Sudan University of science and technology

College of Graduate Study

Study of Computed Tomography Findings of Lumber Spine Injuries

دراسة نتائج فحوصات الأشعة المقطعية لإصابات الفقرات القطنية

A dissertation submitted as partial fulfillment for the degree of M.Sc. in Diagnostic Radiological Technology

Prepared by:

Manahel Mohamed Seed Ahmed

Supervisor:

Dr. Ikhlas Abdelaziz Hassan

May 2015

الآيـة

قال تعالى:-

﴿ رَبِّ أَوْزِعْنَي أَنْ أَشْكُـــــــرَ نِعـــــــْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَي وَلِـــــدَيَّ وَأَنْ أَعْمَــلَ صَـــــــالِحــاً تَــرْضَـــــاهُ وَأَصْلِحْ لِي فِي ذُرِيتِي إنْي تبُتُ إلَيْكَ وإنّي مِنَ المسُلِمِينَ ﴾

سورة الأحقاف

الآية (15)

Dedication

Dedicated this research to my parents and to my kids

To all teachers who taught me and to my colleagues

And to everyone help me to complete this research

Acknowledgement

First and always thank Allah for everything Secondly a great thank to Dr. Ikhlas my teacher and my supervisor thirdly a big thanks to all members of CT centers where my work took place. Finally I continue to be extremely grating full to all those colleagues' family members who have supported me both professionally and personally and who continue to encourage me. Thank you without you this moment and all this would never be possible.

Abstract

Lumbar spine injuries continue to be an enormous public health problem even with modern medicine in the 21 century.

Most patient mild stage, the remaining injuries are divided equally between moderate and severe categories.

This study is statistical study, but through it the researcher reflected the social and economic impact of lumbar spine injuries.

The main purpose of this study is to estimate variety and severity of lumbar spine injuries. This received in some CT diagnostic centers and police hospital in Khartoum state.

30 case were selected randomly, those with clinical diagnosis of lumbar spine injuries and their CT report were collected to evaluate them.

The study carried out in four diagnostic centers and in police hospital in Khartoum state in period extends from January to April 2015.

The result of study explain that male have high incidence of lumbar spine injuries.

ملخص الدراسة

مازالت اصابات الفقرات القطنية تشكل معضلة اكثر شيوعا والتى تهدد المجتمع الصحى حتى مع تقدم الطب وادواته فى القرن الواحد وعشرين ومعظم المصابين ما بين مراحل متوسطة وحادة

الدراسة عبارة عن دراسة احصائيه ومن خلالها اراد الباحث الحالات التى تننتج من الاوضاع الاقتصاديه والاجتماعيه وغيرها من الاسباب

الهدف الاساسى من هذه الدراسه هو تقدير التنوع والاختلاف فى حالات اصابات الفقرات القطنيه بواسطة بعض مراكز الاشعه المقطعيه التشخيصيه ومستشفى الشرطه بولاية الخرطوم

تم اختيار ثلاثون عينه عشوائيه من مرضى تعرضوا لاصابات الفقرات القطنيه تم تحويلهم لاقسام الاشعه المقطعيه والدراسه تمت ما بين اربعه مراكز تشخيصيه ومستشفى الشرطه من شهر يناير وحتى شهر ابريل 2015

من اهم نتائج الدراسه الزكور بنسبه اكبر من الاناث وفى نهاية البحث وضع الباحث بعض المقترحات والتى تساهم فى نشر الوعى والاهتمام بزيادة التشخيص

Contents

List of Figures, Tables and Images

Chapter One

Introduction

1.1: Introduction

Trauma is leading cause of death and lumbar spine injuries is common case Lumbar spine has high psychosocial and economic impact because these patients Often have comparatively long hospital stays, and requires discharge to long care Facility. Lumbar spine can affect any one at any age. Persons who are between 15 and 24years of age have been more vulnerable because of their high risk life styles. Young children and individuals over 70 years of age are also susceptible to lumbar Spine injury falls around the home are the leading cause of injury for infants, elder's people. Violent shaking of Infants or elders is another significant cause. The leading causes for adolescents and adults are automobile and motor cycle accidents, but injuries that occur during violent crimes and road traffic accidents are also major source. Computed tomography scanning of lumbar spine remains the most useful Imaging study for Patients with severe lumbar spine injury or with un stable multiple organ injury. Through this study the researcher aim to show the risk and impact of the lumbar spine injury and also reflect the importance of Computed tomography scanning facility in general and emergency hospital. Computed tomography is technology that uses computer-processed x-rays to produce tomographic image of specific areas of the scanned object allowing the user to see what is inside it without cutting it open. Digital geometry processing is used to generate three dimensional image of the inside of an object from large series of to tow-dimensional radiographic images taken around a single axis of rotation .cross-sectional images are used for diagnostic in various medical disciplines .the rest of this article discusses medical-imaging x-ray computed tomography. (Website: www.radiology Info.com).

1.2. Objectives of study;

1.2.1 General objectives:

1. To evaluate the findings lumbar spine injury using CT.

1.2.2**. Specific objectives;**

1. To estimate the number of lumbar spine injury which being received by the CT centers.

2. To assess the actual needs and supplies of CT systems in general and emergency hospitals.

1.3**. Problem of study;**

Increase in lumbar spine injury cases with shortage in apply of CT service due to shortage in CT system.

1.4 **Important of study**;

Availability of CT in hospitals and especially which located near to the high ways is facilitating

Diagnosis of lumbar spine injuries and reducing time wasted in transporting patients from far Areas. Also routine radiography cannot assess the lumbar spine injury as well as.

1.5. The scope of study;

The study contains five chapters;

Chapter one; general Introduction, methodology of research and previous studies.

Chapter tow; is literature review which consist of anatomy of lumbar spine, lumbar spine

Chapter Three; deals with methodology Chapter four; contain the results of the study

Chapter five; include discussions, conclusion and recommendations, References and Appendix

Chapter two

Theoretical background and previous study

2.1 Theoretical background:

2.1.1. Anatomy of the vertebral column

The human vertebral column is the backbone or spine, consisting of twenty-four articulating vertebrae, and nine fused vertebrae in the sacrum and the coccyx. The vertebrae in the column are separated from each other by intervertebral discs. It houses and protects the spinal cord in its spinal canal.

There are normally thirty-three vertebrae; the upper twenty-four are articulating and separated from each other by intervertebral discs, and the lower nine are fused, five in the sacrum and four in the coccyx or tailbone. The articulating vertebras are named according to their region of the spine. There are seven cervical vertebrae, twelve thoracic vertebrae and five lumbar vertebrae. The number of vertebrae in a region can vary but overall the number remains the same. The number of those in the cervical region however is only rarely changed. (Gray, Henary 1979.)

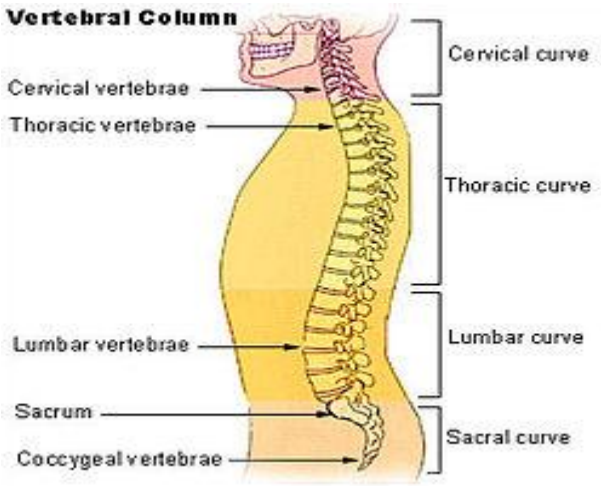


Fig (2-1) Shows: The human vertebral column is divided into regions (labeled)

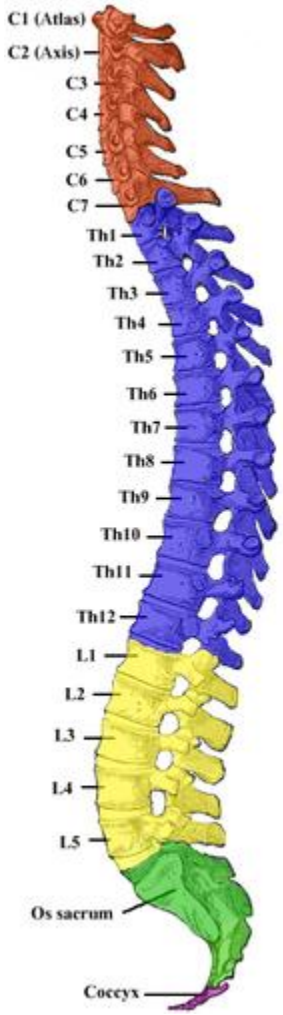


Fig (2- 2) the all vertebral column

The human shows the human vertebral vertebral column consists of 33 vertebrae. are divided into different regions, which correspond to the curves of the spinal column. These regions are called the cervical spine, thoracic spine, lumbar spine, sacrum and coccyx. There are a total of 33 vertebrae in the vertebral column. The articulating vertebrae are name and five lumbar vertebrae. Vertebrae in these The human vertebral column consists of 33 vertebrae. Are divided into different regions, which correspond to the curves of the spinal column. These regions are called the cervical spine, thoracic spine, lumbar spine, sacrum and coccyx. There are a total of 33 vertebrae in the vertebral column. The articulating vertebrae are named according to their region of the spine. There are seven cervical vertebrae, twelve thoracic

vertebrae and five lumbar vertebrae. Vertebrae in these are regions essentially alike, with minor variation. The number of vertebrae in a region can vary but overall the number remains the same. The number of those in the cervical region however is only rarely changed Individual vertebrae are named according to their region and position. From top to bottom(Gray's 2012)

2.1.1.1 Shape

The upper cervical spine has a curve, convex forward, begins at the second cervical vertebra the axis at the apex of the odontoid process known as the dens, and ends at the middle of the second thoracic vertebra; it is the least marked of all the curves.

The thoracic curve, concave forward, begins at the middle of the second and ends at the middle of the twelfth thoracic vertebra. Its most prominent point behind corresponds to the spinous process of the seventh thoracic vertebra. This curve is known as a kyphotic curve the lumbar curve is more marked in the female than in the male; it begins at the middle of the last thoracic vertebra, and ends at the sacrovertebral angle. It is convex interiorly, the convexity of the lower three vertebrae being much greater than that of the upper two. This curve is described as a lordotic curve.

The sacral curve begins at the sacrovertebral articulation, and ends at the point of the coccyx; its concavity is directed downward and forward. The thoracic and sacral curves are termed primary curves, because they are present in the fetus. The cervical and lumbar curves are compensatory or secondary, and are developed after birth. The cervical curve forms when the infant is able to hold up its head (at three or four months) and to sit upright (at nine months). The lumbar curve forms later at twelve or eighteen months, when the child begins to walk.

2.1.1.1 .A anterior surface

When viewed from in front, the width of the bodies of the vertebrae is seen to increase from the second cervical to the first thoracic; there is then a slight diminution in the next three vertebrae; below this there is again a gradual

and progressive increase in width as low as the sacrovertebral angle. From this point there is a rapid diminution, to the apex of the coccyx (Gray's 1977)

2.1.1.1. B: Posterior surface

From behind, the vertebral column presents in the median line the spinous processes. In the cervical region (with the exception of the second and seventh vertebrae) these are short, horizontal and bifid. In the upper part of the thoracic region they are directed obliquely downward; in the middle they are almost vertical, and in the lower part they are nearly horizontal. In the lumbar region they are nearly horizontal. The spinous processes are separated by considerable intervals in the lumbar region, by narrower intervals in the neck, and are closely approximated in the middle of the thoracic region. Occasionally one of these processes deviates a little from the median line which can sometimes be indicative of a fracture or a displacement of the spine. On either side of the spinous processes is the vertebral groove formed by the laminae in the cervical and lumbar regions, where it is shallow, and by the laminae and transverse processes in the thoracic region, where it is deep and broad; these grooves lodge the deep muscles of the back. Lateral to the vertebral grooves are the articular processes, and still more laterally the transverse processes. In the thoracic region, the transverse processes stand backward, on a plane considerably behind that of the same processes in the cervical and lumbar regions. In the cervical region, the transverse processes are placed in front of the articular processes, lateral to the pedicles and between the intervertebral foramina. In the thoracic region they are posterior to the pedicles, intervertebral foramina, and articular processes. In the lumbar region they are in front of the articular processes, but behind the intervertebral foramina(Gray's 2005).

2.1.1.1.C: Lateral surfaces

The sides of the vertebral column are separated from the posterior surface by the articular processes in the cervical and lumbar regions, and by the transverse processes in the thoracic region. They present, in back, the sides of the bodies of the vertebrae, marked in the thoracic region by the facets for articulation with the heads of the ribs. More posteriorly are the intervertebral

foramina, formed by the juxtaposition of the vertebral notches, oval in shape, smallest in the cervical and upper part of the thoracic regions, and gradually increasing in size to the last lumbar. They transmit the special spinal nerves and are situated between the transverse processes in the cervical region, and in front of them in the thoracic and lumbar region.

2.1.1.2. Main article: Vertebra (anatomy)

The vertebral column consists of vertebrae. The vertebrae of the cervical, thoracic and lumbar spines are independent bones, and generally quite similar. The vertebrae of the sacrum and coccyx are usually fused and unable to move independently. Two special vertebrae are the atlas and axis, on which the head rests.a typical vertebra consists of two parts: the vertebral body and the vertebral arch. The vertebral arch is posterior, meaning it faces the back of a person. Together, these enclose the vertebral foramen, which contains the spinal cord. Because the spinal cord ends in the lumbar spine, and the sacrum and coccyx are fused, they do not contain a central foramen. The vertebral arch is formed by a pair of pedicles and a pair of laminae, and supports seven processes, four articular, two transverse, and one spinous, the latter also being known as the neural spine. Two transverse processes and one spinous process are posterior to (behind) the vertebral body. The spinous process comes out the back, one transverse process comes out the left, and one on the right. The spinous processes of the cervical and lumbar regions can be felt through the skin. (Gray's 2005).

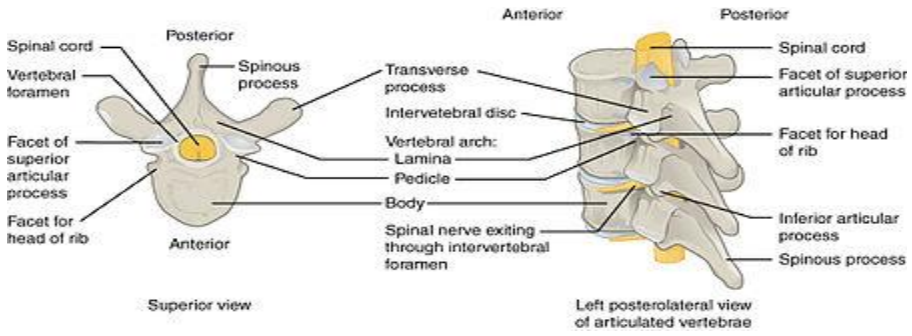


Fig (2-3)Shows: Anatomy of a vertebra

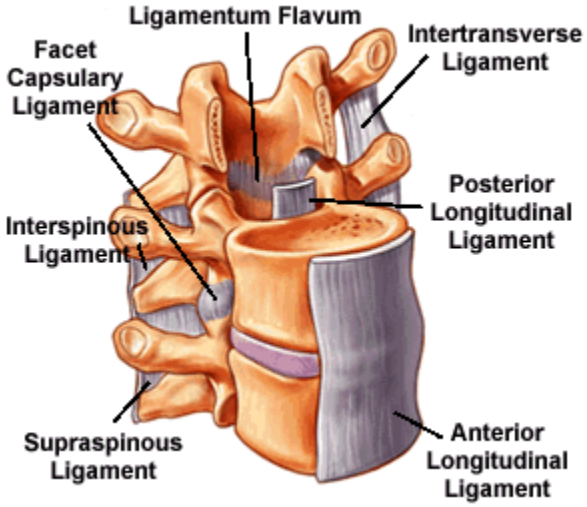
Above and below each vertebra are joints called Zygapophyseal joints. These restrict the range of movement possible, and are joined by a thin portion of the neural arch called the pars interarticularis. In between each pair of vertebrae are two small holes called intervertebral foramina. The spinal nerves leave the spinal cord through these holes.

2.1.1.3: Understanding Spinal Anatomy: Ligaments, Tendons and Muscles

Ligaments and tendons are fibrous bands of connective tissue that attach to bone. Ligaments connect two or more bones together and help stabilize joints. Tendons attach muscle to bone. Tendons vary in size and are somewhat elastic and attach bones to muscles.

2.1.1.3. A Ligaments

The system of ligaments in the vertebral column, combined with the tendons and muscles, provides a natural brace to help protect the spine from injury. Ligaments aid in joint stability during rest and movement and help prevent injury from hyperextension and hyper flexion (excessive movements).



Fig(2-4)shows the vertebral ligament (Gray's 2005).

Table (2-1) shows the description of the ligament.

Ligament Name	Description
Anterior Longitudinal Ligament (ALL) *A primary spine stabilizer*	About one-inch wide, the ALL runs the entire length of the spine from the base of the skull to the sacrum. It connects the front (anterior) of the vertebral body to the front of the annulus fibrosis.
Posterior Longitudinal Ligament (PLL) *A primary spine stabilizer*	About one-inch wide, the PLL runs the entire length of the spine from the base of the skull to sacrum. It connects the back (posterior) of the vertebral body to the back of the annulus fibrosis.
Supraspinous Ligament	This ligament attaches the tip of each spinous process to the other.
Interspinous Ligament	This thin ligament attaches to another ligament called the ligamentum flavum that runs deep into the spinal column.
Ligamentum Flavum *The strongest*	This yellow ligament is the strongest. It runs from the base of the skull to the pelvis, in front of and between the lamina, and protects the spinal cord and nerves. The ligamentum flavum also runs in front of the facet joint capsules.

2.1.1.3. B. Tendons and Muscles

Tendons are similar to ligaments, except these tension-withstanding fibrous tissues attach muscle to bone. Tendons consist of densely packed collagen fibers. Muscles, either individually or in groups, are supported by fascia. Fascia is strong sheath-like connective tissue. The tendon that attaches muscle to bone is part of the fascia.

The muscular system of the spine is complex, with several different muscles playing important roles. The primary function of the muscles is to support and stabilize the spine. Specific muscles are associated with movement of parts of the anatomy. For example, the Sternocleidomastoid muscle (neck area) assists with movement of the head, while the Psoas Major muscle (low back area) is associated with flexion of the thigh. The muscles in the vertebral column serve to flex, rotate, or extend the spine

2.1.2: Function

2.1.2. A Spinal cord

Fig (2-5) the spinal cord nested in the vertebral column.

The vertebral column surrounds the spinal cord. It travels within the spinal canal, 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 matter and white matter and a central cavity. Adjacent to each vertebra emerge spinal nerves. The spinal nervous 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 conus medullaris and cauda equine(Kathleen J.W Wilson 2005)

2.1.3: Disease of spine vertebra

2.1.3.1. spina bifida

Spina bifida is a congenital disorder in which there is a defective closure of the vertebral arch. Sometimes the spinal meninges and also the spinal cord can protrude through this, and this is called Spina bifida cystica. Where the condition does not involve this protrusion it is known as Spina bifida occulta. Sometimes all of the vertebral arches may remain incomplete. Another, though rare, congenital disease is Klippel-Feil syndrome which is the fusion of any two of the cervical vertebrae.Spondylolisthesis is the forward displacement of a vertebra and retrolisthesis is a posterior displacement of one vertebral body with respect to the adjacent vertebra to a degree less than a dislocationSpinal disc herniation, more commonly called a "slipped disc", is the result of a tear in the outer ring (anulusfibrosus) of the intervertebral disc, which lets some of the soft gel-like material, the nucleus pulposus, bulge out in a hernia.Spinal stenosis is a narrowing of the spinal canal which can occur in any region of the spine though less commonly in the thoracic region. The stenosis can constrict the spinal canal giving rise to a neurological deficit.Pain at the coccyx (tailbone) is known as coccydynia. (Gray's Anatomy Edition 2005).

2.1.3.2.Curvature

Spinal curvature is classed as a spinal disease or dorso pathy and includes the following abnormal curvatures Kyphosis is an exaggerated kyphotic (concave) curvature in the thoracic region, also called hyperk yphosis. This produces the so-called "humpback" or "dowager's hump", a condition commonly resulting from osteoporosis. Lordosis as an exaggerated lordotic (convex) curvature of the lumbar region, is known as "lumbar hyper lordosis" and also as "swayback". Temporary lordosis is common during pregnancy Scoliosis, lateral curvature, is the most common abnormal curvature, occurring in 0.5% of the population. It is more common among females and may result from unequal growth of the two sides of one or more vertebrae, so that they do not fuse properly. It can also be caused by

pulmonary atelectasis (partial or complete deflation of one or more lobes of the lungs) as observed in asthma or pneumothorax. (Gray's 2005).

2.1.3.3. Spinal stenosis

Spinal stenosis is the narrowing of the spinal canal through which the spinal cord passes. Vertebral foramina enclose the spinal canal. Stenosis can be very serious if it compromises the spinal cord, resulting in pain, strange neural sensations, and even paralysis. It can be caused by a number of conditions, such as a ruptured disk or a dislocation of vertebrae, but here we will focus on the narrowing of the foramen because of vertebral degenerationWith aging, the stability of the vertebrae, especially at the facet joints degenerates. To counter these stresses, the bone in the vertebrae thickens and the ligaments become thick and stiff. This results in a narrowing of the spinal canal. Stenosis can occur in the cervical, thoracic, lumbar, or all three regions.Treatment options include physical therapy to strengthen back and abdominal muscles and increase flexibility. Medications can provide relief from mild symptoms. Pain-blocking injections can temporarily reduce inflammation of the spinal nerves and nerve roots. Surgery to remove pressure is usually recommended for patients with severe, persistent symptoms.Lamenectomy is the most common surgical technique to relieve spinal cord or nerve branch compression due to stenosis. It involves the cutting of the vertebral lamina and the removal of the posterior portion of the vertebra.In the traditional "open" procedure, the muscles are cut in the approach, increasing recovery time. If done laparoscopically, the muscles are merely pushed aside, reducing recovery. (Gray's 2005).

2.1.3.4. Trauma to the spinal column

Fractures occur when internal or external forces on the vertebrae exceed their structural strength. Common causes are vehicle accidents, sports, violence, and falls. Fractures can be further classified into two more groups: minor and major.

When a posterior column element, such as the facet joint, is fractured it is "minor" because that structure is not vital to the stability of the spine. On the

other hand, if the vertebral body is fractured (middle or anterior column), it is "major" because the stability of the spine may be at risk or damage to the spinal cord may occur. Vertebral body fractures may be further termed as stable or unstable. If a fracture is unstable, the bone fragments can damage the spinal cord and immediate intervention is necessary. (Gray's 2005).

2.1.3.4. ACompression fractures

As the name implies, compression fractures occur from excessive axial forces disrupting the continuity of the anterior column of the vertebral body. Osteoporosis is a leading precursor to compression fractures because of the vertebrae's lower ability to support a load. A missed step or even a cough can result in a compression fracture. People often accept back pain as a normal part of aging.Repeated compression fractures can result in the loss of six inches or more in height. Another common cause of compression fracture is trauma, such as a fall. Click on the button below to witness a sudden vertical impact to the vertebral column.Often, vertebral compression fractures eventually heal on their own. Aspirin and other nonsteroidal anti-inflammatory drugs (NSAIDs) can be taken to relieve pain. More aggressive techniques include vertebroplasty, the injection of bone cement into the vertebra to stabilize it. Kyphoplasty is similar, but the vertebra is first expanded to near normal height and then stabilized with cement or mechanical devices. (Gray's 2005).

2.1.3.4.B. Burst fractures

Burst fractures usually occur from severe trauma such as a vehicle accident or a fall. Burst Fxs are more dangerous than compression Fxs for two reasons. The anterior and middle columns of the vertebral body are broken into several fragments, which are more likely to cause spinal cord injury. Since the vertebral body has lost its structural integrity, the spinal column is less stable.If the burst Fx does not impinge on the spinal cord, it may be treated non-surgically. However, if there are loose fragments or nerve injury, surgery is usually performed. The spine can be accessed anteriorly, posteriorly, or both. Loose fragments may be moved into a better position or

removed. The spine may be reduced (elongated) for alignment. The fragments may be stabilized with screws and other mechanical means. In severe cases, the entire Fx vertebral body is removed and the adjacent vertebrae fixed in place with rods and screws. A bone-conductive reinforcement structure replaces the vertebra. (Gray's 2005).

2.1.3.4.C. Flexion-distraction fracture

This type of fracture is sometimes called a "Chance" fracture. It was often caused by lap seat belts without shoulder restraints in cars. The initial collision can cause extreme flexion of the vertebral column, soon followed by the distraction of the rebound. In this fracture, all three columns of the vertebral body can fail and there may be injury to bone, ligaments and discs as well as other internal injuries.Chance fractures are inherently unstable and require immediate intervention. These fracture types represent about 10% of lumbar spine fractures. The posterior column may be damaged by rupture of the spinus process or posterior longitudinal ligament, or both (Gray's 2005).

2.1.3.4.D. Stable versus unstable fractures

If only the anterior column is damaged, as in the case of most wedge and compression fractures, the fracture is considered stable. When both the anterior and middle columns are involved, the fracture may be considered more unstable.

When all three columns are involved, the fracture is by definition considered unstable, because of the loss of the integrity of the vertebra and posterior stabilizing ligaments.

Stable fractures do not pose a threat to the spinal cord. Unstable fractures endanger the spinal column and, depending on circumstances, may require immediate surgical intervention. (Gray's 2005).

2.1.3.5. Hyperkyphosis

Kyphosis describes the natural curvatures of the thoracic spine, but hyperkyphosis a pathologically exaggerated thoracic curvature, commonly called "hunchback." Hyperkyphos is common in aging adults, usually aided by the vertebral collapse related to osteoporosis. Other common causes may include trauma, arthritis, and endocrine or other diseases. "Dowager's hump" is a frequent result.Adolescent kyphosis, also known as Scheuermann's disease, results from the wedging together of several vertebrae. The cause of the disease is unknown, but treatments with braces and physical therapy are often successful. In extreme cases (Cobb's Angle >60°), surgery may be necessary.Here a modern custom-fit brace is designed to restore lumbar lordosis to a patient with thoracolumbar kyphosis. Results can be seen in the pre-treatment and post-treatment X-rays, respectively, at the right. (Gray's 2005).

2.1.3.4.6. Hyperlordosis of the spine

Lordosis describes the natural curvature of the lumbar spine, but hyperlordosis is a pathologically exaggerated lumbar curvature, commonly called "swayback.Hyperlordosis is usually accompanied by the pelvis tilting abnormally forward, often causing an exaggerated protrusion of the buttocks (See figures). Symptoms may include pain and numbness if the nerve trunks are compromised. Typically, the condition is attributed to weak back muscles or a habitual hyperextension, such as in pregnant women, men with excessive visceral fat, and some dance postures. Hyperlordosis is also correlated with puberty.Treatment for hyperlordosis is not required unless it may progress, causes pain, or compromises nerves. Initially analgesics and anti-inflammatory medication are administered. Physical therapy to build strength, flexibility, and increase range of motion is common. The reduction to ideal body mass index is recommended. In adolescents, bracing may be applied to control progression.
In severe cases with neurological involvement, surgery should be

considered. This typically involves a fusion of L4-L5 and L5-S1.This is a younger person's disease, often associated with overtraining in active sports. There is also a hereditary correlation to weakness in the pars region, suggesting a genetic component. (Gray's 2005).

2.1.3.4. 7.Tumors of the spine

Spinal tumors are relatively uncommon. They can be benign or malignant (cancerous). Primary malignant spinal tumors are rare. Spinal malignancies usually result as a metastasis (spreading) from another malignant tumor.Lateral CT scan showing sagittal view of a sacrococcygeal teratoma, the most common tumor found in newborns. SCTs also can occur in adolescents and adults. and may be benign or malignant.Lateral CT scan showing sagittal view of an ependymoma. These are tumors of the ependyma, a tissue of the central nervous system. The majority are slow-growing and benign. (American Collage of Surgons, Edation, 1997)

2.1.3.4.8.Spinal injury

The spinal cord contains the nerves that carry messages between your brain and body. The cord passes through your neck and back. A spinal cord injury is very serious because it can cause loss of movement (paralysis) below the site of the injury spinal cord injury may be caused by Bullet , stab wound Traumatic injury to the face, neck, head, chest, or back (for example, a car accident),Diving accident. Electric shock Extreme twisting of the middle of the body, Landing on the head during a sports injury ,Fall from a great height. (American Collage of Surgons , 1997)

2.1.4. CT Protocols Of Lumbar spine :

A computed tomography (CT) scan of the lumbar spine makes cross-sectional pictures of the lower back (lumbar spine). It uses x-rays to create the images. (American Collage of Surgons, , 1997)

2.1.4.1.The Test Performed

You will be asked to lie on a narrow table that slides into the center of the CT scanner. Once you are inside the scanner, the machine's x-ray beam rotates around you. (Modern "spiral" scanners can perform the exam without stopping.)A computer creates separate images of the spine area, called slices. These images can be stored, viewed on a monitor, or printed on film. Three-dimensional models of the spine area can be created by adding the slices together. You must be still during the exam. Movement can cause blurred images. You may be told to hold your breath for short periods of time. The scan should take only 10-15 minutes. (American Collage of Surgons, , 1997)

2.1.4.2. Preparation for the Test

Some exams use a special dye, called contrast, that is put into your body before the test starts. Contrast helps certain areas show up better on the x-rays.Contrast can be given in different ways.It may be given through a vein (IV) in your hand or forearm.or given as an injection into the space around the spinal cord.If contrast is used, you may also be asked not to eat or drink anything for 4-6 hours before the test.Let your doctor know if you have ever had a reaction to contrast. You may need to take medicines before the test in order to avoid this problem.If you weigh more than 300 pounds, find out if the CT machine has a weight limit. Too much weight can cause damage to the scanner's working parts.You will be asked to remove jewelry and wear a hospital gown during the study. (American Collage of Surgons, , 1997)

2.1.4.3. The Test will Feel

Some people may have discomfort from lying on the hard table. mouth, and a warm flushing of the body. These feelings are normal and go away in a few seconds. (American Collage of Surgons, , 1997)

2.1.4.4the Test is Performed t0 see

CT rapidly makes detailed pictures of the lower back. The test may be used to look for: Birth defects of the spine in children, Injury in the lower spine, Spine problems when MRI cannot be used This test can also be used during or after an x-ray of the spinal cord and spinal nerve roots (myelography) or an x-ray of the disk (discography).2.1.4.5. Abnormal Results Mean
Abnormal results may be due to: Birth defects of the spine, Bone problems, Fracture Lumbar disk, herniation, Lumbar spinal stenosis,Spondylolisthesis. (American Collage of Surgons, 1997)

2.1.4.5.Risks

Risks of CT scans include: Being exposed to radiation, Allergic reaction to contrast dye The most common type of contrast given into a vein contains iodine. If a person with an iodine allergy is given this type of contrast, nausea or vomiting, sneezing, itching, or hives may occur. .CT scans expose you to more radiation than regular x-rays. Having many x-rays or CT scans over time may increase your risk for cancer. However, the risk from any one scan is small. Talk to your doctor about this risk and how it weighs against the benefits of the test for your medical problem .Some people have allergies to contrast dye. Let your doctor know if you have ever had an allergic reaction to injected contrast dye .If you must have this type of contrast, your doctor may give you antihistamines (such as Benadryl) or steroids before the test.

The kidneys help remove iodine out of the body. People with kidney disease or diabetes may need to receive extra fluids after the test to help flush the iodine out of the body. Rarely, the dye may cause a life-threatening allergic response called anaphylaxis. If you have any trouble breathing during the test, you should tell the scanner operator right away.

Scanners come with an intercom and speakers, so the operator can hear you at all times. (American Collage of Surgons, , 1997)

2.1.4.6.Considerations

The lumbar CT scan is good for evaluating large herniated disks, but it can miss smaller ones. This test can be combined with a myelogram to get a better image of the nerve roots and pick up smaller injuries.

2.1.4.7. lternative Name

CAT scan - lumbar spine; Computed axial tomography scan - lumbar spine; Computed tomography scan - lumbar spine; CT - lower back(American College of Surgeons, 1997)

2.1.5.Radiographic apperance

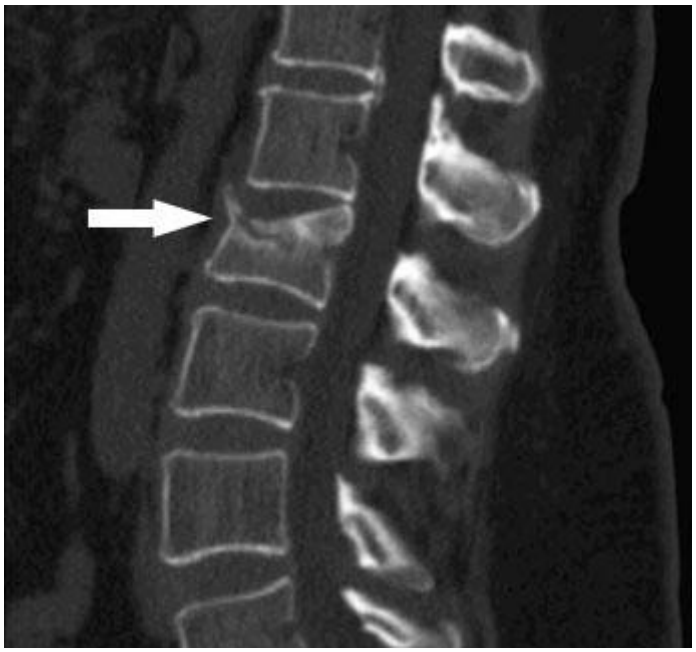


Image (2-1) fracture of L2 lumbar spine (Website; WWW.Radiology. Info.com)

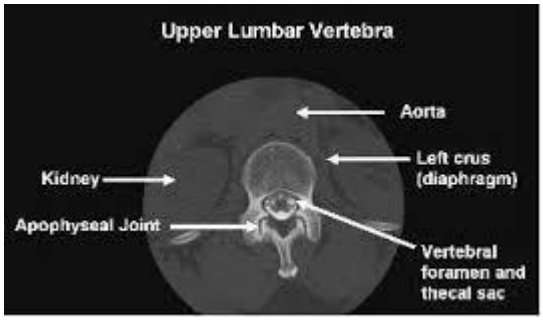


Image (2-2) shows axial CT scan of upper lumbar spine (Website ;WWW.Radiology Info.com)

Image (2-3) shows fracture Image (2-4) shows fracture of L2 and L3 lumbar spine of L2 and L3 lumbar spine (Website;WWW.Radiology Info.com)

Image (2-4) shows fracture of L2 and L3 lumbar spine (Website;WWW.Radiology Info .com)

2.2Previous study;

Study on this topic are different in objection an aims, there statistics of lumbar spine injuries

Was done at the United States, that found approximately 200,000cases of lumbar spine injury

Occur the United States each reaching year.

Of these, about 10 die prior to hospitals, about 80 of lumbar spine injured patientsReceiving medical attention can be categorized as mild, 10 as moderate, and 10 as severe.More than 100,000 patients suffer varying degrees of dis ability from lumbar spine injury every year in the United States.

C.N.S account for more than 40 of mortality in the military .there for, small reduction in the mortality and morbidity resulting from lumbar spine injury should have major impact on public Health.

Chapter Three

Materials and Methods

3.1:Materials:

3.1.1.Patients

Random sample of 30 patients with clinical diagnosis of lumbar spine injury, which referred to CT their age from 10 to 7o years

3.1.2. Study Design;

Observation study –hospital based study

3.1.3 Area of study;

Four CT centers in Khartoum, selected by their locations near to some general hospitals

1- police hospital center.

2-khartoum modern center.

3-Elnileen medical center.

4- Al- Amal Hospital

3.1.4. Duration of study;

From October 2014 to January 2015

3.1.5. Data analysis;-

Statistically computer analysis, using graphed percentage programmed.

3.1.6. Machines used:

The machine used in this study is, Toshiba dual spiral CT, Siemens, GE high speed dual CT. The major components of CT system are gantry, table, operator console, and power distribution

3.1.7..Gantry specification of GE system:

Aperture 65 cm ,Tilt up and down 20 degrees.,Tilt speed 1 degree 1 second

Focus iso center 541 cm.,Focus to detector 949 mm. Rotation speed 360 degrees.

Image (3-1) computed tomography equipment 64 slices.

3.2:Methodes:

3.2.1:Procdure used: The technologist begins by positioning you on the CT examination table usually lying flat on your back or possibly on your side.

Straps and pillows may be used to help your maintain the correct position and to hold still during the exam. If contrast material is used it well be swallowed, injected through an intra venous line. Depending on the type of examination or administered by enema. Next the table will move quickly through the scanner to determine the correct starting position for the scans.

Then the table will move slowly through the machine as actual CT scanning is performed you may be asked to hold your breath during the scanning.

When the examination is completed you will be asked to wait until the technologist verifies that the images are of high enough quality for accurate inter pretention.

3.2.2.Data collection sheet

Data collection sheet used include demographic information (age,gender,weight),type of fracture,severity.

3.2.3.Evaluation and image interpretations:

Cases were evaluated by different consultant radiologist with different experiences and practice.

Table 3-1 Scanning Protocol of Lumber Spine.

Exam	Scan mode	Thickness	Table interval	KVP	MA	Scan Time
Lumbar spine	axial	3 mm	100mm	120 140	300 375	7.94%

Chapter Four

Results

This chapter shows data analysis that collected by data collection sheet

Table4.1: Gender distribution, frequency and Percentage.

Gender		
	Frequency	Percentage%
Female	13	43.3
Male	17	56.7
Total	30	100.0

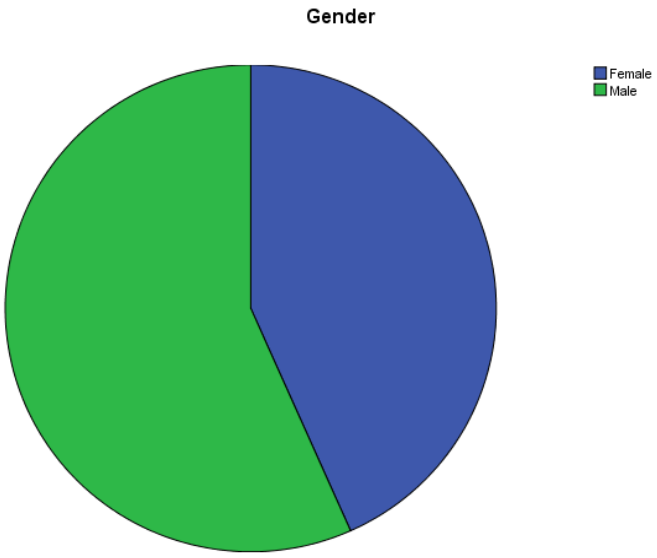


Figure4.1: Pie Chart Shows Gender distribution.

Table4.2: Descriptive Statistics Of the patients Demographic Data(Mean, Std. Deviation, Minimum, Maximum Values

Descriptive Statistics Of the patients Demographic Data

	N	Minimum	Maximum	Mean	Std. Deviation
Age/Year	30	15.00	75.00	45.6	±18.1
Weight/Kg	30	45.00	87.00	67.8	±11.1

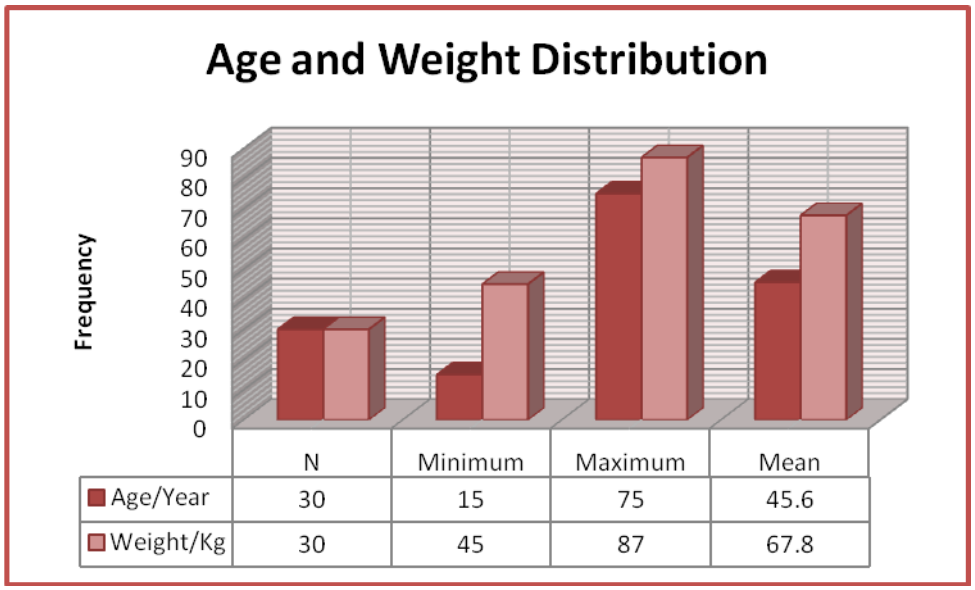


Figure4.2: Chart Shows Age and Weight distribution

Table4.3: Age Class, frequency and Percentage.

Age Class	Frequency	Percentage%
15-25	7	23.4
26-36	3	10.0
37-47	5	16.9
48-58	5	16.6
59-69	8	26.5
>69	2	6.6
Total	30	100.0

Figure 4.3: Histogram shows Age Class Distribution/Year, mean and STDV

Table4.4: Weight Class, frequency and Percentage.

	Weight/Kg	
	Frequency	Percentage%
45-55	5	16.6
56-66	7	23.3
67-77	12	39.9
78-88	6	19.9
Total	30	100.0

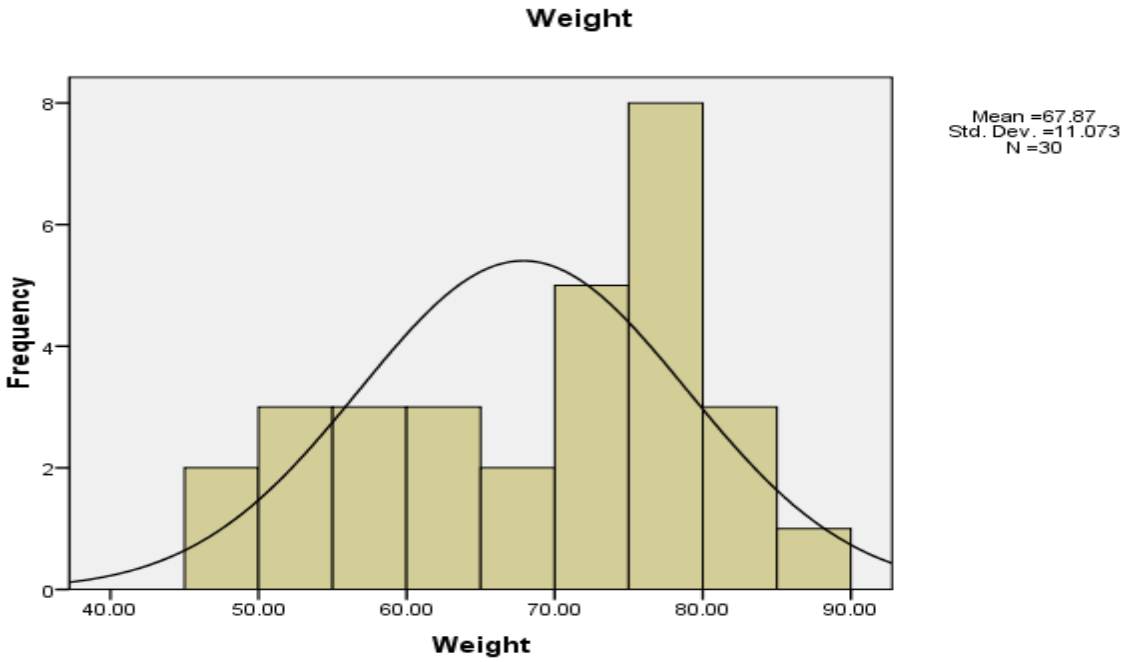


Figure 4.4: Histogram shows Weight Class Distribution/Kg, mean and STDV

Table4.5: Fracture Type, frequency and Percentage.

Fracture Type	*Frequency*	*Percentage*
Complex	11	36.7
Simple	16	53.3
Comminuted	3	10.0
Total	30	100.0

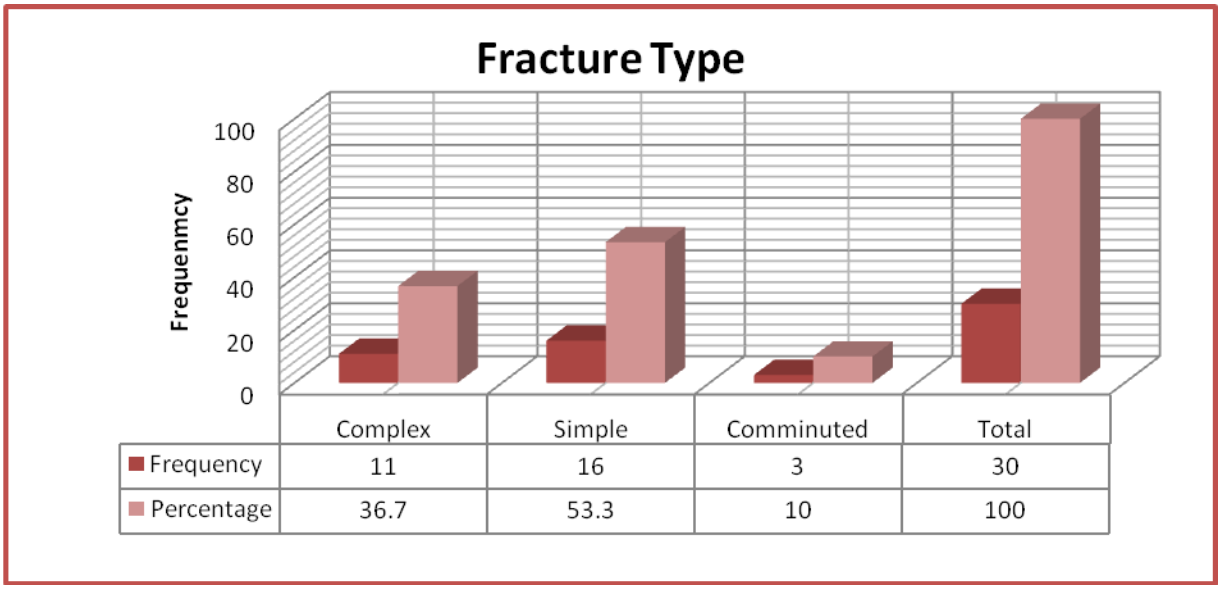


Figure 4.5: Histogram shows Fracture Type, Frequency and Percentages

Table4.6: Fracture Severity, frequency and Percentage

Fracture Severity	Frequency	Percentages%
Mild	16	53.4
Moderate	7	23.3
Severe	7	23.3
Total	30	100.0

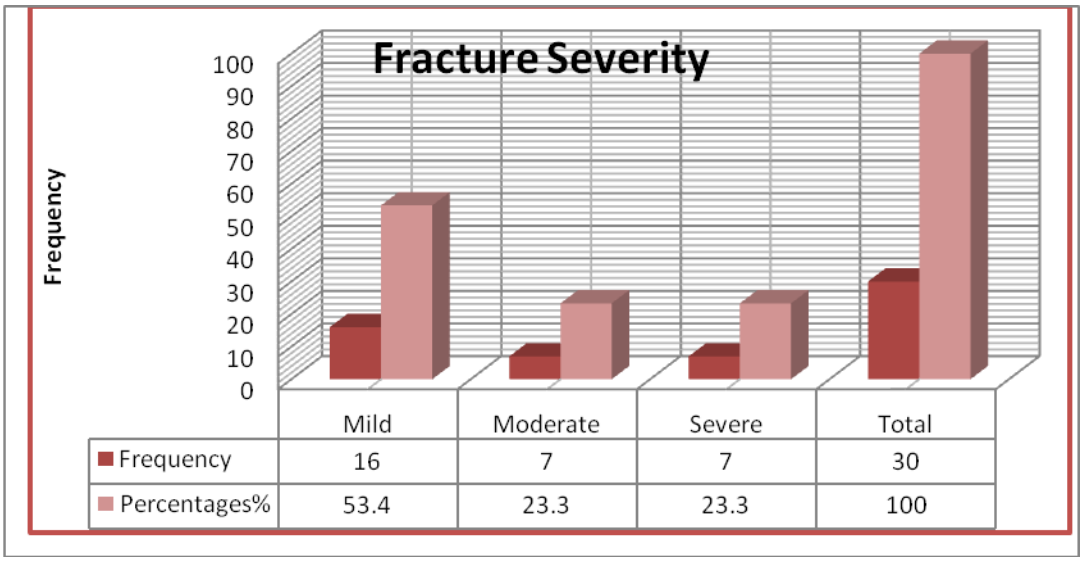


Figure 4.6: Histogram shows Fracture Severity ,Frequency and Percentages

Table4.7: Fracture Site, frequency and Percentage

	Frequency	Percentages%
One Vertebra	21	70.0
More than One Vertebra	9	30.0
Total	30	100.0

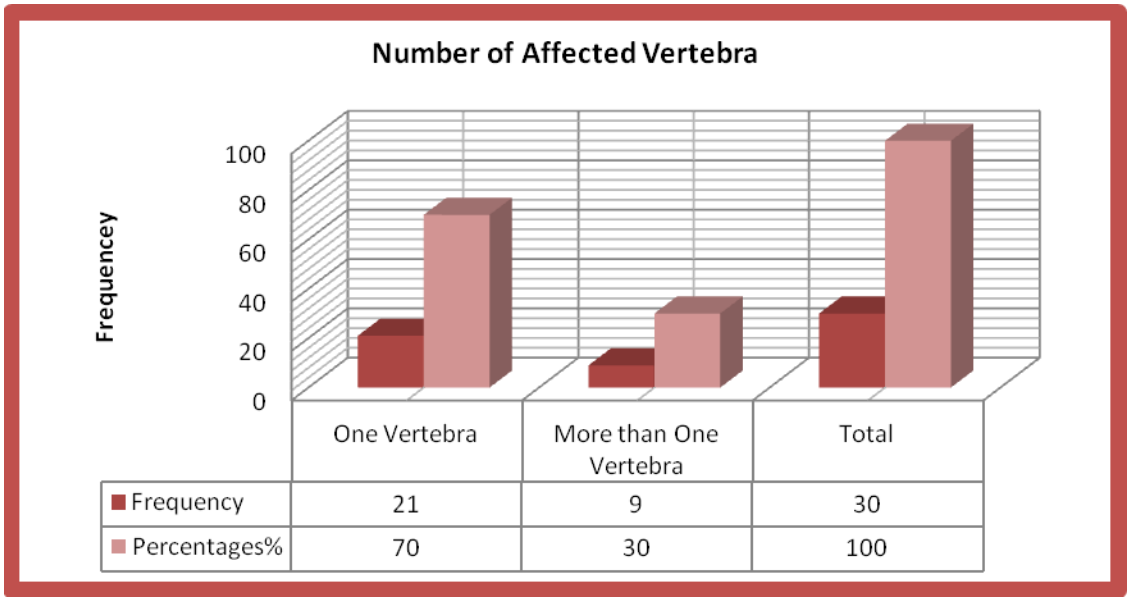


Figure 4.7: Histogram shows Number of the affected vertebra(Fracture Site), Frequency and Percentages

Table4.8: Most Affected Vertebra, frequency and Percentage

Affected Vertebra	*Frequency*	*Percentages%*
L1	***8***	***26.7***
L1&L2	***3***	***10.0***
L2	***1***	***3.3***
L2&L3	***4***	***13.3***
L3	***5***	***16.7***
L3&L4	***2***	***6.7***
L4	***5***	***16.6***
L5	***2***	***6.7***
Total Patients	***30***	***100.0***

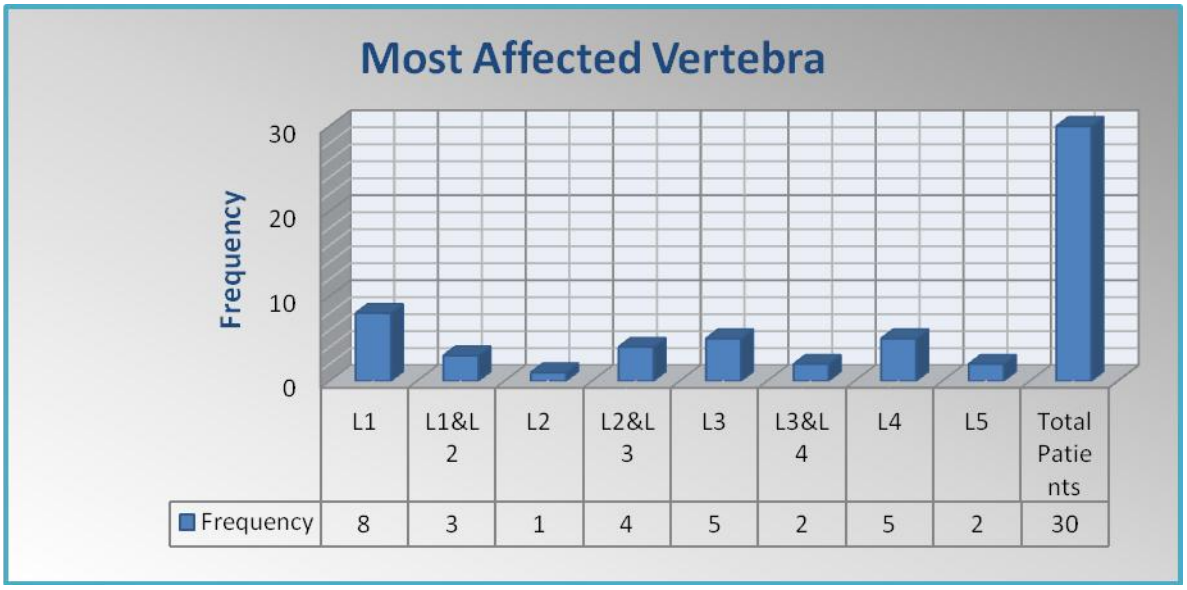


Figure 4.8: Histogram shows most affected Vertebra and its Frequency

Table4.9: Cross Tabulation between The Fracture Type and Affected Vertebra

		Site		Total
		One Vertebra	More than One Vertebra	
Fracture Type	Complex	5	6	11
	Simple	16	0	16
	Comminuted	0	3	3
Total		21	9	30

Chi-Square Tests/ Linear-by-Linear Association=0.709

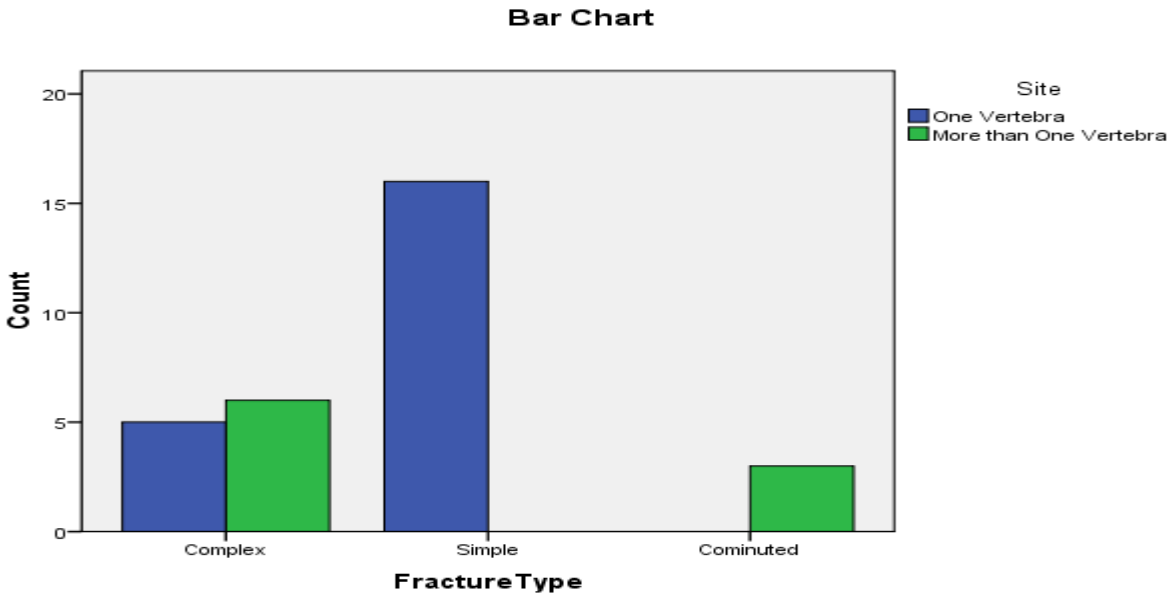


Figure 4.9: Histogram shows The Fracture Type and The affected Vertebra(Site)

Table4.10: Cross Tabulation between The Fracture Type and Severity of The Fracture

		Severity			***Total***
		Mild	Moderate	Severe	
Fracture Type	Complex	5	1	4	10
	Simple	8	5	3	16
	Comminuted	3	0	0	3
Total		16	6	7	29

Chi-Square Tests/ Linear-by-Linear Association=0.144

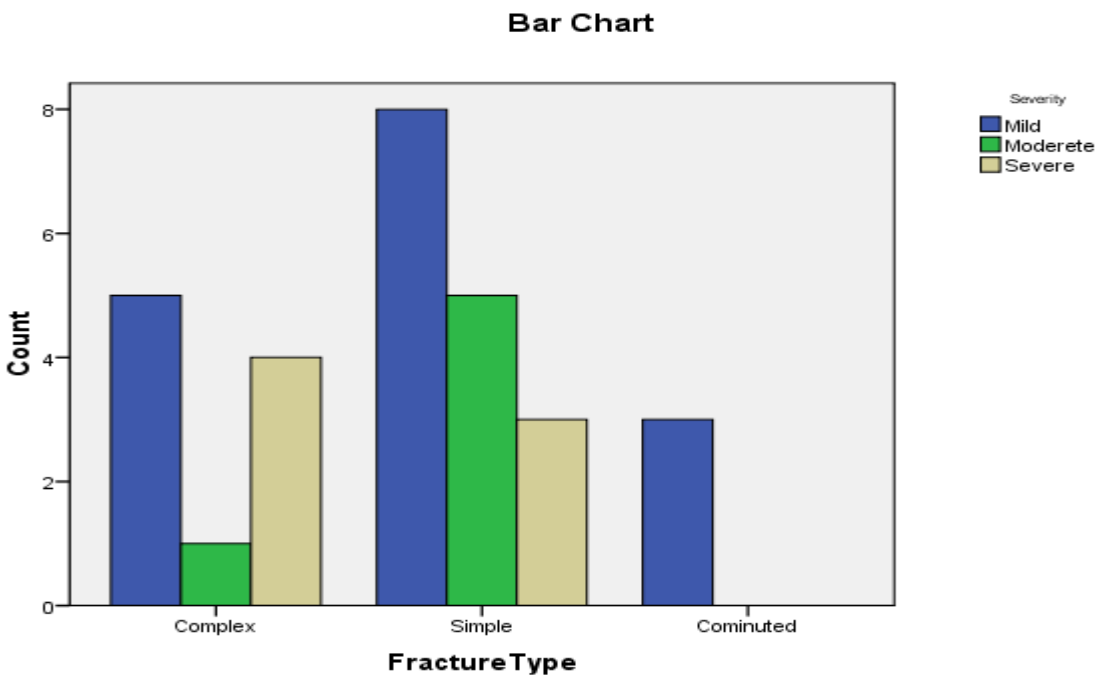


Figure 4.10: Histogram shows The Fracture Type and the Severity of the Fracture (Mild, Moderate and Severe)

Chapter five
Discussion, Conclusion and Recommendation

5 .1 Discussions:

Once important part of the lumbar spine injuries evaluation, lumbar spine radiograph have been replaced by CT scans and are rarely used in patient with closed lumbar spine injuries. Lumbar spine radiograph are occasionally used in evaluation of trauma. Also act is diagnostic study of choice in evaluation of lumbar spine injuries because it has rapid acquisition time is universally available, is easy to interpret and reliable. Introduced more than 25 years ago CT scans of lumbar spine take more time to complete.

This acquisition time has decreased steadily the current generation of ultra fast CT scanners can performed lumbar spine CT scan in less than one minute ,faster than the time required to enter demographic data in to the scanner .The study conducted on 30 patients who refer to CT scan examination under diagnosis of lumbar spine injuries.The diagnosis of those patient s is gathered in data collection sheet for each separate Patient analyzed. After analysis of data the researcher found that incidence of male is greater than female about 56,7% and female 43, 3%

Incidence of effected vertebrae re the vertebra number one more effected than the others. The type of fracture happened more than one is simple fracture.

The researcher found that after the analysis data collection from 30 patients around different diagnostic centers (Alnileen, Almotaour) and Alamal, medical molatery. police hospitals found this result not similar to other previous studies. Type of fracture(simple 53,3%, complex 36,7%, comminuted 10,0%),severity of fracture(mild 53,3%, moderate 53,3% ,severe 23,3%) Most common effected vertebrae L126,7% and another vertebrae L1 and L2 10% ,L2 3,3%, L2 and L3 13,3%, L3 16,7% ,L3 and L4 6,7% ,L4 16,7%

And L5 6, 7%.

5 .2 Conclusions:

Through this study we meant to reflect the high risk of lumbar spine injury. We put some recommendations must be useful in trauma management and how we can prevent or reduce the happening of the lumbar spine injuries.

5.3 Recommendations:

The researcher **recommended** that:

1) Availability CT near to every hospital save the patient rescue time.
2) Increase the CT centers for apply good and quick service the patient.
3) Good management of trauma at the site of accident and inside the CT room.

For future study we advice to made wide study on this topic over all country.

References:

1. American college of surgeons, Trauma life support programe,6th edition,1997.
2. Gray, Henry (1977). *Gray's Anatomy*. New York: Crown Publishers, Inc. p. 34.
3. Jhon Smith MSC, American College of Radiology, 2010.
4. kathleen J.W Wilson ,Annewaugh, Anatomy and physiology in Health and illness 8edition 1997.
5. Leef Poger, Radiology of Skeletal Trauma 3rd Edation 2002.
6. peter L.willimas .Grays Anatomy 38 edition 1995
7. website ;emedicine.come
8. website ;WWW .radiology Info.com

Data collection sheet

Age	Gender	Weight	Site of fracture	Type of fracture	Severity of Fracture