated with prevalent joint arthropathy [Atsushi Fujiwara et al., 1999].

The concept of functional disability defines the disability as any long-term limitation in any activity resulting from a health problem condition [Gellhorn AC., 2013]. In this study, we would like to assess the functional disability due to low back pain. According to Arnstein et al. [1998], pain is the most common predictor of the degree to which people will have disabilities [Arnstein P *et al.*, 1998]. The people who suffer from pain, whether acute or chronic, because of their injury might increase the possibilities to be functionally disabled.

Some researchers believe that disability is associated with self-efficacy beliefs. Self-efficacy beliefs are defined as personal judgments of how well a person believes they can perform specific behaviours in particular situations.

Although low back pain (LBP) and neck pain represent complex disorders that are best addressed within the framework of a biopsychosocial model, a precise evaluation of the part that joint arthropathy plays in this context has been largely neglected. About half of the adults suffer from neck pain and two-thirds from LBP at some point in their lifetime. In the lumbar spine, referred pain is predominantly found in the buttock and the thigh. Pain radiation past the knee is rare.

There is a variety of self-report questionnaires that had been developed to assess the disability of a person due to pain. These questionnaires allow respondents to make their judgment on their ability to complete the daily task and leisure activities, as well as the task that involves their role in the workplace [Gauthier N *et al.*, 2008]. Some of the standard questionnaires that always being used in the research field are Roland-Morris Questionnaire (RMQ), Pain Disability Index (PDI), Orebro Musculoskeletal Pain Screening Questionnaire (OMPSQ), Visual Analog Scale (VAS) and Oswestry Disability Index (ODI).

A study done by Adel Maataoui et al. [2014] has shown that there is a weak correlation between facet joint osteoarthritis and functional disability [Adel Maataoui et al, 2014]. However, there are no other criteria that can cause lower back pain. Therefore, we performed this study to determine the association between degenerative spine disease and functional disability

## 1.2 OBJECTIVES

### 1.2.1 General objective:

To determine the association between the degenerative spine disease on MRI of the lumbosacral and functional disability.

### 1.2.2 Specific objectives:

1. To determine the proportion of the patient with facet joint osteoarthritis patients on MRI at the level L4/L5 and L5/S1.

2. To determine the association between degenerative disc disease on MRI at the level L4/L5 and L5/S1 with the functional disability using Pain Disability Index (PDI) in a patient with facet joint osteoarthritis.

3. To determine the association between L4/L5 and L5/ S1 nerve root compression and the functional disability using the Pain Disability Index (PDI) in a patient with facet joint osteoarthritis.

# CHAPTER 2: LITERATURE REVIEW

Over the past decades, we have come to appreciate that spinal degeneration involves a complex interplay of biologic and biomechanical events that are causing the increasing prevalence of back pain recurrence [Fitzell P *et al.*, 2006]. The prevalence of low back pain in developed countries is estimated to range from 10 to 31% [Hoy D *et al.*, 2012, Walker BF *et al.*, 2004]. In Malaysia, the prevalence of back pain was found to be 12%, and it was rated as the ninth and fifth most common complaint in public and private primary healthcare clinics, respectively, between August to November 2012 [Sivasampu S *et al.*, 2014]. Low back pain is causing increased socioeconomic implications concerns [Sivasampu S *et al.*, 2014]. The most common cause of lower back pain in Malaysia is degenerative spine disease, such as degenerative disc disease, facet joint osteoarthritis, and nerve root impingement. Other causes include infections, inflammatory, and malignancy [Malaysian Low Back pain Guideline., 2015]. Our study concentrated on facet joint osteoarthritis, degenerative disc diseases, and nerve root impingement.

The facet joints are articulations structure in the posterior arch of the vertebrae. They are an important part of the posterior column that provides structural stability to the vertebral column. These joints are surrounded by a fibrous capsule and connect the vertebrae's superior and inferior articular facets. The posterior ligamentous complex such as facet joint capsule, ligamentum flavum, interspinous ligament, and supraspinous ligament are important elements that keep the facet joints and the vertebrae in a fixed position. Injury of this complex can result in subluxation or dislocation of the facet joint [Dieter Schellinger *et al.*, 1987]. The facet joints consist of two articular surfaces, which are true synovial joints, unlike the intervertebral disc. The prime lubricant for the joint and the nutritional source for the joint surface cartilage is synovial fluid, which is produced by the facet joints [Dieter Schellinger *et al.*, 1987]. Like in

all synovial lined joints, arthrosis is a continuum between loss of joint space narrowing, loss of synovial fluid or cartilage, and bony overgrowth [Walker BF *et al.*, 2004].

In many cases, degenerative facet disease already begins before the age of 20 [Abbas *et al.*, 2011]. No gender preference is noted in this disease [Cynthia Peterson *et al.*, 2003]. It is probably related to mechanical loading, minor repetitive trauma, a form of predisposition or a combination of these factors [Faure M *et al.*, 1995]. Symptoms and signs of facet joint osteoarthritis are non-specific and can be variable due to its progressive nature. Most commonly, it gives rise to a mechanical type of neck or back pain, but it can also be asymptomatic [Faure M *et al.*, 1995]. Studies have shown that facet joints are clinically important spinal pain generators [Marchiori *et al.*, 1996]. Once diagnosed, the patients who have symptomatic facet joint disease can benefit from specific, targetted interventions [Perolat R *et al.*, 2018].

Diagnosis of facet-mediated spinal pain is difficult. History and physical examination may suggest, but cannot confirm, the facet joint as the source of pain [Hancock MJ *et al.*, 2007]. Imaging, especially MRI, is frequently used to examine patients with back pain. It can provide the root cause of the pain [Hancock MJ *et al.*, 2007]. Most literature focuses on intervertebral discs; however, it is increasingly apparent that the facet joints also play a major role in low back pain [Hancock MJ *et al.*, 2007]. Facet joint osteoarthritis is functionally related to degenerative disc disease. It affects structures in the vertebral column's anterior aspect [Gellhorn AC *et al.*, 2013].

Intervertebral disc degeneration is the other common cause of low back pain. Intervertebral disc is pads of fibrocartilage-based structures that provide support, flexibility, and minor load-sharing. These discs are primarily composed of two layers: a soft, pulpy nucleus pulposus on the inside of the disc and a surrounding firm structure known as the annulus fibrosus [Adel Maataoui *et al.*, 2014]. A disruption of the normal architecture of these round discs can lead to a disc herniation or a protrusion of the inner nucleus pulposus, possibly applying pressure to the spinal cord or nerve root and resulting in radiating pain and specific locations of weakness [Chester J. Donnally III *et al.*, 2020]. Lumbar degenerative disc disease (DDD) is a progressive condition that exists along a continuum of pathologic processes. The disease starts as desiccation of the nucleus pulposus, followed by annular tearing, diffuse disc bulging, and disc space collapse. The degenerative process can occur over the decades, culminating in substantial debilitation [Ujjwal K Debnath *et al.*, 2018].

The healthy spinal disc has relatively high fluid levels. Prolonged sitting, poor posture, and traumatic events can deplete these fluid levels [Perolat R *et al.*, 2018]. When the fluid levels are low, the spinal disc is classified as a degenerated or desiccated disc. Although often seen in the elderly, nowadays, it can affect young, healthy individuals [Perolat R *et al.*, 2018]. A study done in Japan shows that there is a relationship between disc degeneration and facet joint osteoarthritis. However, this paper showed that disc degeneration is more closely associated with ageing than with facet joint osteoarthritis [Atsushi Fujiwara *et al.*, 1999]. MRI exams are the best diagnostic test for the disc as it reveals disc hydration or fluid levels [Atsushi Fujiwara *et al.*, 1999]. A degenerated disc could cause impingement of the spinal cord or the exiting nerve roots, giving rise to pain.

The spinal cord runs through a canal in the centre of these bones. The nerve roots then split from the cord and travel between the vertebrae into various areas of the body. When these nerve roots become pinched or damaged, the resulting symptoms are called radiculopathy [John Hopskins *et al.*, 2001]. When radiculopathy occurs in the lower back, it is known as lumbar radiculopathy. It is also referred to as sciatica because nerve roots that make up the sciatic nerve are often involved. The lower back is the area most frequently affected by radiculopathy. There are many causes of nerve root impingement [Chester J. Donnally III *et al.*, 2020]. In our study, our main concern is radiculopathy caused by degenerative spine disease. More than 90% of herniated discs occur at the L4-L5 or the L5-S1 disc space, which will impinge on the L4, L5 or S1 nerve root [Chester J. Donnally III *et al.*, 2020]. This is because of the increase in loading burden at this level.

One of the main problems of degenerative spine disease is the occurrence of pain. Besides, all people who suffer from pain will often have a certain degree of functional disability. According to Arnstein et al., pain is the most reliable predictor for the degree to which people will experience disabilities [Arnstein P *et al.*, 1999]. Functional disabilities are often assessed using questionnaires. The most important reason why these questionnaires are always being used in the research field is that it is simple and easy to administer and score. Therefore, it provides much help to the researcher in completing their study [Gauthier N *et al.*, 2008]. Besides, it is validated to be used in the studies involving disability due to pain [Weishaupt D *et al.*, 2007].

Nowadays, there is a variety of self-report questionnaires that had been developed to assess the disability of a person due to pain. Some of the standard questionnaires that always being used in the research field are Roland-Morris Questionnaire (RMQ), Pain Disability Index

(PDI), Orebro Musculoskeletal Pain Screening Questionnaire (OMPSQ), Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) [Gauthier N *et al.*, 2008]. These questionnaires allow respondents to make their judgment on their ability to complete the daily task and leisure activities, as well as the task that involves their role in the workplace [Gauthier N *et al.*, 2008]. The Pain Disability Index (PDI) is a comprehensive but straightforward questionnaire because it comprises questions covering all aspects of daily living activity [Gauthier N *et al.*, 2008]. PDI help to measure the degree of daily lives activity disruption secondary to chronic pain. The respondent will answer seven types of questions, which will cover the assessment of the home, social, recreational, occupational, sexual, self-care and life support activities distruption.

A study was done in Germany to correlate facet joint osteoarthritis (FJOA) and functional disability (using the ODI method). The result shows no significant correlation between FJOA and ODI on both sides of the lumbar vertebra at the L4/5 and the left side of the lumbar vertebra at the L5/S1. However, there is a weak positive correlation between ODI and FJOA on the right side of the lumbar vertebra at the L5/S1 [Adel Maataoui *et al.*, 2014]. Another study conducted for correlation between intervertebral disc degeneration (IDD) and functional disability (also using the ODI method) shows a statistically significant positive correlation between ODI and IDD for the lumbar vertebral levels L4/5 and L5/S1 [Marcus Middendorpa *et al.*, 2017]. However, no study was done using the Pain Disability Index (PDI) in correlation with facet joint osteoarthritis or degenerative disc disease in our literature review.

## 2.2 Rationale of The Study

Facet joint arthropathy of the lumbar is well known as a cause of low back and lower extremity pain. This disease can concurrently present with any other disease association, such as degenerative disc disease, disc herniation, and nerve root compression. These illnesses could affect functional disability. We want to study the association between facet joint osteoarthritis with functional disability. The Pain Disability Index (PDI) is a tool to assess functional disability. It contains questions concerning the patient's ability to cope with everyday life activity. If there is a correlation between FJOA and PDI, this can be used to assess and predict the patients' disability before treatment. Therefore, treatment planning and execution can be tailored to manage the patient holistically.

# CHAPTER 3: METHODOLOGY

### 3.1 Study Design

Cross-sectional study.

### 3.2 Study Location and Duration

This study was conducted in the Department of Radiology, Hospital Universiti Sains Malaysia (HUSM) from June 2020 until December 2020.

### 3.3 Study Population and Sample

a) Target population: All patients who were appointed for MRI lumbosacral.

b) Source population: Patients who underwent MRI lumbosacral study in HUSM Radiology department MRI room from June 2020 until December 2020.

### 3.4 Sampling Technique

Convenience sampling method was used for this study.

### 3.5 Inclusion Criteria

1. Patient aged above 18 years old.
2. MRI evidence of facet joint osteoarthritis alone or with degenerative disc disease/ nerve root impingement at L4/L5 and L5/ S1 vertebrae.

### 3.6 Exclusion Criteria

1. Patient with premorbid having spine disease such as tumour/ malignancy, fracture, scoliosis, or infection.
2. Patient with images that have an artefact or not interpretable.

3. History of spinal surgery, radiotherapy, or facet joint injection.

### 3.7 Sample Size Calculation

The sample size was calculated using sample size calculator ver. 1.7 (in Microsoft Excel spreadsheet) which was downloaded from website (http://www.medic.usm.my/biostat). The sample size is calculated using the single-propotion formula and two-mean formula. The required sample size is 179 [Appendix A].

### 3.8 Research Tools

All subjects underwent MR imaging at the MRI room in the Radiology Department, HUSM using Philips 3 Tesla Achieva MR scanner (Philips, Best Netherland) after informed consent was obtained. A standard spine coil was used.

The imaging protocol included sagittal T2-weighted fast spin-echo images (TR 2850, TE 102) with the following parameters: matrix 512, a field of view 300 mm, slice thickness 4 mm, interslice gap 0.4mm, number of excitations 2; axial T2-weighted fast spin-echo images (TR 3550, TE 90) with the following parameters: matrix 448; a field of view 210 mm; slice thickness 4 mm; interslice gap 0.4mm, number of excitations 2. The Proton Density sequence is not applicable in this study as T1 weighted images, and T2 weighted images are adequate for our study. Unless there is abnormality or mass seen at the nerve root regions, then we have to proceed with PD and contrasted study for further evaluation. This abnormality will be informed to the primary team (ortho/neuro) for further management. As a result, this patient is

excluded from our study. All the images are transfers to PACS viewer Version 6 (Chicago, Illinois USA) for reporting.

All patients with MRI images that meet the inclusion and exclusion criteria will be given questionnaires. The candidates are given 30minutes to one hour to complete the questionnaires.

The Pain Disability Index (PDI) is the way of how to measures functional disability. The questionnaire is designated to measure the degree of functional disability that are disrupted by chronic pain. The respondents are asked to respond to each category by indicating the overall impact of pain, not just when it is at its worst.

Each respondent needs to circle the number on the scale that describes the level of disability. A total of seven questions that describes life activities were asked in the questionnaire. A score of 0 means no disability at all, and a score of 10 signifies that all of the activities in which the respondent would usually be involved have been totally disrupted or prevented by the pain. The scores as below:

Total scores are divided according to the severity:

| Severity (percentage) | Interpretation |
|---|---|
| 0%-20% | Minimal disability;<br>The patient can cope with most living activities. |
| 21%-40% | Moderate disability;<br><br>The patient experiences more pain and difficulty with sitting, lifting and standing. Travel and social life are more difficult, and they may be disabled from work. Personal care, sexual activity and sleeping are not grossly affected. |
| 41%-60% | Severe disability;<br>Pain remains the main problem in this group, but activities of daily living are affected. |
| 61%-80% | Crippled;<br>Back pain impinges on all aspects of the patient's life. |
| 81%-100% | Patients are bedbound;<br>These patients are either bed-bound or exaggerating their symptoms. |

*Fairbank JCT & Pynsent, PB (2000) The Oswestry Disability Index. *Spine,* 25(22):2940-2953.

Davidson M & Keating J (2001) A comparison of five low back disability questionnaires: reliability and responsiveness. *Physical Therapy* 2002;82:8-24

** Due to compliance with the local ethical sensitivity, the question about sexual functions was excluded.

### 3.9 Data Collection

Each subject will be given a research number that will be used to identify the subjects. Subject's information, including age, gender, and measurement, will be collected by the researcher. These data were recorded in the data collection sheet and labelled with a serial research number to maintain the subject's privacy and confidentiality.

### 3.10 Image Analysis

All 137 patients underwent MR imaging at the MRI room in the Radiology Department, HUSM using Philips 3 Tesla Achieva MR scanner (Best, The Netherlands) after informed consent obtained with a standard spine coil. The standard protocol was used for this examination (Sagital T1WI, Sagital T2WI, Axial T1WI, Axial T2WI).

The MRI images will be reviewed using the Picture Archiving and Communication System (PACs) through a standard primary diagnostic monitor. The criteria for viewing monitor includes:

- Screen resolution : >1280 x 1024 (1.3 megapixels)
- Screen size : > 24cm (17 inch)
- Contrast ratio : > 500:1
- Brightness : >500cd/$m^2$
- Grey scale bit depth : 8bit greyscale

### 3.11 Statistical Analysis

All quantitative data were analyzed using Microsoft® Office Excel and Statistical Product and Service Solutions (SPSS) for Windows, SPSS Inc.© (version 26.0, SPSS Inc., Chicago, IL, USA). Demographic data were presented in frequency and means.

All parameters were measured and recorded by a researcher in a customized spreadsheet and validated by the radiologist to ensure data consistency. Statistical analyses were perform using SPSS software. Categorical data were presented as count and percentage. The associations between the PDI score and the two study focuses' binary outcomes were analyzed using a simple logistic regression test. A p-value of less than 0.05 used to indicate a statistically significant difference.

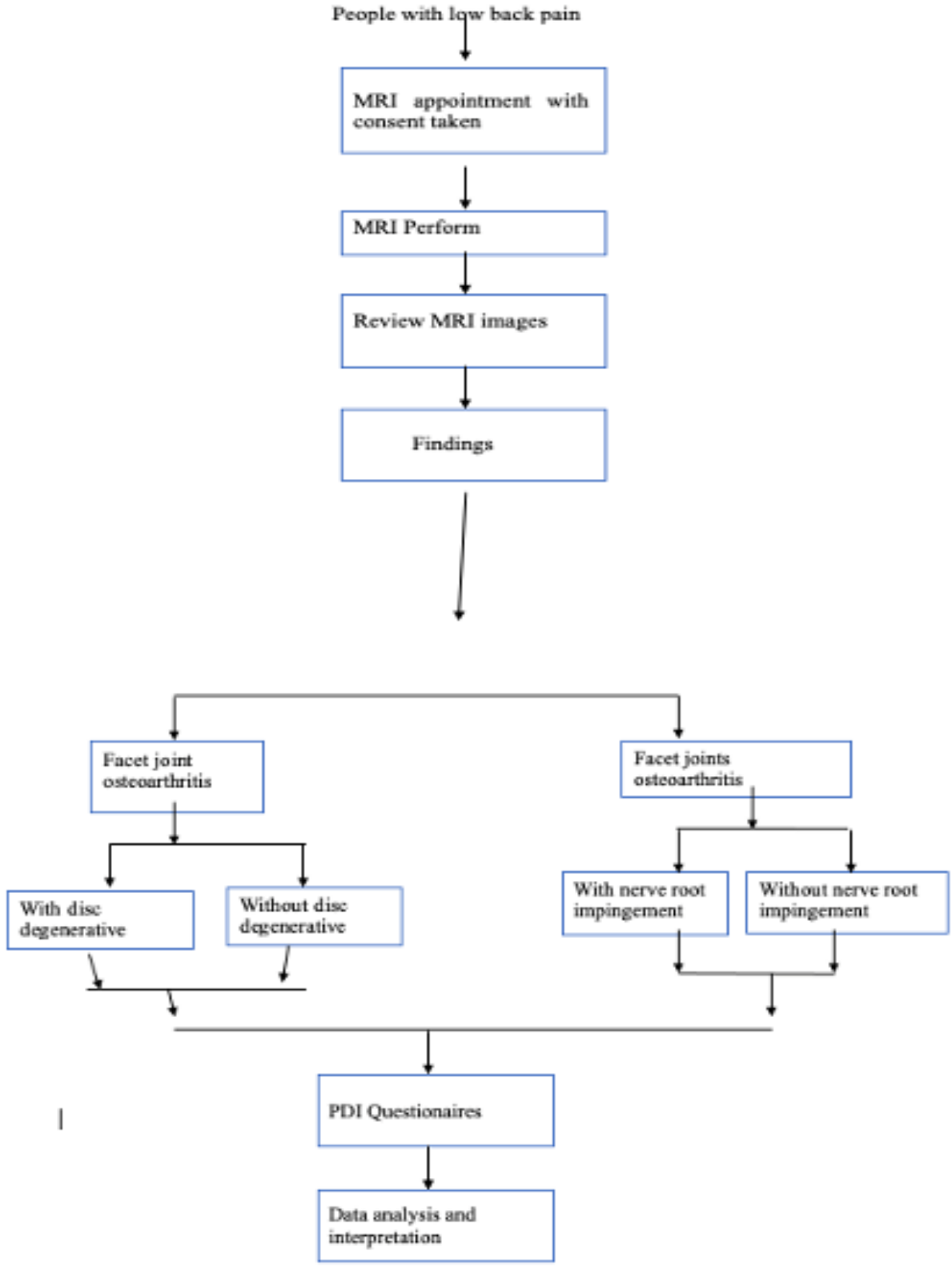
### 3.13 Confidentiality and Privacy

A serial research number identified the participants. No identifiable data were shared publicly. The information was used for research purpose only and encrypted in a password protected computer. The researchers retained the data for knowledge purposes only. Neither the name nor any identifying information will be used in any publication or presentation resulting from this study.

### 3.14 Ethical Consideration

The ethical approval was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (JEPeM Code: USM/JEPeM/20010073) which complies with the Declaration of Helsinki [see Appendix C].

### 3.15 Study Flow Chart



# CHAPTER 4: MANUSCRIPT

**The association between degenerative spine disease on MRI of the lumbar spine and functional disability.**

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**The Association Between Degenerative Spine Disease on MRI of the Lumbar Spine and Functional Disability**

**ABSTRACT**

**Introduction:** Degenerative spinal disease is one of the spinal conditions that can cause a person to be unable to work. Various forms of questionnaires are available in determining the lack of function. The purpose of this study was to investigate and determine the relationship between degenerative spinal diseases on MRI lumbar spine and work disability. There are various causes of degenerative spine disease. In this study, we wanted to investigate the different such as facet joint arthropathy, degenerative disc disease, and nerve root impingement.

**Methodology:** Patients with degenerative spine disease were underwent a Magnetic Resonance Imaging (MRI) and images that have been taken were viewed on Pictures Archiving and Communication System (PACS). The patient's MRI images showed facet joint with degenerative disc disease/nerve root compression at the level of L4/L5 or L5/S1 vertebra were recruited. This patient were given a copy of the questionnaire. This questionnaire were answered by the selected patients within one hour. Each copy of the questionnaire produced the degree (grade) of disability, i.e., minimum disability (0-20%), moderate disability (21-40%), severe disability (41-60%), crippled (61-80%), and the patient is bedbound (81-100%). Using logistic regression analysis, the associations between the functional disability (PDI score) and the binary outcomes of the three study focuses were analysed.

**Results:** A total of 137 study subjects were recruited in this study. The participants over 40 years old constitute about 82% of the study subjects. The proportion of male to female was almost similar. At the sa me time, the majority of the study subject was Malays, followed by Chinese and Indians. The proportion of the patient with facet joint osteoarthritis patients on