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Prevalence and risk factors of spinal disorders among Yemeni population using Magnetic Resonance Imaging

Prepared by

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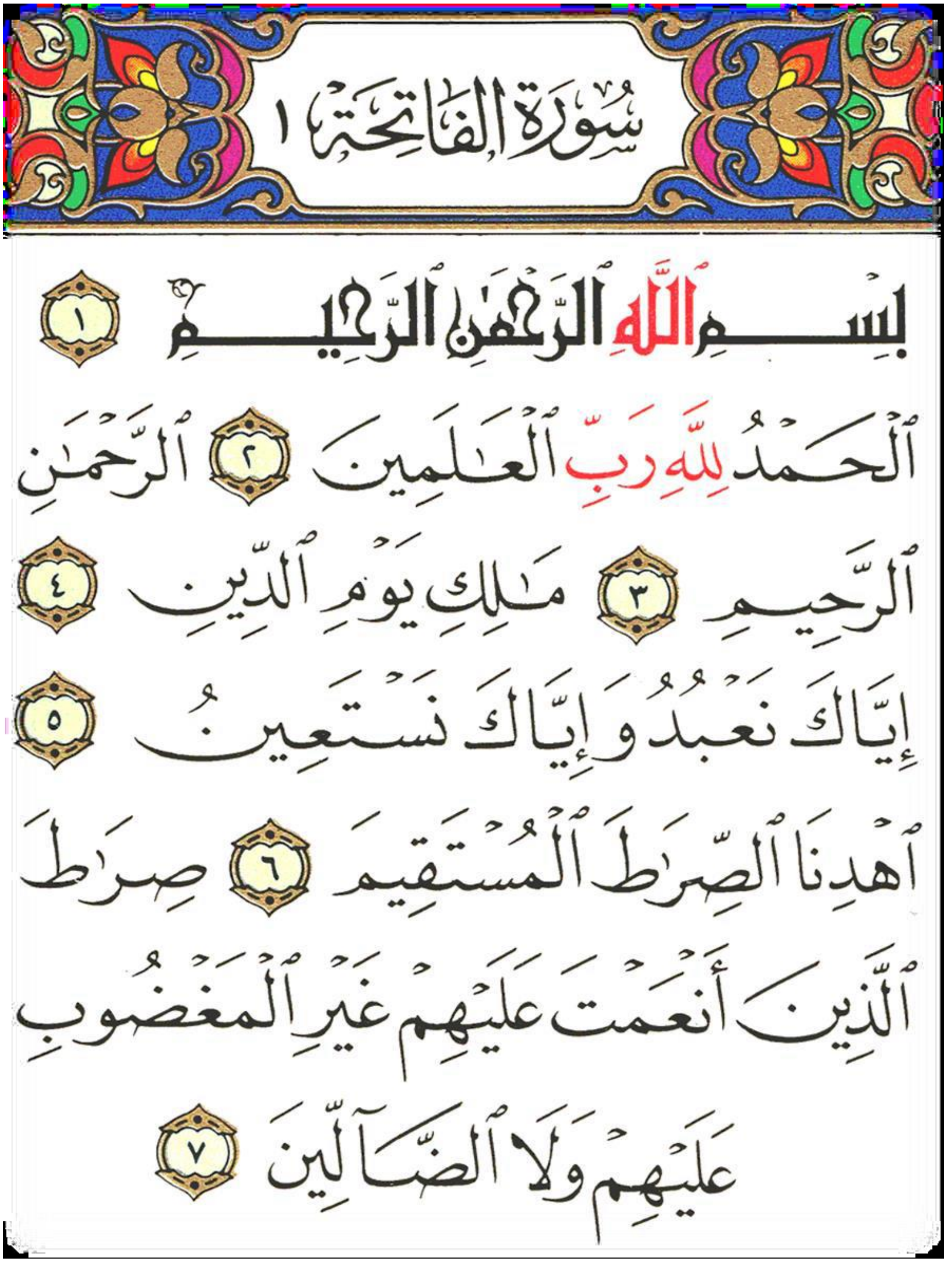
Quranic Verse



سُورَةُ الفَاتِحَة ١

بِسۡمِ ٱللَّهِ ٱلرَّحۡمَٰنِ ٱلرَّحِيمِ ١
ٱلۡحَمۡدُ لِلَّهِ رَبِّ ٱلۡعَٰلَمِينَ ٢ ٱلرَّحۡمَٰنِ
ٱلرَّحِيمِ ٣ مَٰلِكِ يَوۡمِ ٱلدِّينِ ٤
إِيَّاكَ نَعۡبُدُ وَإِيَّاكَ نَسۡتَعِينُ ٥
ٱهۡدِنَا ٱلصِّرَٰطَ ٱلۡمُسۡتَقِيمَ ٦ صِرَٰطَ
ٱلَّذِينَ أَنۡعَمۡتَ عَلَيۡهِمۡ غَيۡرِ ٱلۡمَغۡضُوبِ
عَلَيۡهِمۡ وَلَا ٱلضَّآلِّينَ ٧

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Dedication

We dedicate this research to our fathers, mothers, family and everyone who contributed to the completion of this research, to our college and its teaching staff and to the soil of our beloved country.

Table of Contents

Quranic Verse……………………………………...…………………2
Acknowledgment…………………………….……......……………....3
Dedication……………………………………………..…………….…4
Table of content.……………………………………………….…….….5
List of Figures..…..………………………...…..…...…….…….…7
List of Tables …………………………………………………………8
List Of Abbreviation's……………………………...…………….……9
Abstract ………………………………………………………………10
Chapter 1 :- Introduction………………………………....………..12
1. Introduction ………………..……………………………….……..13
1.1 Overview ………………………………………………….………...13
1.2 Problem statement ………………………………….…..…………15
1.3 Study objective ………………………………….…..……………15
1.3.1 Main Objective …...…………….....……………….…………….15
1.3.2 Special Objective ...………………………….…...………..15
1.4 Significance of the study …………………………………………15
1.5 Study out line …………………………….………………………15
Chapter 2 :- Literature Review……………………..……………...17
2.1 Theoretical Background…….…………….……………………....18
2.1.1 Anatomy of the spine …………………...………………...18
2.1.2 Pathology…………………………………………..………...24
2.1.3 Diagnosis modalities………………………………….……......32
2.2 Previous study……………………….…………………….…..41
Chapter 3 :- Methodology……………………………...………44
3. Methodology……………………………………………...………45
3.1 Study Area……………………………………………….….…45
3.2 Study design……………………………………………….…….45
3.3 Study population……………………………...….....…………45
3.3.1 Inclusion Criteria …………………………………….….…..45
3.3.2 Exclusion Criteria ……………………………………………..45
3.4 Sampling ………………………………………………......……..45
3.4.1 Simple size…………………………………...……...…......45
3.5 Tools…………………………………………..…..………46
3.6 Statistical Analysis ……………………………...……......46
3.7 Ethical Consideration……………………..……..…….....46
3.8 Limitation …………………………………………………......46

Chapter 4 :- Result and discussion…………………………...………47
4.1 Result………………………………………...…………....48
4.1.1Soci demographic characteristic ……….…………………...…...48
4.1.1.1 Gender ………………………………………………...….48
4.1.1.2 Age group…………………………………...………..….49
4.1.1.3 Distribuend of study sample according to their gender and age…..50
4.1.1.4 Diagnosis of L.S abnormalities ……………………….……..51
4.1.1.5 Association between lumber spine abnormalities and gender ……53
4.1.1.6 Association between age group and L.S abnormalities………......56
4.2 Risk factor……...…………………………………………...…57
4.2.1 Association between smoking and L.S abnormalities……...………58
4.2.2 Association between diabetes and L.S abnormalities ……….…….59
4.2.3 Association between chewing Qat L.S abnormalities …………..….60
4.2.4 Association between V.D deficiency and L.S abnormalities……....61
4.3 Discussion ……………………………………………………...62
Chapter 5 :- Conclusion and Recommendation…………………………..65
5.1 Conclusion……………………………………….……...…...66
5.2 Recommendation……………………………..………........67
Reference……………………………..……………………...…..68
Appendix…………………………………………….……….…...71

List of Figures

Figure . NO	Title	Page
2-1	general anatomy of spine	16
2-2	spinal curve	17
2-3	vertebrae(lat view)	18
2-4	vertebrae (above view)	18
2-5	intervertebral disc space	19
2-6	anatomy vertebrae	19
2-7	spinal canal	19
2-8	ligament of spine	20
2-9	muscle of whole spine	21
2-10	spinal cord	22
2-11	Annular disc tear	23
2-12	Type of annular tear	24
2-13	Osteophyte	25
2-14	Thickened Ligamentum flavum	26
2-15	Spondylosis	26
2-16	Spinal Stenosis	27
2-17	Herniated disc	28
2-18	Osteoarthritis	30
2-19	MRI machine	33
2-20	Sagittal FSE T1	37
2-21	Sagittal FSE T2	37
2-22	Axial/oblique FSE T2	38
4-1	Distribution of study sample according to gender	48
4-2	Distribution of study sample according to age group	49
4-3	Distribution of sample study according to diagnosis	69
4-4	Distribution of sample study according to diagnosis	69

List of Tables

Table . NO	Title	Page
4-1	Distribution of study sample according to gender	48
4-2	Distribution of study sample according to age group	49
4-3	Distribution of study sample according to diagnosis	50
4-4	Distribution of study sample according to gender and age	51
4-5	Relationship between gender and L.S abnormalities	53
4-6	Relationship between age and L.S abnormalities	55
4-7	Distribution of study sample according to risk factor	56
4-8	Association between smoking and L.S abnormalities	57
4-9	Association between diabetes and L.S abnormalities	58
4-10	Association between Qat and L.S abnormalities	59
4-11	Association between V.D deficiency and L.S abnormalities	60

List of Abbreviation's

MRI	Magnetic Resonance Imaging
OA	Osteoarthritis
FSE	Fast spin echo
RF	Radiofrequency
TE	Time to echo
TR	Repetition time
T	Tesla
FOV	Filed of view
L.S	Lumber spine
C.T	Computed tomography
MM	Millimeter
GRE	Gradient recalled echo
SE	Spin echo
SNR	Signal to noise ratio
P	Posterior
A	Anterior
L	Left
R	Right
T.B	Tuberculosis
D.G	Degenerative
N. Foramen	Nurul foramen
L.F.H	Ligamentum flavum hypertrophy

Abstract

Objective

The aim of this study was to evaluate the lumber spine abnormalities among Yemeni population using Magnetic Resonance Imaging (MRI)

Materials and methods

This descriptive analytic study comprised 451 patients divided to 99 daily and 352 PACS cases (288 males, 163 females) , the median age was 40 years. All participants had lumber spine MRI. The study population had targeted all patients who visited the radiology department undergo MRI for lumber spine.

Results

This study illustrated that , the majority of patients were male (63.9%). The most cases age group were between (30-60) year with (59.8%) cases , while the most abnormalities were bulge with 309 cases (68.5%) , narrowing neural foramen with 259 cases (57.4%) and degenerative disease 254 (56.3%).

From study sample, with related to risk factors , there was significant association between ; Diabetes and degeneration & V.D deficiency and degeneration . Whereas there was no significant association between smoking and lumber spine abnormalities , Chewing Qat and lumber spine abnormalities.

Conclusion

The most abnormalities in L.S structure were bulge, narrowing neural foramen, degenerative and OA .

From this study , there was significant association between diabetes and degeneration and no significant association with others L.S abnormalities .

There was significant association between V.D deficiency and degeneration , and no significant association with others abnormalities .

Chapter one: - introduction

Introduction

1.1 Overview

Vertebrae bone of the neck and back provide structural support for the spine, protect and encases the spinal cord .Radiologist and orthopedic surgeons use a number of different terms when they refer to disc problems, herniated disc ruptured disc, protruded disc, prolapsed disc and slipped disc generally all mean the same things .The disc line between the end surfaces of the bony blocks (vertebrae) that make up the spine. They have a soft center with surrounded by tough outer ring, the disc allows move mint of the spine and also act as shock absorber. The nerve which run from the brain to the arm and leg lies within spinal canal. As the nerves leave the spine to go to the muscle and skin, they pass very close to back of the disc. When disc damaged the soft center may slip out (prolapsed) and pass on nerve. The usual place for such prolapsed to occur in the lower back (lumber) region or occur in the neck (cervical) region.[1]

Inter vertebral disc space and disc prolapse and most common pathology associated in the vertebral column. The lumber spine is the first common site. Spinal imaging firstly applied by plain x -ray and myelography replaced by computed tomography and recently MRI, these procedures regarding economic status of the patient and radiation protection.[2]

Lumber spine consist of the five bone (vertebrae) in the lower back. lumber vertebrae, known as L1 to L5, are the largest of entire spine. It is located below 12 chest (thoracic) vertebrae and above the five fused bones that make up triangular -shaped sacrum bone. compared with other spine vertebra, lumber vertebrae are large, thicker and more block -like bone. lumber vertebra provide stability for the back and spinal column and allow for appoint of attachment for many muscles and ligaments. It is providing support for the weight of body, surrounds and protects spinal cord and allows for wide range of body motion. Many conditions can affect this area of spine, including lower back pain, arthritis, degenerative bone, and disk disease, and stenosis.

Lower Back Pain is very common, it can result from a strain (injury) to muscle or tendon in the back. Other causes include arthritis, structural problems and disk injuries. Pain can range from mild to severe, in some cases, pain can make it difficult or impossible to walk, sleep, work or do everyday activities. Pain often gets better with rest, physical therapy and medication. Reduce your risk of low back pain by keeping at a healthy weight and staying active.

MRI has opened new horizons in the diagnosis and treatment of many musculoskatal diseases. It demonstrates abnormalities in bones and soft tissue before they become evident at other imaging modalities. The exquisite soft tissue contrast resolution , noninvasive nature and multiplanner capabilities of MR imaging make it especially valuable for the detection and assessment of verify of soft tissue disorder of the ligament (e.g. sprain) tendons (tendonitis , rupture , dislocation)another soft tissue strictures (e.g. sinuses tarsal syndrome , synovial disorders) MR imaging has also been shown to be highly sensitive in the detection and staging of number for musculoskeletal infections including cellulites ,osteoarthritis and osteomyelitis in addition, MR imaging is excellent for the early detection and assessment of number of osseous abnormalities such as bone contusion , streets and insufficiency fractures, osteochondral fractures, osteonecrosis and transient bone marrow edema.[1]

1.2 Problem statement

Due to increasing the spread of lower back pain in Yemeni society, which causes disability for patients in their work. This study assess the prevalence of L.S abnormalities and evaluate the effect of some risk factor such as (smoking, diabetes, V.D deficiency and chowing Qat) on L.S abnormalities .

1.3 Study objective

1.3.1 Main objective

This study aims to determine the prevalence and risk factors for lower back pain in Yemeni community using MRI.

1.3.2 Special objectives

- ❖ Association between smoking and L.S abnormalities .
- ❖ Association between Chewing Qat and L.S abnormalities .
- ❖ Association between diabetes and L.S abnormalities .
- ❖ Association between V.D deficiency and L.S abnormalities .

1.4 Significance of the study

This study will provide information about association between the L.S abnormalities and some risk factors such as smoking , diabetes , chewing Qat , and V.D deficiency .

1.5 Study out line

This study consisted of five chapters, chapter one consist of introduction and problem statement and study objective and study out line. Chapter two includes theoretical background and previous studies. Chapter three includes materials and methods. Chapter four includes data collection, results and discussion . Chapter five includes conclusion and recommendations.

Chapter two: - Literature Review

2.1 Theoretical Background

2.1.1 Anatomy of The Spine

Spine is made of 33 individual bones stacked one on top of the other. Ligaments and muscles connect the bones together and keep them aligned. The spinal column provides the main support for your body, allowing you to stand upright, bend, and twist. Protected deep inside the bones, the spinal cord connects your body to the brain, allowing movement of your arms and legs. Strong muscles and bones, flexible tendons and ligaments, and sensitive nerves contribute to a healthy spine. Keeping your spine healthy is vital if you want to live an active life without back pain.[1]

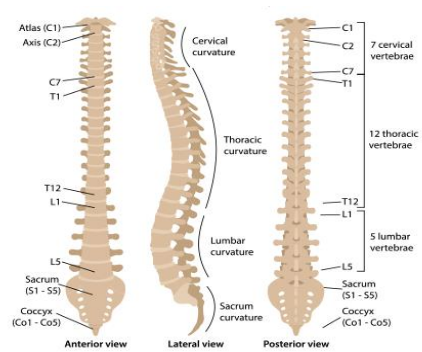


Figure 2-1 general anatomy of spine[34]

2.1.1.1 The spinal curves:

When viewed from the side, an adult spine has a natural S-shaped curve. The neck (cervical) and low back (lumbar) regions have a slight concave curve, and the thoracic and sacral regions have a gentle convex curve. The curves work like a coiled spring to absorb shock, maintain balance, and allow range of motion throughout the spinal column.[1]

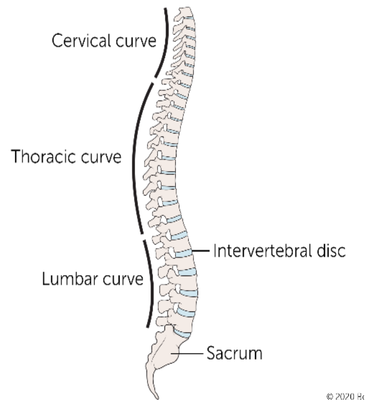
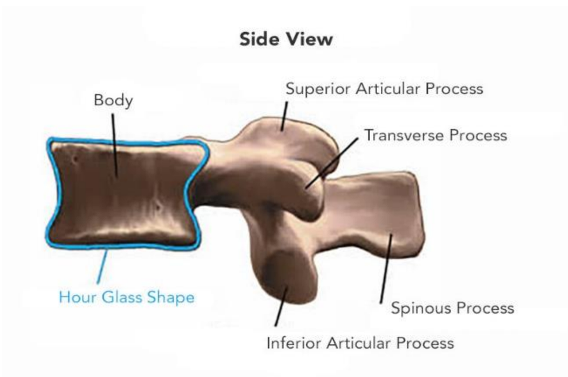


Figure 2-2 spinal curve [17]

2.1.1.2 The vertebrae:

Vertebrae are the 33 individual bones that interlock with each other to form the spinal column. The vertebrae are numbered and divided into regions: - cervical, thoracic, lumbar, sacrum, and coccyx. Only the top 24 bones are moveable; the vertebrae of the sacrum and coccyx are fused. The vertebrae in each region have unique features that help them perform their main functions.

Cervical (neck) - the main function of the cervical spine is to support the weight of the head (about 10 pounds). The seven cervical vertebrae are numbered C1 to C7. The neck has the greatest range of motion because of two specialized vertebrae that connect to the skull. The first vertebra (C1) is the ring-shaped atlas that connects directly to the skull. The second vertebra (C2) is the peg-shaped axis, which has a projection called the odontoid, that the atlas pivots around. Thoracic (mid back) - the main function of the thoracic spine is to hold the rib cage and protect the heart and lungs. The twelve thoracic vertebrae are numbered T1 to T12.[1] The range of motion in the thoracic spine is limited. Lumbar (low back) - the main function of the lumbar spine is to bear the weight of the body. The five lumbar vertebrae are numbered L1 to L5.[1] These vertebrae are much larger in size to absorb the stress of lifting and carrying heavy objects. Sacrum- the main function of the sacrum is to connect the spine to the hip bones (iliac). There are five sacral vertebrae, which are fused together. Together with the iliac bones, they form a ring called the pelvic girdle. Coccyx region - the four fused bones of the coccyx or tailbone provide attachment for ligaments and muscles of the pelvic floor.[1]



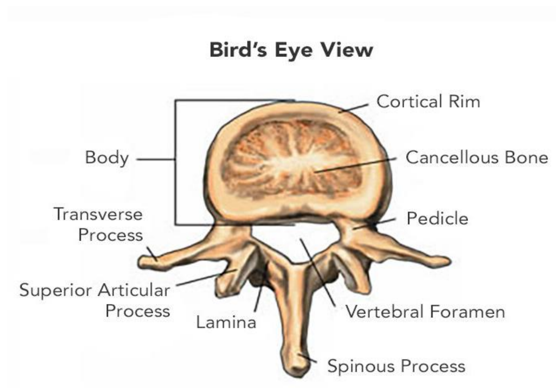


Figure 2-3 vertebrae (let view) [18] Figure 2-4 vertebrae (above view) [18]

2.1.1.3 The intervertebral discs:

Each vertebra in your spine is separated and cushioned by an intervertebral disc, keeping the bones from rubbing together. Discs are designed like a radial car tire. The outer ring, called the annulus, has crisscrossing fibrous bands, much like a tire tread. These bands attach between the bodies of each vertebra. Inside the disc is a gel-filled center called the nucleus, much like a tire tube.[3]

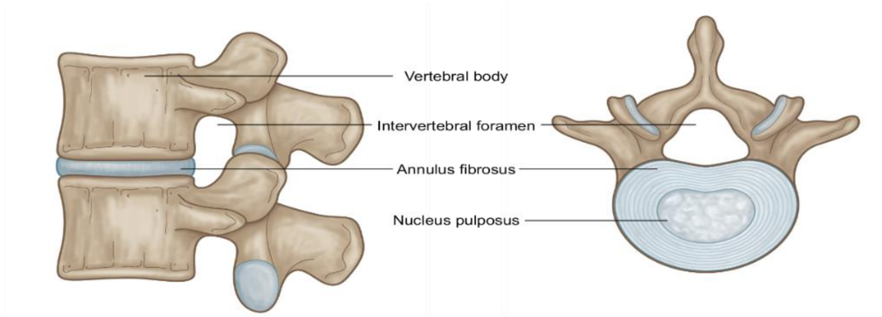


Figure 2-5 intervertebral disc space [19]

2.1.1.4 Vertebral arch & spinal canal:

The arch is made of two supporting pedicles and two laminate. The whole spinal canal contains the spinal cord, fat, ligaments, and blood vessels. Under each pedicle, a pair of spinal nerves exits the spinal cord and pass through the intervertebral foramen to branch out to your body. Seven processes arise from the vertebral arch: the spinous process, two transverse processes, two superior facets, and two inferior facets.[3]

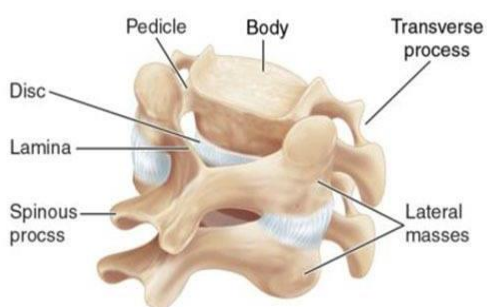


Figure 2-6 vertebrae anatomy [20]

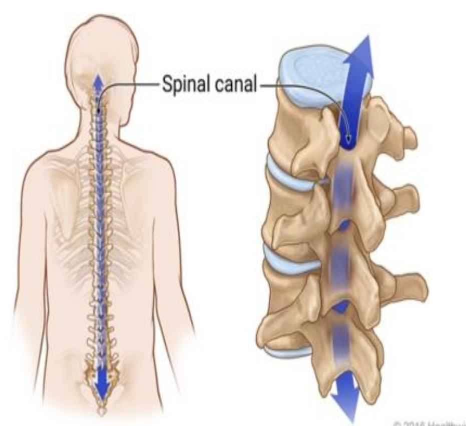


Figure 2-7 spinal canal [21]

2.1.1.5 The ligaments:

There are different ligaments involved in the holding together of the vertebrae in the column, and in the column's movement. The anterior and posterior longitudinal ligaments extend the length of the vertebral column along the front and back of the vertebral bodies. The interspinous ligaments connect the adjoining spinous processes of the vertebrae. The supraspinatus ligament extends the length of the spine running along the back of the spinous processes, from the sacrum to the seventh cervical vertebra. From there it is continuous with the nuchal ligament. [4]

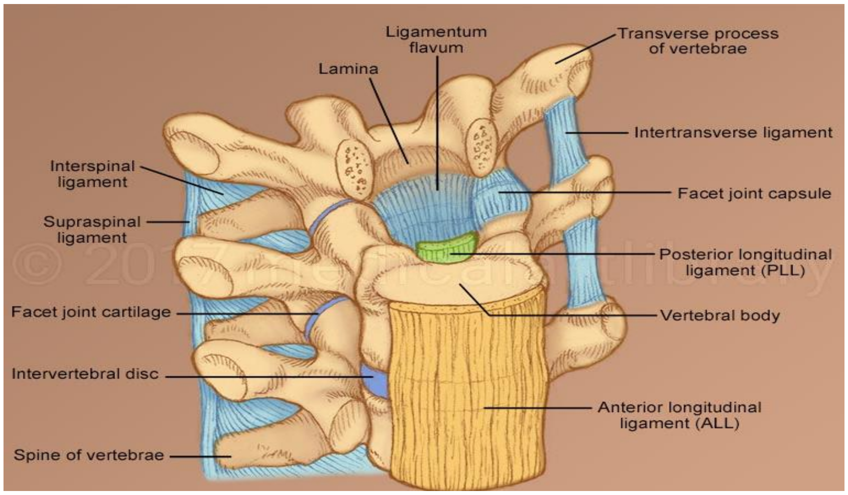


Figure 2-8 ligament of spine [22]

2.1.1.6 The muscle:

The two main muscle groups that affect the spine are extensors and flexors. The extensor muscles enable us to stand up and lift objects. The extensors are attached to the back of the spine. The flexor muscles are in the front and include the abdominal muscles. These muscles enable us to flex, or bend forward, and are important in lifting and controlling the arch in the lower back.[4]

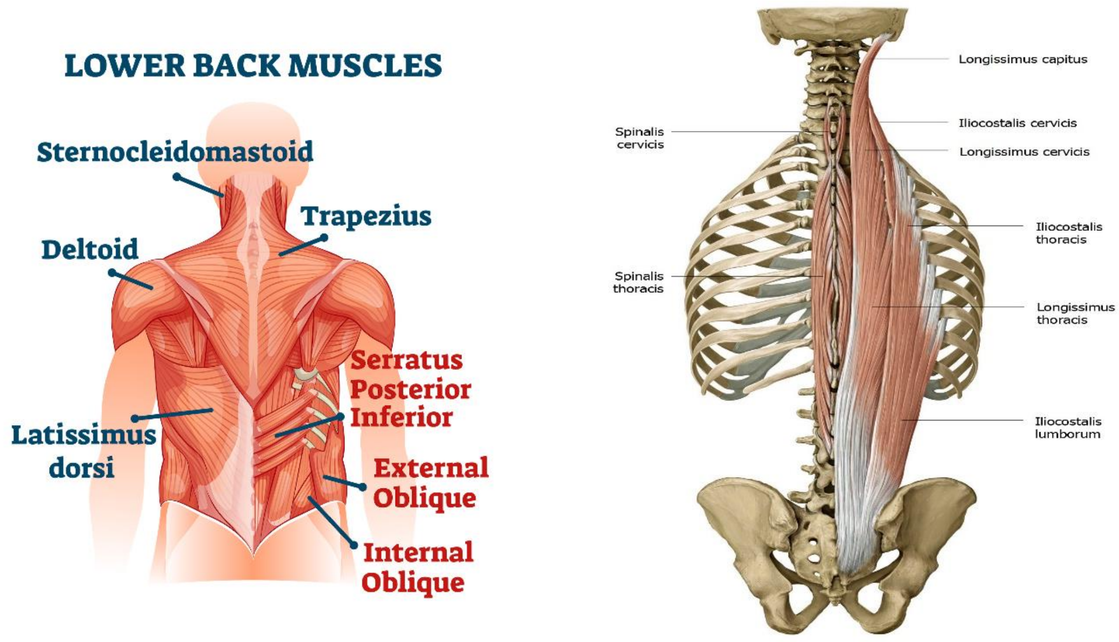


Figure 2-9 muscle of whole spine [23] [24]

2.1.1.7 Spinal cord:

The vertebral column surrounds the spinal cord which travels within the spinal canal, formed from a central hole within each vertebra. The spinal cord is part of the central nervous system that supplies nerves and receives information from the peripheral nervous system within the body. The spinal cord consists of grey and white matter and a central cavity, the central canal. Adjacent to each vertebra emerge spinal nerves.[4] The spinal nerves provide sympathetic nervous supply to the body, with nerves emerging forming the sympathetic trunk and the splanchnic nerves. The spinal canal follows the different curves of the column; it is large and triangular in those parts of the column which enjoy the greatest freedom of movement, such as the cervical and lumbar regions; and is small and rounded in the thoracic region, where motion is more limited. The spinal cord terminates in the conusmedullaris and caudaequina.[4]

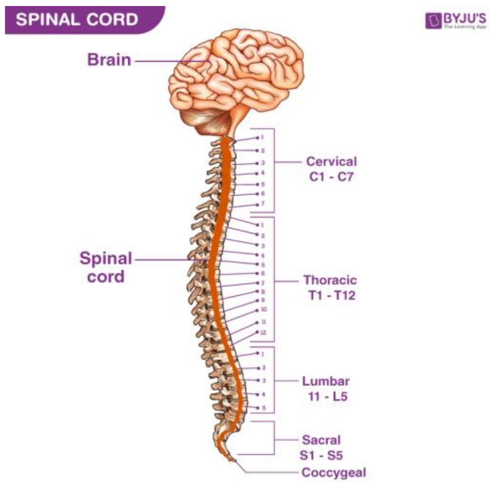


Figure 2-10 spinal cord [25]

2.1.2 Pathology

2.1.2.1 Annular Disc Tear:

An intervertebral disc is a strong ligament that connects one vertebral bone to the next. The discs are the shock-absorbing cushions between each vertebra of the spine. Each disc has a strong outer ring of fibers, called the annulus fibrosis, and a soft, jelly-like center, called the nucleus pulposus. The annulus is the strongest area of the disc and connects each vertebra together. The annulus can tear or rupture anywhere around the disc. If it tears and no disc material is ruptured, this is called an annular tear. The outer 1/3 of the disc's annular ring is highly innervated with pain fibers. Thus, if a tear involves the outer 1/3 it may be extremely painful. This tear will heal with scar tissue over time but is more prone to future tears and injury. Studies also indicate that annular tears may lead to premature degeneration of the disc, endplates, and facet joints.[5]

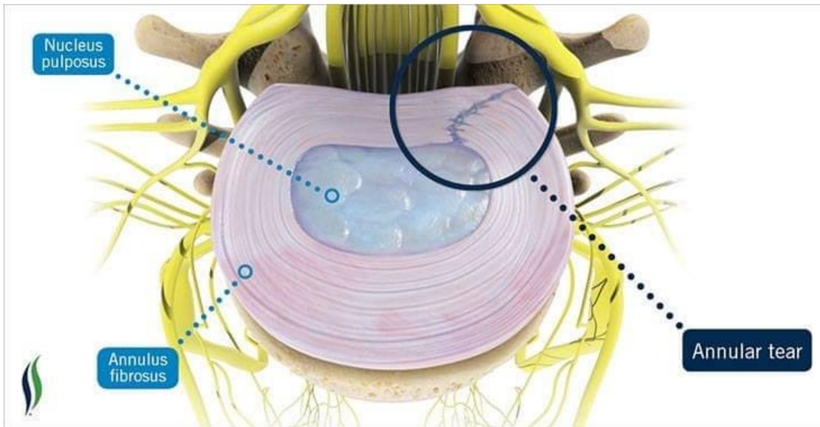


Figure 2-11 Annular Disc Tear [26]

2.1.2.2 Types of annular tear:

The annulus fibrosis is constructed of several layers, each of which can become torn. The nature of the tear and the layers it affects will be the basis for how the Tear is categorized: -

1- Radial tears: -Typically caused by the natural aging process, radial tears begin at the center of the disc and extend all the way through the outer layer of the annulus fibrosis. These tears can cause a disc to herniate, which occurs when the center nucleus of a disc extrudes through the tear to the outside of the disc. [5]

2- Peripheral tears (also known as rim lesion or transverse tear) These tears occur in the outer fibers of the annulus fibrosis and are usually brought on by traumatic injury or contact with a bone spur. Peripheral tears can lead to the degeneration or breakdown of an intervertebral disc. [5]

3- Concentric tears (also known as circumferential tears, or delaminations), the broken fibers are parallel with the borders of the intervertebral disc at some distance in between the center and edge.[5] Tears here create spaces between adjacent concentric fibers which can fill with fluid, such as the nucleus pulposus. These tears often occur with compressive stress on older discs, which is usually caused by injury.

4- Horizontal tear (also known as a transverse tear), which are usually small and may represent early stages of age-related disc deformity. These are often found in conjunction with radial tears.[5]

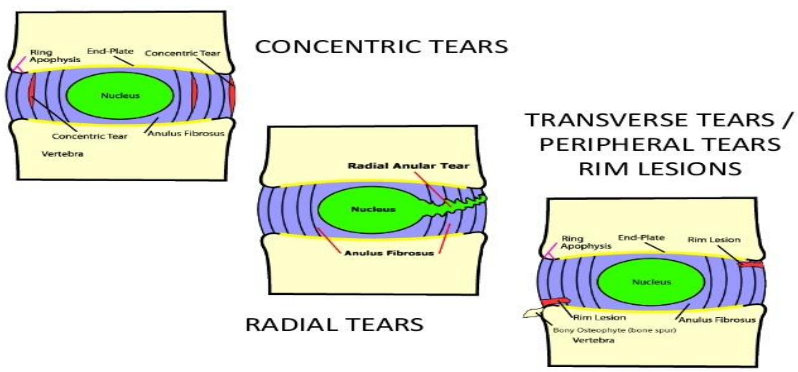


Figure 2-12 Types of annular tear [27]

2.1.2.3 Osteophytes:

Lumbar osteophytes, also known as bone spurs, are smooth growths that form on the facet joints and/or around the vertebrae in the lower spine. Bone spurs do not always cause pain, but in some cases may compress nerves in the lower back causing symptoms of radiating pain, weakness, tingling, or numbness in the legs and feet, along with stiffness and lack of movement in the lower back.[6]

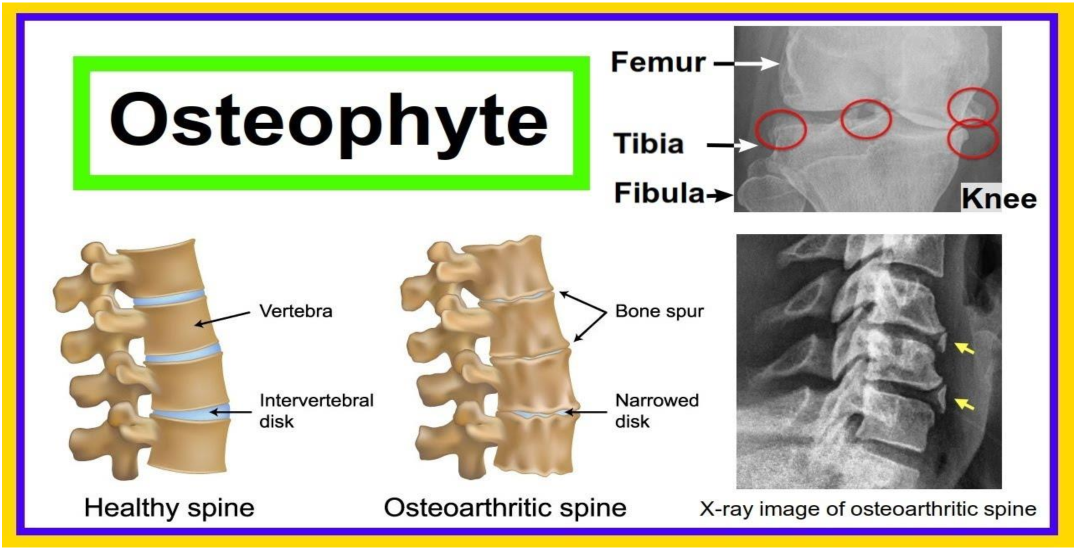


Figure 2-13 osteophyte [28]

2.1.2.4 Ligamentum flavum Thickening: -

Ligamentum flavum thickening was measured on the axial image, perpendicular to the spinal canal, axis and parallel to the lamina, where Ligamentum flavum were seen along their entire length & measurement were taken at the half length of ligament flavum. A mean thickness of the Ligamentum flavum of 4.44 mm in the patients with the spinal canal stenosis labeled as thickened and 2.44 mm thickness in the control group. So, we had labeled a >4 mm Ligamentum flavum thickening as thickened.[6]

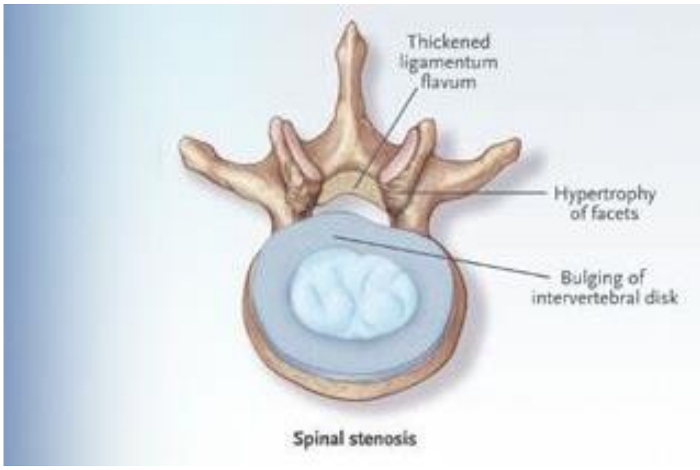


Figure 2-14 thickened Ligamentum flavum [29]

2.1.2.5 Spondylosis:

Spondylosis is a general term for degenerative arthritis changes of the spine, or more simply arthritis. Most degenerative changes of the spine are part of the normal aging process, much like developing grey hair. Everyone is expected to have some evidence of spondylosis as they get older. Many times, patients who have spondylosis on imaging studies do not have any symptoms. In fact, more than 90% of adults over 65 show signs of arthritis. These degenerative changes most commonly occur at the vertebral body and openings for nerve roots.[6]

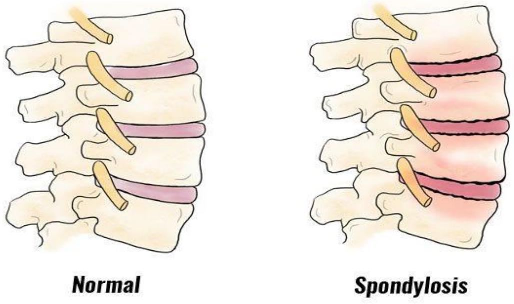


Figure 2-15 spondylosis [30]

2.1.2.6 Spinal Stenosis:

Spinal stenosis the narrowing of the spinal canal This narrowing of the spinal canal limits the amount of space for the spinal cord and nerves. Pressure on the spinal cord and nerves due to limited space can cause symptoms such as pain, numbness, and tingling. The most common reason to develop spinal stenosis is degenerative arthritis, or bony and soft tissue changes that result from ageing. Spinal stenosis is usually seen in patients over 50 years of age, and becomes progressively more severe with increased age, Spinal canal diameter less than 12 mm indicates narrowing of the canal.[6]

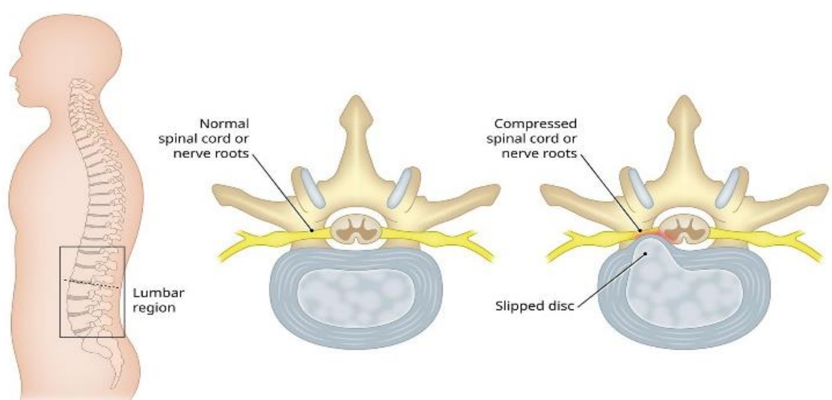
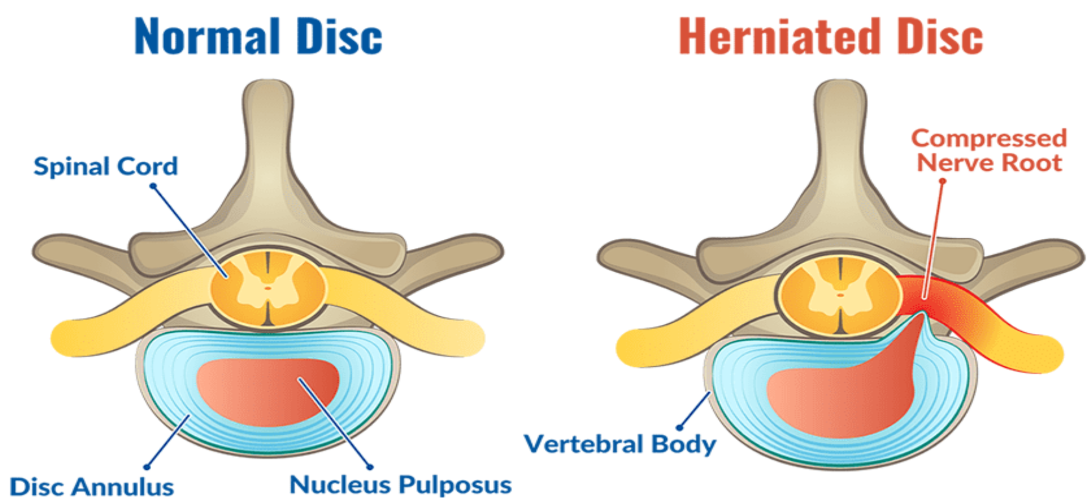


Figure 2-16 Spinal Stenosis [31]

2.1.2.7 Herniated disc or disc prolapsed:

A herniated disc occurs when the inter vertebral disc outer fibers (the annuls are damage and the soft inner material of the nucleus pulpous protrude out of its normal space if the annulus tear near the spinal canal). This can cause mush pressure on the spinal cord and nerve root. There is also some evidence that the nucleus pulpous material causes a chemical irritation of nerve root and the chemical irritation can lead to problems the nerve function. A herniated disc is common in lumbar spine because of the all pressure it supports. Herniated lumber disc often produce sciatica, condition where the lower back pain and



numbness radiation down to the back of the leg.[5]

Figure 2-17 Herniated disc [32]

The human spine consists of alternating bony vertebrae and intervertebral discs extending from the neck to the coccyx. The lower portion of the spine in the region of the lower is called the lumber spine. The intervertebral discs are the 'shock absorbers' of the body and are composed of an outer strong fibrous membrane and an inner 'jellylike' nucleus giving both strength and elasticity. A disc prolapse occurs when there is a weakening in the outer membrane leading to a protrusion of the inner nucleus. This protrusion usually heads poster laterally towards the lateral parts of spinal canal which contains the nerve root. (1) Occasionally the protrusion heads more centrally and can cause compression of the spinal cord. There is no known cause of lumber disc prolapses. Heavy lifting and straining may exacerbate the condition. Traumatic disc prolapses may occur with localized high velocity pressure.[1]

2.1.2.8 Osteoarthritis: -

Osteoarthritis (OA) is a degenerative joint disease affecting an estimated 27 million Americans. This disease is caused by the deterioration of cartilage. This is the smooth, elastic tissue that protects joints and provides the lubrication necessary for normal joint function.

Osteoarthritis can affect different joints in the body, such as those in the: - Hands , knees , hips , spine. OA of the spine specifically affects the facet joints, the cartilage between the bones that make up the spine, and the ligaments in the spine.

As you age, the cartilage coating the facet joints can slowly wear away. Your vertebral discs are made primarily of water. These discs can dehydrate as you grow older. This can cause the discs in your spine to narrow and put increased pressure on facet joints.[1]

What are the symptoms of OA of the spine?

OA of the spine causes various symptoms. The most common is back pain. Pain often starts in the lower back. In the early stages of the disease, you may only have pain in the mornings due to hours of inactivity. Since this is a progressive disease, symptoms typically worsen over time. Other symptoms of osteoarthritis of the spine include: -

joint tenderness, joint stiffness, limited range of motion, weakness or numbness in the legs or arms, tingling in the legs, Back pain caused by OA of the spine is often worse when sitting upright or standing. It usually improves when lying down. Some people who have osteoarthritis of the spine don't have any symptoms.[1]

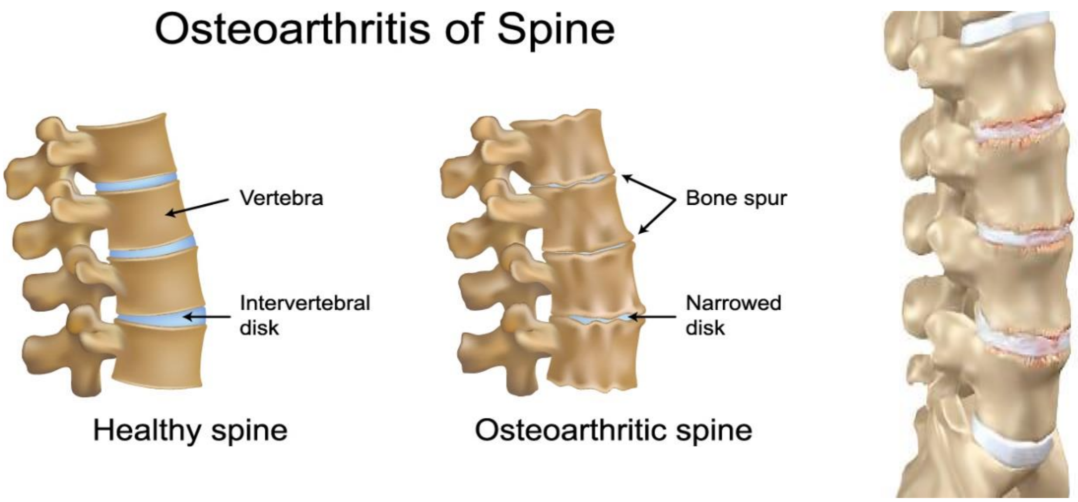


Figure 2-18 osteoarthritis [33]

2.1.3 Diagnosis modalities:

2.1.3.1 X-ray:

X-rays are effective at showing narrowed spinal channels (spinal stenosis), fractures, bone spurs (osteophytes), or osteoarthritis On the plain films, your surgeon will be looking for vertebral alignment, scoliosis, and fracture—other spinal issues that can come along with DDD, Your surgeon may also order flexion and extension x-rays to evaluate the stability of your spine and your range of motion (how well your joints move). You'll be asked to bend forward (flexion) and backwards (extension) during these x-rays. [7]

2.1.3.2 Computed tomography:

A CT scan works by shooting an X-ray beam through the body. Next, a computer is used to reformat the image into cross sections of the spine. This process is repeated at multiple different intervals, a CT scan is often used to evaluate the bony anatomy in the spine, which can show how much space is available for the nerve roots and within the neural foramina and spinal canal .CT scans should not be performed for women who may be pregnant.[7]

2.1.3.3 Bone scan:

The bone scan to help your surgeon detect spinal problems such as osteoarthritis, fractures, or infections you may have. You will have a very small amount of radioactive material injected into a blood vessel. That will travel through your bloodstream and be absorbed by your bones. More radioactive material will be absorbed by an area where there is abnormal activity, such as an inflammation. A scanner can detect the amount of radiation in all your bones and show the "hot spots " (the areas with more radioactive material) to help your surgeon figure out where the problem is.[7]

2.1.3.4 Magnetic resonance imaging (MRI):-

The most common test to diagnose a herniated disc is the MRI scan. This test is painless and very accurate. It is usually the preferred test to do (after X-rays) if a herniated disc is suspected.[7]

2.1.3.4.A Principle of MRI:

The basis of MRI is the directional magnetic field, or moment, associated with charged particles in motion. Nuclei containing an odd number of protons and/or neutrons have a characteristic motion or precession. Because nuclei are charged particles, this precession produces a small magnetic moment. When a human body is placed in a large magnetic field, many of the free hydrogen nuclei align themselves with the direction of the magnetic field. The nuclei process about the magnetic field direction like gyroscopes. This behavior is termed Larmor precession. In a 1.5 T magnetic field at room temperature this difference refers to only about one in a million nuclei since the thermal energy far exceeds the energy difference between the parallel and antiparallel states. Yet the vast quantity of nuclei in a small volume sum to produce a detectable change in field. Most basic explanations of MRI will say that the nuclei align parallel or anti-parallel with the static magnetic field; however, because of quantum mechanics quantum mechanical reasons, the individual nuclei are actually set off at an angle from the direction of the static magnetic field. The bulk collection of nuclei can be partitioned into a set whose sum spin are aligned parallel whose sum spin are anti-parallel.[8]

2.1.3.4.B Equipment of MRI:

The MRI equipment consists of following components: The magnet generates the magnetic field. Shim coils make the magnetic field homogeneous. Radio frequency coils transmit the radio signal into the body part being imaged. Receiver coils detect the returning radio signals. Gradient coils provide spatial localization of the 18 signals. Shielding coils produce a magnetic field that cancels the field from primary coils in regions where it is not desired. The computer reconstructs the signals into the image. The MRI scanner room is shielded by a faraday shield. Different cooling systems cool the magnet, the scanner room and the technique room. [8]

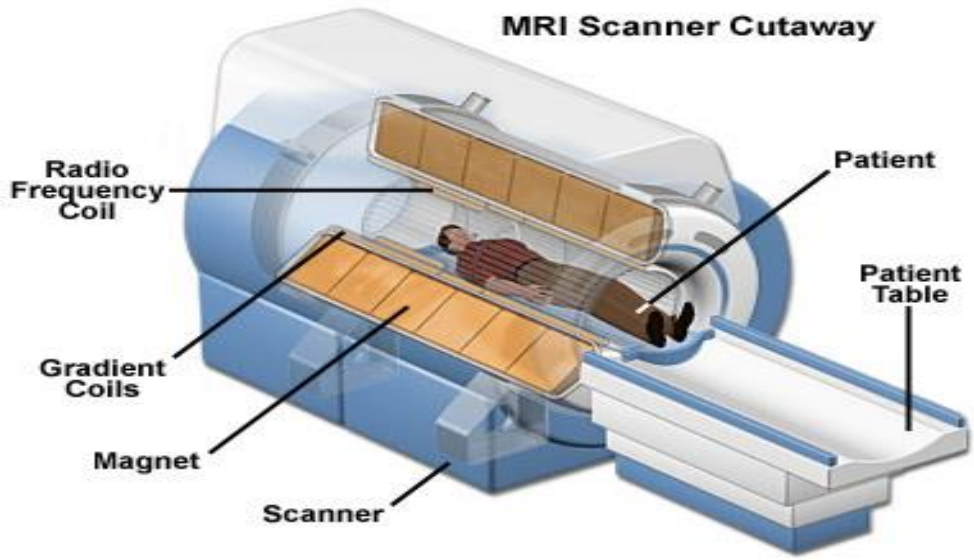


Figure 2-19 MRI machine

2.1.3.4.B.A Magnet:

The magnet is the largest and most expensive component of the scanner, and the remainder of the scanner is built around it. The strength of the magnet is measured in Tesla (T). Clinical magnets generally have field strength in the range 0.1–3.0 T. Three types of magnet have been used: 1-Permanent magnet: Conventional magnets made from ferromagnetic materials. 2-Resistive electromagnet: A solenoid wound from copper wire is an alternative to a permanent magnet. 3-Superconducting electromagnet: most common type found in MRI scanners today.[8]

2.1.3.4.B.B Radio frequency (RF)

System the RF transmission system consists of a RF synthesizer, power amplifier and transmitting coil. This is usually built into the body of the scanner. The power of the transmitter is variable, but high-end scanners may have a peak output power of up to 35 kW, and be capable of sustaining average power of 1 kW. The receiver consists of the coil, pre-amplifier and signal processing system. A recent development in MRI technology has been the development of sophisticated multi-element phased array coils which are capable of acquiring multiple channels of data in parallel. This 'parallel imaging' technique uses unique acquisition schemes that allow for accelerated imaging, by replacing some of the spatial coding originating from the magnetic gradients with the spatial sensitivity of the different coil elements. However, the increased acceleration also reduces SNR and can create residual artifacts in the image reconstruction. Two frequently used parallel acquisition and reconstruction schemes are sense.[8]

2.1.3.4.B.C Coils: -

A Coil are part of the hardware of MRI machines and are used to create a magnetic field by voltage induced in the wire, coil consists of one or more loops of conductive wire, looped around the core of the coil. Different types of MRI coils are used in MR systems. [8]

2.1.3.4.B.D Surface Coil

Is essentially a loop of conducting material, This type of receiver coil is placed directly on or over the region of interest for increased magnetic sensitivity.[8]

2.1.3.4.B.E Volume Coil

That surrounds either the whole body, or one specific region, such as the head or a knee. Volume coils have a better RF homogeneity than surface coils, which extends over a large area.[8]

2.1.3.4.B.F Gradient Coil:

Current carrying coils designed to produce a desired magnetic field gradient, Gradient coils in general vary the main magnetic field, so that each signal can be related to an exact location. [8]

2.1.3.4.C Technique of MRI in lumber spine

2.1.3.4.C.A Common indications: -

Disc prolapse with cord or nerve root compression.

- Spinal dysraphism (to assess cord termination, syrinx, diastematomyelia).
- Discitis.
- Evaluation of the conus in patients with appropriate symptoms.
- Failed back syndrome.
- Arachnoiditis.

2.1.3.4.C.B Equipment: -

- Posterior spinal coil/multi-coil array spinal coil.
- Foam pads to elevate the knees.
- Ear plugs.

2.1.3.4.3.C.C Patient positioning:

The patient lies supine on the examination couch with their knees elevated over a foam pad, for

comfort and to flatten the lumbar curve so that the spine lies nearer to the coil. The coil should extend from the xiphoid process to the bottom of the sacrum for adequate coverage of the lumbar region. The patient is positioned so that the longitudinal alignment light lies in the midline, and the horizontal alignment light passes just below the lower costal margin, which corresponds to the third lumbar vertebra.[9]

2.1.3.4.D Suggested protocol: -

2.1.3.4.D.A Sagittal/coronal SE/FSE T1 or coherent GRE T2* .

Acts as a localizer if three-plane localization is unavailable. The coronal or sagittal planes may be used.

Coronal localizer: Medium slices/gap are prescribed relative to the vertical alignment light, from the posterior aspect of the spinous processes to the anterior border of the vertebral bodies. The area from the conus to the sacrum is included in the image.[9]

P 20 mm to A 30 mm

Sagittal localizer: Medium slices/gap are prescribed on either side of the longitudinal
alignment light, from the left to the right lateral borders of the vertebral bodies. The area from the conus to the sacrum is included in the image.[9]

L 7 mm to R 7 mm .

2.1.3.4.D.B Sagittal SE/FSE T1:- Thin slices/gap are prescribed on either side of the longitudinal alignment light, from the left to the right lateral borders of the vertebral bodies (unless the paravertebral region is required). The area from the conus to the sacrum is included in the image, as it shown in figure 2-20 [9]

Figure 2-20 Sagittal FSE T1 weighted midline slice through the lumbar spine showing normal appearances [9]

2.1.3.4.D.C Sagittal SE/FSE T2 or coherent GRE T2*

(Figure 2-21) Slice prescription as for Sagittal T1.

Figure 2-21 Sagittal FSE T2 weighted midline slice through the lumbar spine showing normal appearances [9]

2.1.3.4.D.D Axial/oblique SE/FSE T1/T2 or coherent GRE T2*

Thin slices/gap are angled so that they are parallel to each disc space and extend from the lamina below to the lamina above the disc. The lower three lumbar discs are commonly examined as it shown (Figure 2-22).[9]

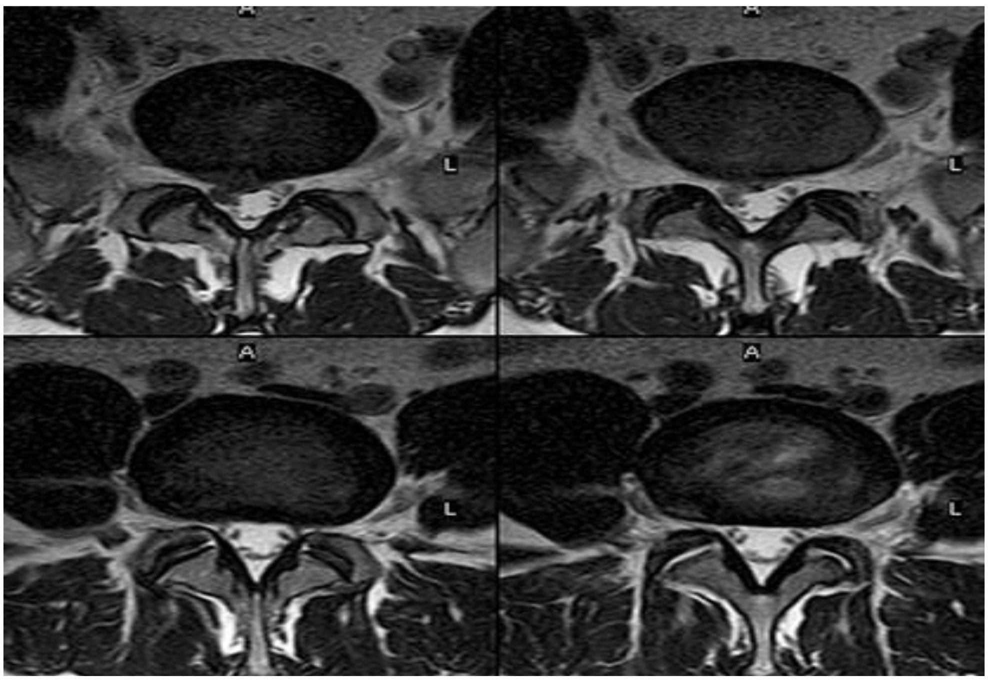


Figure 2-22 Axial/oblique FSE T2 weighted image of the lumbar spine[9]]

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2.1.3.4.E Additional sequences*:* -

2.1.3.4.E.A Axial/oblique or Sagittal SE/FSE T1

With contrast for determining disc prolapse versus scar tissue in failed back syndrome, and for some tumors. Without contrast in spinal dysraphism.

Chemical/spectral prestarvation is beneficial to differentiate between fat and enhancing pathology[9].

2.1.3.4.E.B Coronal SE/FSE T1

For cord tethering or alternative view of conus when sagittal are inconclusive [9].

2.1.3.4.E.C Axial/oblique FSE T2

For Arachnoiditis. As for Axial/obliques, except prescribe one slice through, and parallel to, each disc space and vertebral body from the sacrum to the conus.[9]

2.2 Previous study :-

- Rahman Shiri et al (2018) studied the Risk Factors for Low Back Pain :- The study sample was included (3,505) patients, The result showed that lower back pain and lumbar radicular pain were more common in women than in men. Lower back pain slightly declined with increasing age, while lumbar radicular pain increased with age. Smoking and strenuous physical work increased the risk of both lower back pain and lumbar radicular pain . Lifestyle and physical workload factors increase the risk of lower pack pain and lumbar radicular pain. Walking and cycling may have preventive potential for lower pack pain .[11]

- Feda Makkiyah et al (2022) , studied the Risk Factors Associated with Lower Back Pain in Middle-Aged Adults :-.This study included 3005 middle-aged adults . The study result previous findings that lower back pain is most common in people aged 40 to 80 years old, with a prevalence of (23.2± 2.9%) . From the result of this study, it was found that the 12-month prevalence of low back pain in middle-aged adults was 44,29%. The vast majority of respondents (74.7%) did not smoke. Gender was found to be associated with LBP in our study. In line with previous research, we discovered that the prevalence of LBP was higher in females than in males.[11]

- Rahma Abdallah et al (2023) studied the lumbar MRI findings in Sudanese patients with lower back pain :- Total 104 patients with lower back pain from both gender and aged between (11-80) years were scanned for lumbar spine MRI .The study found that the most common MRI findings were disc bulge (67.6%), followed by loss of lordosis (48.9%), and the most affected level was L4-L5. MRI findings was not affected with patients age and gender .[12]

-Rupal Patel et al (2015) studied the MRI Evaluation of Lumbar Disc Degenerative Disease :- Study Design was Cross-sectional and observational study. total 109 patients of the lumbar disc degeneration with age group between 17 to 80 y were diagnosed & studied on 1.5 Tesla Magnetic Resonance Imaging machine. Lumbar disc degeneration is the most common cause of low back pain. Men are more frequently affected to the disc degeneration than women.[13]

-Bard Natvig (*2000)* studied the localized low back pain and low back pain :- study sample was 893 persons (31%) reported LBP during the previous week in 1994. Of these, 222 had LBP as their only musculoskeletal problem, while 281 had LBP along with symptoms from at least four other areas. Individuals with localized LBP were more often male than those with LBP as part of widespread pain. LBP as part of widespread pain was most often reported by the middle-aged. We found no differences in civil state between the groups.[14]

- Aminuddin et al (2013) study the Association of Low Back Pain and Common Risk Factors :- This study was performed in the rural area to see the association of some common posture related and modifiable risk factors of low back pain. Among 51 participants, 32(63%) had LBP and 19 (37%) did not. The point prevalence of LBP was 63% . Mean age of the 32 LBP patients was 45.8 (±10.8 SD) years; median age was 48 years . Seventy per cent of the LBP patients were females and 30% were males.[15]

-Green Jonson et al (2016) Studied the Association Between Smoking and Back Pain in a Cross-Section of Adult Americans This study examined data from 34,525 United States adults from the 2012 National Health Interview Survey Analyses assessed the difference in back pain prevalence among current smokers, former smokers, and never smokers and the number of cigarettes smoked between current smokers with and without back pain Results: Back pain prevalence was 28%. There was a significant association between back pain and smoking .Back pain increased with increased smoking exposure; back pain was present in 23.5% of never-smokers, 33.1% of former smokers, and 36.9% of current smokers. The number of cigarettes smoked per day for current daily smokers was higher for those with back pain (Md = 13) than those without back pain (Md = 10). [16]

Chapter Three :- Methodology

3. Methodology: -

3.1 Study Area:

This study was conducted in Sana’a - Yemen.

Data collection:

Data collected from UST Hospital, European Hospital, Smart Scan Center, Azal hospital, Al-Razi Diagnostic Medical Center, Al-Fuad Medical Center and Main Diagnostic Center , from 2022 to 2023 .

3.2 Study Design: -

This study followed descriptive method (prospective and retroprospective)

3.3 Study population:

All patient admitted to radiological department for L.S MRI scan

3.3.1 Inclusion Criteria

All patient admitted to MRI department for L.S scan with L.S abnormalities.

3.3.2 Exclusion Criteria

1-No Yemeni population.

2-Patients less than one year because it effects on analytic statistics .

3.4 Sampling

3.4.1 Simple Size

The data were collected from 451 cases who correspond to the inclusion criteria .

3.5 Tools

The tools used to collect this study data include :-

1. MRI machine.
2. spine coil.
3. Weight scales.
4. Height measurement meters.
5. Report.
6. Data collection sheet.

3.6 Statistical Analysis: -

To maintain the accuracy of data processing, the data were analyzed by SPSS and Excel program and presented in Tables and Figures.

3.7 Ethical Consideration:

An official written permission was issued for this study from the University of Since and Technology, Verbal explanation of the nature and aim of the study was provided to patient , medical and radiological staff .

3.8 Limitation: -

This study had done in short period and the sample's study was not enough to assess the risk factors accurately .

Chapter 4 :- Result and discussion

4.1 Result

To maintain accuracy of data processing, we use to analyzed the data were by SPSS and Excel program and the result were presented in tables and graphs.

4.1.1 Socio-demographic characteristics as the followed

4.1.1.1 Gender

The total case were 451 patients with different gender, the Table (4.1), figure (4.1) describe the distribution of patients according to their gender groups.

Table 4-1: Distribution of study sample according to their gender

Gender	Number	Percent
Male	288	63.9
Female	163	36.1
Total	451	100.0

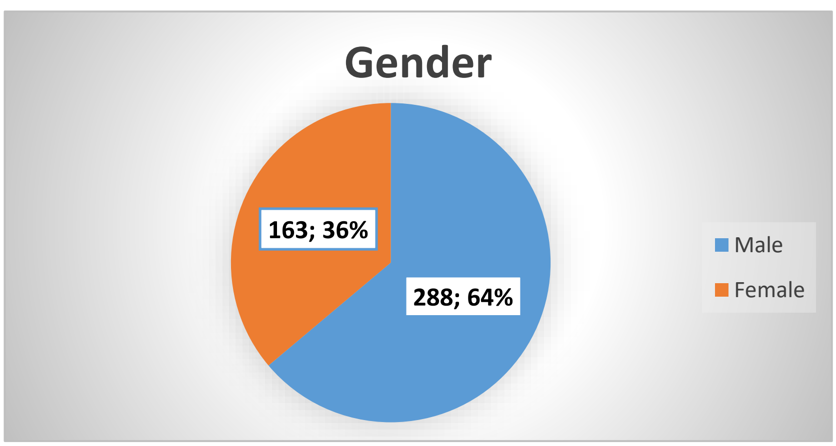

Figure 4-1: Distribution of study sample according to their gender

The Table (4.1) and Figures (4.1) show that 288 were male patients (63.9%) diagnosed as abnormal lumber spine and 163 were female patients (36.1%)

diagnosed by abnormal lumber spine, the most gender exposed to abnormal lumber spine are male while their low percentage were female gender might have an abnormal lumber spine.

4.1.1.2 Age Group

The selected cases have variant in age as show in Table 4-2 and Figure 4-2. Which describes the distribution of age in different age groups (less than 30 years, between 30 to 60 years and greater than 60 year)

Table 4-2: Distribution of study sample according to their age group

Age group	Number	Percent
less than 30	113	25.0
30 to 60	270	59.7
more than 60	69	15.3
Total	452	100.0

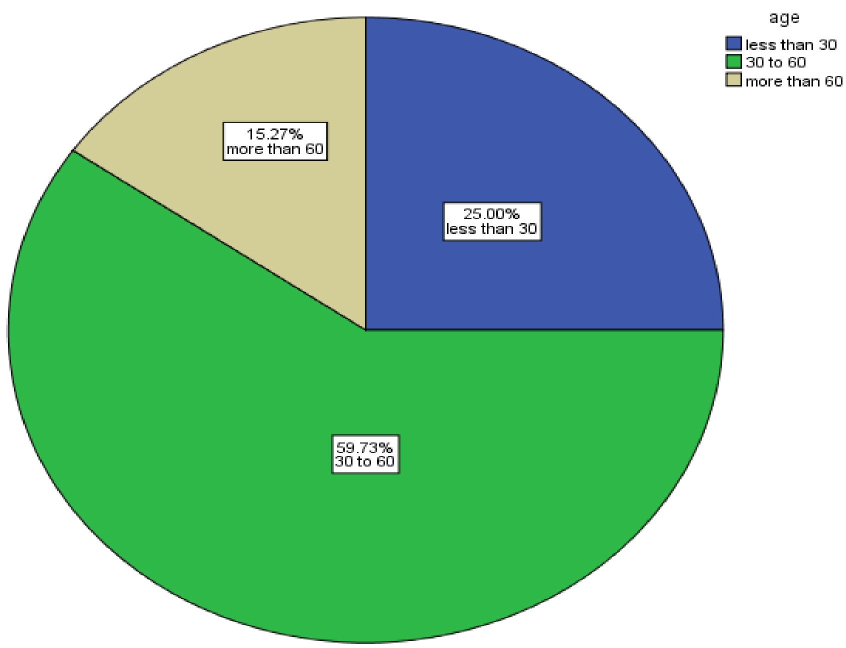

Figure 4-2: Distribution of study sample according to their age group

The Table and Figure (4-2) show that the most affected group by lumber spine abnormalities was in mid-age group (30-60) with percent of 59.7%. While the second group was adult group (< 30 years) with 25% in contrast the less affected group of lumber spine abnormalities was (>60 years) with percentage of 15.3%.

4.1.1.3 distribution of study sample according to their gander and age

Table 4-4: distribuend of study sample according to their gander and age

Gender	less than 30	30 to 60	more than 60
Male	89(19.7%)	144(31.9%)	55(12.2%)
Female	24(5.3%)	121(26.9%)	18(4%)
Total	113(25%)	265(58.8%)	73(16.2%)

Table (4-4) demonstrate that the cases with age less than 30 years of male and female patients diagnosed abnormal lumber spine were 89 in male and 24 in female patients respectively which the age between 30- 60 years of male and female patients diagnosed abnormal lumber spine via MRI 144 in male and 121 in female patients respectively, and more than 60 years of male and female patients diagnosed abnormal lumber spine via MRI were 55 in male and 18 in female patients respectively. The most group of male that defect from lumber spine abnormality was between30-60 years that represented 144patients, whereas the most group of females that defected lumber spine abnormality was between 30-60year that represented 121patients**.**

4.1.1.4 Diagnosis of L.S abnormalities

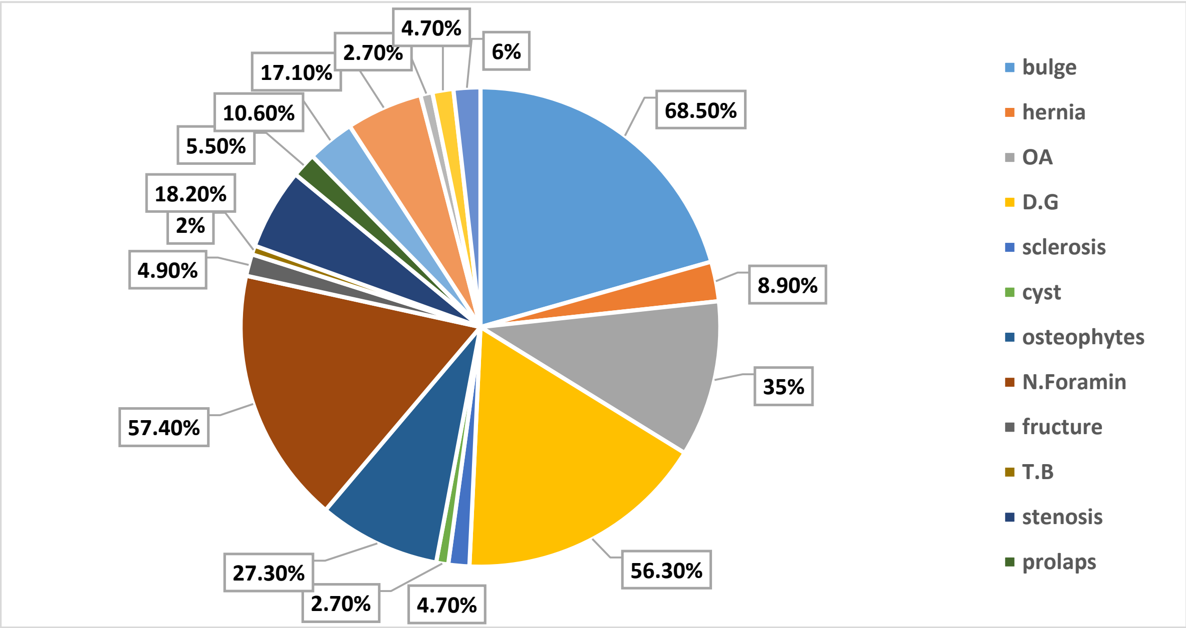

Figure 4-3: Distribution of sample study according to L.S abnormalities

Table 4-3: Distribution of sample study according to L.S abnormalities

L.S disorder	Number		
	Yes/%	No/%	Total
Bulge	309(68.5%)	142(31.5%)	451
Herniation	40(8.9%)	411(91.1%)	451
OA	158(35%)	293(65%)	451
Degeneration	254(56.3%)	197(43.7%)	451
Sclerosis	21(4.7%)	429(95.1%)	450
Cyst	12(2.7%)	439(97.3%)	451
Osteophyte	123(27.3%)	328(72.7%)	451
Neural Foramen	259(57.4%)	192(42.6%)	451
Fracture	22(4.9%)	429(95.1%)	451
TB	9(2%)	442(98%)	451
Stenosis	82(18.2%)	369(81.8%)	451
Prolapse	25(5.5%)	426(94.5%)	451
Spondylosis	48(10.6%)	403(89.4%)	451
Straight L.S	77(17.1%)	374(82.9%)	451
spondylolisthesis	12(2.7%)	438(97.1%)	451
Metastasis	21(4.7%)	430(95.3%)	451
L.F hypertrophy	27(6%)	424(94%)	451

Table (4-3) and Figure (4-3) described of diagnosis result for 451 cases who exposed to MRI examination as the following:-

309 patients diagnosed with bulge disease with percentage of 68.5%, 259 patients diagnosed with narrowing neuroforamen with percentage of 57.4%, 245 patients diagnosed with degenerative disk with percentage of 56.3%, 158 patients diagnosed with OA with percentage of 35%, 123 patients diagnosed with osteophyte formation with percentage of 27.3%, 82 patients diagnosed

with stenosis with percentage of 18.2%, 77 patients diagnosed with straight lumber spine with percentage of 17.1%, 48 patients diagnosed with spondylosis with percentage of 10.6%, 40 patients diagnosed with herniation with percentage of 8.9%, 27 patients diagnosed with Ligamentum flavum hypertrophy with percentage of 6%, 25 patients diagnosed with prolapse with percentage of 5.5%, 22 patients diagnosed with fracture with percentage of 4.9%, 21 patients diagnosed with metastasis and sclerosis with percentage of 4.7%, 12 patients diagnosed with spondylolisthesis and cyst with percentage of 2.7%, 9 patients diagnosed with T.B with percentage of 2%.

4.1.1.5 Association between lumber spine abnormalities and gender

All 451 patient underwent MRI exam and had a MRI report . There was significant association between gender of osteophytes , cyst , Spondylothsis and L.S abnormalities .

Table 4-5: distribution of study sample L.S abnormalities according patient gender

L.S disorder	Gender		Chi-square test	
	M	F	value	P-value
Bulge	193	116	0.832	0.362
Herniation	28	12	.717	0.397
OA	108	50	2.130	0.144
Degeneration	162	92	.002	.969
Sclerosis	15	6	.528	.468
Cyst	4	8	4.977	.026
Osteophytes	67	56	6.456	0.011
Neural Foramen	159	100	1.606	.205
Fracture	15	7	.187	.665
TB	3	6	3.707	.054
Stenosis	50	32	.361	.548
Prolapse	14	11	.708	.400
Spondylosis	32	16	.184	.668
Straight L.S	52	25	.543	.461
Spondylosis	4	8	5.51	.063
Metastasis	9	12	4.209	.040
L.F hypertrophy	20	7	1.304	.254

The Table (4-5) demonstrated how many patients (male and female) were diagnosed with abnormal lumber spine via MRI. The most disease that defects males and females were bulge which represented in (193, 116) patients respectively.

The second most defects for males and female were narrowing neural foramen which represented (159 , 100) patients respectively. The third disease defect both male and female were degenerative which represented (162 , 92) patients respectively. the fourth disease defect both male and female were OA which represented (108,50) patients respectively. The fifth disease defect both male and female were osteophyte formation which represented (67,56) patients respectively. The sixth disease defect both male and female were straight L.S which represented (52 , 25) patients respectively. The seventh disease defect both male and female were stenosis formation which represented (50 , 32) patients respectively. The eighth disease defect both male and female were spondylosis which represented (32 , 16) patients respectively. The ninth disease defect both male and female were herniation which represented (28 ,12) patient respectively. The tenth disease defect both male and female were L.F hypertrophy which represented (20, 7) patients respectively. The eleventh disease defect both male and female were fracture and sclerosis which represented (15, 7) patients respectively.

In Table (4-5) show significant association between gander and some L.S abnormalities in Osteophytes, cyst and metastasis. And no association significant between gender and other disease because p. value more than 0.05 .

4.1.1.6 Association between age group and L.s abnormalities

Table 4-6: distribution of study sample of L.S abnormalities according to their age group

L.S disorder	1 - 30 y		31 - 60 y		61 - 90 y		91+		Pearson Chi-Square	
	Yes	No	Yes	No	Yes	No	Yes	No	Value	P-value
Bulge	14.4 %	15.7%	41.9%	14.4%	12%	1.3%	0.2 %	0%	44.45	0.000
Herniation	2.4%	27.7%	5.5%	50.8%	0.9%	12.4%	0.0 %	0.2%	0.858	0.836
OA	7.3%	22.8%	21.3%	35%	6.2%	7.1%	0.2 %	0%	13.20	0.004
Degeneration	10.9 %	19.3%	35%	21.3%	10.2%	3.1%	0.2 %	0%	37.20%	0.000
Sclerosis	1.1%	29%	2.4%	53.9%	1.1%	12.2%	0.0 %	0.2%	2.231	0.526
Cyst	0.7%	29.5%	1.8%	54.5%	0.2%	13.1%	0%	0.2%	0.599	0.897
Osteophyte	2%	28.2%	18.6%	37.7%	6.4%	6.9%	0.2 %	0.0%	49.642	0.000
Neural Foramen	12.9 %	17.3%	34.4%	22%	10%	3.3%	0.2 %	0.0%	21.816	0.000
Fracture	1.6%	28.6%	2.7%	53.7%	0.7%	12.6%	0.0 %	0.2%	0.087	0.993
TB	0.4%	29.7%	1.3%	55%	0.2%	13.1%	0.0 %	0.2%	0.420	0.936
Stenosis	3.3%	26.8%	10.9%	45.5%	4%	9.3%	0.0 %	0.2%	10.743	0.013
Prolapse	0.4%	29.7%	3.8%	52.5%	1.3%	12%	0.0 %	0.2%	7.284	0.063
Spondylosis	2%	28.2%	6.9%	49.4%	1.8%	11.5%	0.0 %	0.2%	3.544	0.315
Straight L.S	6%	24.2%	8.6%	47.7%	2.4%	10.9%	0.0 %	0.2%	1.545	0.672
Spondylothsis	0%	29.9%	2.2%	54.1%	0.4%	12.9%	0.2 %	0%	7.714	0.260
Metastasis	1.1%	29%	2.7%	53.7%	0.9%	12.4%	0.0 %	0.2%	0.892	0.827
L.F.H	0.9%	29.3%	3.1%	53.2%	2.4%	10.9%	0.0 %	0.2%	17.306	0.001

Table (4-6) showed the association between age group and L.S abnormalities there are significant association between O.A, stenosis, L.F.H and age group and no significant association between bulge, hernia, metastasis, spondylosis, S.L.S, prolapse, degeneration, T.B, Neural Foramen, cyst and scoliosis because P.value more than 0.05 .

4.2 Risk factor

The 99 patients affected by several risk factors that dependent on their life style which explain the following risk factor of lower back pain were study: smoking, diabetes, Chewing Qat and the V.D deficiency.

Table 4-7: The risk factors among study sample

Variable	Number		Total
	Yes	No	
Smoking	19(19.3%)	80(80.7%)	99(100.0)
Diabetes	12(12.2%)	87(87.8%)	99(100.0)
V_D	12(12.2%)	87(87.8%)	99(100.0)
Chewing Qat	60(60.6%)	39(39.4%)	99(100.0

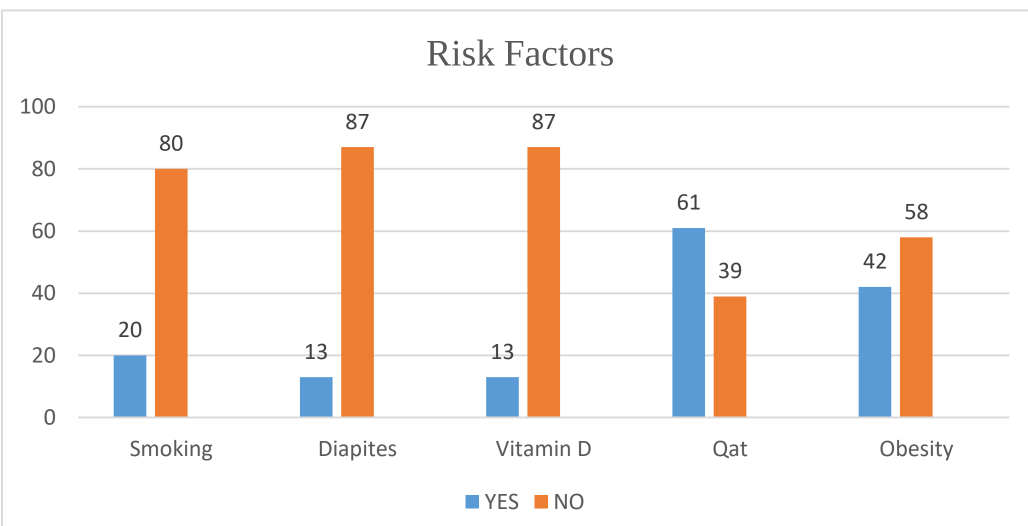

Figure (4-7) The risk factors among study sample

The Table(4-7) and Figure (4-7) showed the risk factors among study sample which were 20 (19.2%) patients smoking ,80 (.80.7%) patents nonsmoking and13 (12.2%) patients has diabetes disease, 87 (87.7%) patents not has diabetes disease and 13 (12.2%) patients has V-D deficiency , 87 (87.7%) patents not has V-D deficiency and 61(61%) Chewing Qat , 39 (39.4%) patents not Chewing Qat .

4.2.1Association between smoking and L.S abnormalities

Diagnosis		Smoking		Chi-square Tests	
		No	Yes	Value	**p-vvalue**
Cyst	No	75	19	0.628	**0.428**
	Yes	5	0		
Osteophytes	No	54	11	0.628	**0.428**
	Yes	26	8		
Neural Foramen	No	44	9	0.359	**0.549**
	Yes	36	10		
Fracture	No	76	18	0.002	**0.962**
	Yes	4	1		
T.B	No	78	19	0.485	**0.486**
	Yes	2	0		
Stenosis	No	67	18	1.526	**0.217**
	Yes	13	1		
Prolapse	No	74	18	0.117	**0.732**
	Yes	6	1		
Spondylosis	No	68	17	0.253	**0.615**
	Yes	12	2		
Straight L.S	No	69	15	0.637	**0.425**
	Yes	11	4		
Spondylothsis	No	78	18	0.399	**0.528**
	Yes	2	1		
Metastasis	No	74	17	0.189	**0.189**
	Yes	6	2		
L.F.H	No	74	18	0.117	**0.732**
	Yes	6	1		
Bulge	No	24	8	1.028	**0.311**
	Yes	56	11		

Herniation	No	66	18	1.788	**0.181**
	Yes	14	1		
Degeneration	No	38	6	1.576	**1.576**
	Yes	42	13		
Sclerosis	No	78	17	2.551	**0.110**
	Yes	2	2		

Tables 4-8: showing the association between smoking and L.S abnormalities

Tables (4-8) showed the association between smoking and L.S abnormalities Show no significant association between smoking and L.S abnormalities because P.value larger than 0.05.

4.2.2Association between diabetes and L.S abnormalities:

Diagnosis		**Diabetes**		**Chi-square Tests**	
		No	Yes	Value	**p-value**
Cyst	No	82	12	0.726	**0.394**
	Yes	5	0		
Osteophytes	No	60	5	3.485	**0.062**
	Yes	27	7		
Neural Foramen	No	48	5	0.773	**0.379**
	Yes	39	7		
Fracture	No	83	11	0.307	**0.580**
	Yes	4	1		
T.B	No	85	12	0.282	**0.596**
	Yes	2	0		
Stenosis	No	75	10	0.072	**0.789**
	Yes	12	2		
Prolapse	No	81	11	0.033	**0.856**
	Yes	6	1		
Spondylosis	No	73	12	2.249	**0.134**
	Yes	14	0		
Straight L.S	No	74	10	0.024	**0.876**
	Yes	13	2		
Spondylothsis	No	84	12	0.427	**0.514**
	Yes	3	0		
Metastasis	No	80	11	0.001	**0.973**
	Yes	7	1		

L.F.H	No	81	11	0.033	**0.856**
	Yes	6	1		
Bulge	No	30	2	1.530	**0.216**
	Yes	57	10		
Herniation	No	73	11	0.494	**0.482**
	Yes	14	1		
Degeneration	No	42	2	4.267	**0.039**
	Yes	45	10		
Scoliosis	No	83	12	0.575	**0.448**
	Yes	4	0		

Tables 4-9: showing the association between diabetes and L.S abnormalities

Tables (4-9) showed the association between diabetes and L.S abnormalities. no significant association between smoking and L.S abnormalities because P.value larger than 0.05.

4.2.3 Association between chewing Qat and L.S abnormalities

Diagnosis		**Qat**		**Chi-square Tests**	
		No	Yes	Value	**p-vale**
Cyst	No	35	59	3.637	**0.057**
	Yes	4	1		
Osteophytes	No	25	40	0.069	**0.793**
	Yes	14	20		
Neural Foramen	No	23	30	0.765	**0.382**
	Yes	16	30		
Fracture	No	37	57	0.001	**0.977**
	Yes	2	3		
T.B	No	37	60	3.140	**0.076**
	Yes	2	0		
Stenosis	No	33	52	0.082	**0.775**
	Yes	6	8		
Prolapse	No	38	54	1.989	**0.158**
	Yes	1	6		
Spondylosis	No	33	52	0.082	**0.775**
	Yes	6	8		
Straight L.S	No	32	52	0.392	**0.531**

	Yes	7	8		
Spondylothsis	No	38	58	0.048	**0.827**
	Yes	1	2		
Metastasis	No	34	57	0.946	**0.163**
	Yes	5	3		
L.F.H	No	36	56	0.038	**0.846**
	Yes	3	4		
Bulge	No	14	18	0.376	**0.540**
	Yes	25	42		
Herniation	No	34	50	0.272	**0.602**
	Yes	5	10		
Degeneration	No	19	25	0.476	**0.490**
	Yes	20	35		
Sclerosis	No	39	56	2.709	**0.100**
	Yes	0	4		

Tables 4-10: showing the association between chewing Qat and L.S abnormalities

Tables (4-10) showed the association between chewing gate and L.S abnormalities. no significant association between chewing gate and L.S abnormalities because P.value larger than 0.05.

4.2.4Association between V.D deficiency and L.S abnormalities

Diagnosis		**V.D**		**Chi-square Tests**	
		No	Yes	value	**p-value**
Cyst	No	82	12	0.726	**0.394**
	Yes	5	0		
Osteophytes	No	58	7	0.325	**0.569**
	Yes	29	5		
Neural Foramen	No	48	5	0.773	**0.379**
	Yes	39	7		
Fracture	No	82	12	0.726	**0.394**
	Yes	5	0		
T.B	No	85	12	0.282	**0.596**
	Yes	2	0		
Stenosis	No	73	12	2.249	**0.143**
	Yes	14	0		
Prolapse	No	80	12	1.039	**0.308**
	Yes	7	0		

Spondylosis	No	75	10	0.072	**0.789**
	Yes	12	2		
Straight L.S	No	73	11	0.494	**0.482**
	Yes	14	1		
Spondylothsis	No	84	12	0.427	**0.427**
	Yes	3	0		
Metastasis	No	80	11	0.001	**0.973**
	Yes	7	1		
L.F.H	No	81	11	0.033	**0.856**
	Yes	6	1		
Bulge	No	30	2	1.530	**0.216**
	Yes	57	10		
Herniation	No	73	11	0.494	**0.482**
	Yes	14	1		
Degeneration	No	42	2	4.267	**0.039**
	Yes	45	10		
Sclerosis	No	83	12	0.575	**0.448**
	Yes	4	0		

Tables 4-11: showing the association between V.D deficiency L.S abnormalities

Tables (4-11) showed the association between V.D deficiency and L.S abnormalities . There was significant association between V.D deficiency and degeneration while there is no significant association between V.D deficiency and Spondylosis, Herniation, Osteophyte, L.F.H, Metastasis, Neural Foramen, Stenosis Prolapse Bulge because Value larger than 0.05.

4.3 Discussion: -

Low back pain is a ubiquitous health problem, representing one of the most frequent illness of mankind. It is often controversial, frustrating, and challenging foe clinicians. Most persons will experience acute low back pain during their lifetime. The first episode usually occurs between 20 to 40 years of age.

MRI has high contrast and special resolution and lack of ionizing radiation, so, MRI is considered by many to be the best imaging technique for the investigation of LBP.

This study included (451) patients with lumber spine abnormalities or clinically suspected with internal disease of L.S referred to MRI in radiology department .

The age of the patients ranges from (5- 100) years with the median of (40) years old. The most common age group was from 30 to 60 years old represented (59.73%) of the patient.

In the present study, the male were more than female with percentage of

(63.9%) . This study opposite study of Aminuddin et al (2013),

Rahma et all (2018).

In the present study, MRI scan detected L.S abnormalities for 309 (68.5%) patients with bulge disease , comparable to the study of (Rahma Abdullah et al , 2023) . And 259 (57.4%) patients narrowing neural foramen , 254 (56.3%) patients degeneration disease , and 158 (35%) patients OA.

There is no association between gender and L.S abnormalities except (Osteophyte , Cyst, and Metastasis) , also there is no association between age group and L.S abnormalities except (OA , Stenosis , and L.F.H)

For 99 patients who have affected by several risk factors which related to their life style . The risk factors of lower back pain were: smoking, diabetes, Chewing Qat and V.D deficiency.

In the present study , The patients that suffer from lumber spine abnormalities who were chewing Qat a proximity 60(60.6%) , and who were taking cigarette about 19(19.3%) , and who had Vitamin D deficiency about 12(12%) and who had diabetes a proximity 12(12.2%).

There is significant association between Vitamin D deficiency and degeneration,

while there is no significant association between L.S abnormalities and the smoking which opposite to study of Johnson et al in (2016) . In addition there is no significant association between chewing Qat and L.S abnormalities .

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Chapter 5 :- Conclusion and Recommendation

5.1Conclusion

The result of this study indicated that the majority of patients were male (63.9%). The age group between (30-60) year were the most frequently (270), while the most abnormalities were bulge 309(68.5%) , the narrowing neural foramen 259(56.3%) , degenerative disease 254(57.4%) , and OA 158 (35%) .

From study sample, the patient of L.S abnormalities in Yemen population who were chewing Qat (60%), while those who were smoking(19.3%), Vitamin D deficiency were (12%) and who had diabetes were (12.2%).

The significant association between gander and L.S abnormalities only occur in Osteophytes, cyst and metastasis. Whereas there was no significant association between gender and other disease**.** Many risk factors affecting to the lumber spine such as smoking, diabetes, chewing Qat, and live style.

The number of patients that who suffer from lumber spine abnormalities in Yemeni population that were chewing Qat a proximately 60(60.6%), who were smoking about 19(19.3%), and who had Vitamin D deficiency about 12(12%) and who had diabetes a proximately 12(12.2%).

There was no association between most of L.S abnormalities and the risk factors (smoking, diabetes and chewing Qat) while there was significant association between diabetes and Vitamin D deficiency with degeneration disease in L.S .

5.2 Recommendation

- Future studies must use large sample to support the findings.
- Technologist must be learned how they read MRI images if needed for other sequence or protocols to help the radiologist in evaluation the disease in lumber vertebrae MRI.
- Further study should ask the patients specifically about what type of work to know exactly the affect of the factors.

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Appendix

L. spine MRI

Technique:

Transverse and sagittal slices in T2 and sagittal T1 weighted images.

Finding:

" Good alignment of lumber spine, with no evidence of spinal instability.
" Average sagittal diameter of lumber bony spinal canal.
" The vertebral body heights and disc spaces are well preserved.
" Normal thickness and signal pattern of spinal cord. The conus medullaris ends at a normal level.
" Normal appearance and signal pattern of vertebral bodies and their appendages.
" No prevertebral soft tissue swelling.

IMPRESSION :

Patient is complaining of lower back pain radiating to right lower limb, current study reveals:

" L4/5 mild disc degenerative changes with disc dehydration and mild height reduction along with mild diffuse disc bulge just abutting the ventral aspect of thecal sac , but normal lateral recesses and exiting nerve foramina ,no remarkable neural element compromise.
" Annular disc relaxation noted at L3/4 level with no significant disc bulge or herniation.
" Straightening of lumbar lordosis mostly due to muscular spasm.
" No frank MRI sign of pars defect.

D / Enas Ghulais
MD Radiologist

L. spine MRI

Findings:

c Normal diameters of the bony lumbar spinal canal.
c Normal MRI appearance of the conus medullaris and cauda equina nerve roots.
c Normal marrow signal of the imaged vertebrae.
c No paraspinal signal abnormalities.

Opinion:

- Straightening of lumbar spine mostly due to muscle spasm.
- Multi-level Spondylosis affecting lumbosacral spine evident by anterior and posterior osteophytes, disc dehydration mainly at L4/L5 and L5/S1, multi-level Schmorl's nodes and reduced disc height at L5/S1 and same level endplate edematous changes (Modic type I).
- L4/L5 & L5/S1 levels show diffuse posterior disc bulges indenting ventral aspect of thecal sac, encroaching upon both side lateral recesses and narrowing of both side exciting neural foramina.

Best regards
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Consultant Radiologist