CHAPTER – 1

1.1 Introduction:

Low back pain is a common disorder and nearly everyone is affected by it at some time. For most people affected by low back pain substantial pain or disability is short lived and they soon return to normal activities regardless of any advice or treatment they receive. A small proportion, however, develop chronic pain and disability. Once low back pain has been present for more than a year few people with long-term pain and disability return to normal activities.

Though Low back pain (LBP) is a substantial health problem it accounts for considerable healthcare and socioeconomic costs.\(^1\) It is a major public health (medical) concern in many countries.\(^2\) It is not only a major medical problem, but also a significant economic problem. The indirect costs of low back pain, which include work disability payments and work absenteeism, made up 93% of the total. Direct medical costs, including costs for hospitals, medical specialists, Primary care physicians and allied health professionals, made up 7% of the total.\(^3\)

According to National Institute of Occupational Safety and Health (NIOSH), approximately 7,06,000 cases away from work resulted from overexertion and repetitive motion and approximately 5,30,000 cases lost work time associated with manual materials handling activities such as lifting, pushing, pulling and carrying and over 60% of these cases involved back pain.

Moreover the World Health organization (WHO) has included “low back pain” as a priority in the Bone and Joint decade 2000 – 10.

The term low back pain (LBP) is very broad and covers a large heterogeneous group of disorders. It has been estimated by some that a somatic cause is found in 10-20% of cases with LBP\(^4\), whereas others find that as much as 97% of LBP is called “non-specific” or “sprain/strain.”\(^5\) Thus, LBP refers to a set of symptoms or a syndrome rather than a diagnosis.\(^6\) A number of subgroups have been proposed in LBP but this area is still not well understood and in the majority of patients with LBP it is not possible to reach an exact diagnosis which can match specific clinical, biological, laboratory, or imaging findings to the presence of LBP.\(^7\)
1.2 History of Low Back Pain:

The earliest description of Back Pain and sciatica is in an Egyptian manuscript, dated about 2,500 B.C. Later Hippocrates who introduced the term “sciatica”, but the ancient Roman authors, like Soranus and Caelius Aurelianus, who defined sciatica and introduced the terms “psoadica” and “ischiatricus dolor” for pain in the psoas and ischia regions. Aurelianus and Soranus described different types of back pain. Vesalius in the 16th century described an anatomical basis for the etiology of LBP. In the 18th and 19th century, authors like Cotugno, Von Luschka, Lasègue, Oppenheim, Babinski, Virchow and Kocher attributed to the understanding of back pain. Mixter and Barr in 1934 for the first time, assigned prolapse of the intervertebral disc as the etiologic factor of - especially the sciatic part of - the symptoms. Steinler first highlighted a relation between low back pain and degeneration of the IV disc in the late forties.

1.3 Definitions of Low Back Pain:

According to World Health Organization (WHO), Low back pain would be considered as a disability, and the social design, and architectural barriers would be its handicaps. Other activities often blamed weight, lumbar lordosis, height, body mass index, and discrepancy between leg lengths may not play a major role.

According to Spitzer WO, LeBlanc RE, Low back pain (LBP) is a broadly defined term, which in all likelihood represents a variety of conditions presenting themselves as slight discomfort with no consequences for the individual to far more painful and severely disabling conditions. Low back pain is defined as pain and discomfort, localized below the costal margin and above the inferior gluteal folds, with or without referred leg pain. Non-specific low back pain is defined as low back pain not attributed to recognizable, known specific pathology.

The definition of non-specific low back pain used in the guidelines of Waddell’s description of “simple low back pain”, which is as follows: “Clinical presentation is usually at ages 20–55 years; lumbo sacral region, buttocks and thighs; pain is ‘mechanical’ in nature: varies with physical activity and varies with time; patient well.”
1.4 Epidemiology (Prevalence and Incidence):

In a review, Frymoyer states that 60–90% of the entire population will experience an episode of low back pain at least once in their lives and that the corresponding annual incidence is 5%. Although 60-90% of the population experiences LBP during their lifetime, only a small subset of these become chronic/recurrent LBP sufferers. The lifetime prevalence of low back pain is reported as over 70% in industrialized countries.

A recent study among Danish twins found that by the age of 18 for girls and 20 for boys more than 50% had experienced at least one LBP episode, and another study found that LBP at age 18 significantly increased the risk of LBP at age 30. Back pain mainly affects adults of working age, particularly people aged between 40 and 60 years.

The incidence of LBP is higher in manual workers, particularly occupations that involve heavy lifting and twisting (e.g. construction, mining). However, there is evidence that the prevalence of LBP is also high in sedentary workers. Psychological factors (e.g. job dissatisfaction, inadequacy of income, depression, anxiety) have also been found to increase the transition of acute low back pain to chronic pain and disability.

Non Specific Low Back Pain (NSLBP) represents about 85% of LBP patients seen in primary care and the vast majority of LBP patients seen by physical therapists are classified under this label. The annual incidence and prevalence of non-specific low back pain in the average primary care physician’s practice are 30 and 35 episodes, respectively, per 1,000 registered patients.

In the UK, estimates indicate that low back pain is the largest single cause of absence from work and is responsible for 12.5% of all sick days. Among patients receiving care in the USA, the proportion receiving physician care increased from 64% in 1987 to 74% in 1997, whereas those obtaining care from physical therapists increased from 5% to 9% during the same period.

The impact of LBP has been so broad that it is the 2nd reason for physician visits after the common cold, 3rd cause for surgical procedures, and 5th cause for hospital admissions. For physical therapists, low back pain is a common referral diagnosis, with 27% of all patients referred having low back pain.
1.5 Classification:

According to ‘International Association for the Study of Pain’ (IASP) an episode of low back pain can be classified according to its duration as either Acute (0–6 weeks duration), Sub-acute (7–12 weeks duration) or Chronic (> 12 weeks duration). Recurrent low back pain (occurrence of more than two episodes of back pain within one year such that the total duration is less than six months).²⁹

Low Back pain is sometimes further referred to as Mechanical back pain, Idiopathic back pain, Non-specific back pain, Backache, or Lumbago. A distinction is made between specific low back pain and non-specific low back pain depending on the origin of the pain. Specific low back pain is back pain that has a specified cause, such as trauma, a tumor, an infection, or nerve root compression (the radicular syndrome). In non-specific low back pain, no physical cause can be demonstrated.³⁰

Low back pain can be broadly categorized into 5 clusters, including:

1. Uncomplicated low back pain (non radiating with no structural damage/defect)
2. Uncomplicated sciatica (radiating back pain that does not extend below knee)
3. Major neurologic dysfunction (loss of motor function or continence)
4. Major mechanical problem (spinal fracture or instability)
5. Infection or neoplasm³¹

A simple and practical classification, which has gained international acceptance, is to divide low back pain into three categories – the so-called “diagnostic triage” (Waddell 1987):

- Specific spinal pathology
- Nerve root pain/radicular pain
- Non-specific low back pain

The recommendations are given in relation to “non-specific” chronic low back pain, i.e. low back pain that is not attributable to a recognizable, known specific pathology.³²

Nonorganic low back pain also occurs and can be divided into several categories,

1. Psychosomatic spinal pain (tension syndrome fibrositis, or muscle tension generated physiologically by anxiety)
(2) Psychogenic spinal pain (somatization of anxiety into neck or back pain with no physiologic changes, as in a conversion reaction)

(3) Psychogenic modification of organic spinal pain (an emotional reaction that modifies the appreciation of an organic pain)

(4) Situational spinal pain (litigation reaction, conscious over concern or exaggeration).  

According to Pathophysiologial classification,

<table>
<thead>
<tr>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertebral and paravertebral causes</strong></td>
</tr>
<tr>
<td>Degenerative disc disease</td>
</tr>
<tr>
<td>Degenerative joint disease</td>
</tr>
<tr>
<td>Arachnoiditis</td>
</tr>
<tr>
<td>Musculoskeletal disorders</td>
</tr>
<tr>
<td>Neoplasm</td>
</tr>
<tr>
<td>Infectious</td>
</tr>
<tr>
<td>Rheumatic conditions</td>
</tr>
<tr>
<td>Traumatic</td>
</tr>
<tr>
<td>Idiopathic</td>
</tr>
<tr>
<td><strong>Referred causes</strong></td>
</tr>
<tr>
<td>Vascular origin</td>
</tr>
<tr>
<td>Biliary origin</td>
</tr>
<tr>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>Uterine origin</td>
</tr>
<tr>
<td>Renal origin</td>
</tr>
</tbody>
</table>

According to **Quebec classification**, emphasis is laid on objective documentation of the back pain symptoms, and on possible causes of the pain. Possible sources of pain in category 1, 2, and 3 are, for example, injuries to soft tissues, the facet joints or the intervertebral disc. Lumbar disc herniation, specific nerve root lesions, and cauda equina syndrome due to (massive) lumbar disc prolapse are classified in categories 4 and 6. Category 5 includes acute spinal trauma and segmental instability, category 7 all forms of spinal stenosis. Issues related to spinal surgery and “chronic pain syndrome” is grouped in 8, 9, and 10. Other causes of low back pain like spondylolisthesis, primary and secondary tumors, and inflammatory lesions are in category 11.
1.6 Anatomy of Lower Back:

The lower back is composed of a variety of structures. These include the bony structures which are typically the five lumbar vertebrae, the sacrum and coccyx. There are also the intervertebral discs and ligamentous structures of the spine as well as the paraspinal muscles, nerves, and blood vessels.

The lumbar vertebrae articulate with each other at anterior and posterior intervertebral joints. They are stabilized by ligaments anteriorly and posteriorly (Moore, 1992). A single vertebra consists of many distinct parts. Anteriorly is the vertebral body which then progresses to the pedicles and the lamina which form a canal called the vertebral foramen. The spinal cord and its surrounding structures are found within the vertebral foramen or spinal canal. Laterally the vertebrae have transverse processes and posteriorly there is a spinous process. These structures serve as attachment points for the various ligaments and muscles of the back. Two vertebrae in articulation have vertebral notches, which are indentations of the pedicles, which form the intervertebral foramen (Moore, 1992). The intervertebral foramina are where the nerve roots exit the spinal column. The sacrum is formed from the fusion of 5 sacral vertebrae and the coccyx is a vestigial remnant of bone. The sacrum is integrated into the pelvis in such a way that, normally, only little motion can occur in the sacro-iliacal joints (SI-joints).

Figure 1: Superior view of vertebra:
Figure 2: Lateral view of vertebra:

Figure 3: Oblique view of several vertebrae:
The lumbar vertebra can be divided into three functional parts: 1) the vertebral body; 2) the pedicles; 3) the posterior elements. The different parts have unique functions but they act together in the integrated function of the whole vertebra.

1) **The vertebral body:** The vertebral body is a large block of bone, perfectly designed for its – longitudinally applied - weight-bearing purpose. Its internal structure consists of a cancellous cavity with vertical and transverse trabeculae surrounded by a layer of cortical bone. The main advantages of having the trabecular internal structure over a solid bone block is the lesser weight of the vertebra, the ability of sustaining static as well as dynamic loads, and the possibility of being well supplied by the arteries and veins running through the trabecular cavity. The trabecular cavity of the vertebral body filled with blood appears as a sponge and is therefore also known as **Spongiosa**. Although the weight-bearing capacity of the vertebral bodies is enormous, the vertebral bodies can not resist sliding and twisting movement of the lumbar spine.

2) **The pedicles:** The pedicles function as a bridge between the vertebral body and the posterior elements. They transmit both tension and bending forces acting on the posterior elements of the vertebra to the vertebral body.

3) **The posterior elements:** The posterior elements of the vertebra consist of the articular processes, the spinous processes, and the laminae. The posterior elements are submitted to various forces acting on the vertebra. The inferior and superior articular processes, for example, resist forward sliding and twisting of the vertebral bodies.

   The spinous, transverse, accessory and mamillary processes are muscles-attachments and are therefore submitted to muscular forces acting on the vertebra. The laminae conduct forces from the spinous and articular processes to the vertebral body resulting in movement and providing stability. A specific part of the laminae at the junction of the vertically oriented lamina and the horizontally projecting pedicle, the pars interarticularis, is subjected to forces transmitted by the lamina into the pedicle.

   The laminae have, in addition to the conduction of forces, a protective function of the neural contents of the vertebral canal.
**Intervertebral joints:**

Between two consecutive lumbar vertebrae, there are three joints: a joint between the vertebral bodies, and two joints between the articular processes (zygapophyseal joints or facet joints). Part of the interbody joint is the intervertebral disc, a layer of strong, deformable, soft tissue allowing load transfer and movement of the vertebrae in all directions. The zygapophyseal joints are typical synovial joints, covered by articular cartilage, synovium, and enclosed by a fibrous capsule. The zygapophysial joints prevent forward displacement and rotary dislocation of the vertebrae. The extent to which a zygapophyseal joint can prevent movement strongly depends on the shape and position of the articular processes.\(^3^4\)

**Figure 4: Anterior view of Intervertebral Disc:**

![Diagram of Intervertebral Disc](image)

**The intervertebral disc:**

The lumbar intervertebral discs consist of a central nucleus pulposus surrounded by an anulus fibrosus. A third component of the disc is the vertebral end-plate, which covers the top and bottom of the disc.

The central fibers of the inner two-third of the anulus fibrosus attach directly to the cartilaginous end-plates and the peripheral fibers insert along the bony vertebral body margin (ring apophysis) as the so-called Sharpey’s fibers. The collagen fibres of the inner two-thirds of the anulus fibrosus sweep around into the vertebral end-plate, forming its fibrocartilaginous component. The peripheral fibres of the anulus are anchored into the bone of the ring apophysis (RA).
The nucleus pulposus is an acellular meshwork of proteoglycan units, aggregates, and collagen fibers collectively called the nucleus matrix. The proteoglycans make up 65% of the dry weight of the nucleus, the collagen (predominantly type II) 15-20%. The proteoglycan units are formed by many glycosaminoglycans linked to a core protein. These proteoglycans contain water, the main component of the nucleus pulposus. The high water content of the nucleus pulposus (70-90%) is essential for maintaining its principle function: sustaining and transmitting weight.

When the intervertebral disc is compressed, the pressure in the nucleus pulposus will increase resulting in deformation of the nucleus pulposus. The pressure is then exerted radially onto the anulus fibrosus. Subsequently, the tension in the anulus fibrosus will rise and this will prevent further radial expansion of the nucleus pulposus. Water is also the main component of the anulus fibrosus (60-70%) but collagen (mainly type I) makes up 50-60% of the dry weight and only 20% of the dry anulus is proteoglycan. This high concentration of collagen thickens the anulus.

Another difference between the nucleus and the anulus is the high concentration of elastic fibers in the anulus (10% of the dry weight). These elastic fibers are arranged circularly, obliquely and RA35 vertically in the lamellae of the anulus and are predominantly located towards the attachment sites of the anulus on the vertebral end-plate. Because the collagen fibers of the anulus are elastic they can stretch and thereby retain energy. This energy can be exerted back onto the nucleus pulposus and restore its deformation.

The vertebral end-plates are also composed of water, proteoglycans, and collagen. The relative concentrations of the components in the end-plate are similar to that in the disc: high water and proteoglycan concentrations in the part of the end-plate adjacent to the nucleus; high water and high collagen concentrations in parts of the end-plate in contact with the anulus.

Small molecules can therefore freely diffuse from the vertebral sinusoids to the avascular disc elements, important for nutritional needs. Once the tension in the annulus has increased after compression of the intervertebral disc, nuclear pressure is exerted on the end-plates by the anulus as well as by the nucleus. This pressure eventually transmits the load from one vertebra to the next.
Ligaments of the lumbar spine:

In general, ligaments provide much of the joint-stability and limitation to the range of motion. The ligaments of the lumbar spine may be divided in those connecting:

1) The bodies of the vertebrae;
2) The laminae;
3) The spinous processes;
4) The articular processes;
5) The 5th lumbar vertebra to the sacrum and ilium;

Finally, so called false ligaments are also present.

Ligaments connecting the bodies of the vertebrae:

The ligaments that interconnect the vertebral bodies are the *anterior longitudinal ligament* and the *posterior longitudinal ligament*. The two ligaments are strongly related with the *anuli fibrosi* of the intervertebral discs. During extension, the anterior longitudinal ligament resists anterior separation of the vertebrae, while the posterior longitudinal ligament prevents posterior separation during flexion. The anulus fibrosus resists distraction, bending, sliding, and twisting of the intervertebral joint during all kinds of motion.

Ligaments connecting the laminae:

The *ligamentum flavum* is a short, thick ligament interposed between the laminae of two consecutive vertebrae. The ligaments consist of yellow elastic tissue and are therefore often called the yellow ligament. Its unique elastic properties are thought to be necessary for returning the flexed lumbar spine into the extended position and for preserving the upright posture.

Ligaments connecting the spinous processes:

The *interspinous ligaments* connect two spinous processes. They limit forward bending by preventing supra physiological separation of the two spinous processes. The supraspinous ligament interconnects the apices of the spinous processes. The supraspinous ligament is closely blended with the aponeurosis of the back muscles.

Ligaments connecting the articular processes:

The *capsular ligaments* form the capsules of the zygapophysial joints. They function as ligaments by preventing excessive motion of these joints.36
The lumbo-sacral and ilio-lumbar ligaments:

The lumbo-sacral ligament is short, thick, and triangular and connects the lower and front part of the transverse process of the fifth lumbar vertebra to the lateral part of the base of the sacrum. The ilio-lumbar ligament binds the transverse process of the fifth lumbar to the ilium. The ilio-lumbar ligament consists of five parts: anterior, superior, posterior, inferior, and vertical.

Figure 5: Ligaments of Lumbar Vertebra

False ligaments:

The lumbar spine contains some ligaments that can not be considered as “real” ligaments for several reasons such as structure and origin. They include the intertransverse ligaments, the transforaminal ligaments, and the mamillo-accessory ligament. The intertransverse ligaments are sheets of connective tissue connecting the upper border of one transverse process to the lower border of the transverse process above. They lack distinct borders, and the fibers are not densely packed nor are they oriented as fibers of true ligaments. The transforaminal ligaments are collagen fibers traversing the outer end of the intervertebral foramen. They do not connect two bones and their structure resembles bands of fascia rather than ligament. The mamillo-accessory ligament connects the tip of the ipsilateral mamillary and accessory processes of each lumbar vertebra and its structure appears more like a tendon than a ligament.
1.7 Biomechanics of Lower Back:

The lower back is a multifarious structure, having to provide support for the upper body and transmit the weight of the upper body into the pelvis and lower limbs,\(^{39}\) whilst providing a protective passage for the spinal cord, at the same time allowing enough mobility and flexibility to execute a variety of tasks.\(^{40}\)

The basic **functional unit** of the spine is also known as a functional motion unit, or **Motion segment**. The motion segment includes all articular tissue, the overlying spinal muscles, and the segmental contents of the vertebral canal and intervertebral foramen between two vertebrae and its concept is ideal for experimental studies. It also consists of two adjacent vertebral bodies with the intervertebral disc between them.\(^{41}\)

The functional motion units enable the spine to bend forward (flexion), backward (extension), twist (axial rotation) and bend to the side (lateral flexion), as well as combinations of the above movements.\(^{41}\)

The various components of the spine all play their own role in the function of the spine. The intervertebral discs are interposed between the bodies of two adjacent vertebrae.\(^{42}\) The intervertebral discs are the main load bearing units of the spine for axial compression, flexion and lateral and posterior shear.\(^{40}\) They act as a shock absorber for the spine, distributing and absorbing some of the load applied to the spine.\(^{39}\) They also separate the vertebrae, allowing far more mobility to the spine than if the vertebrae were in direct contact with each other\(^{43}\) and allowing the nerve roots to pass freely from the spinal cord through the intervertebral foramina.\(^{39}\)

The intervertebral disks vary in shape, thus producing the secondary curvatures of the vertebral column.\(^{42}\) According to Bogduk\(^{44}\) the lumbar spine normally has a lordotic curve, which protects it to a large extent from compressive forces due to body weight because if the lumbar spine was straight, forces would be transmitted through the vertebral bodies and intervertebral discs, with the shock absorption of the intervertebral discs being the only protection of the vertebrae. However, the curves of the vertebral column reduce these downward forces significantly, by helping to reduce the transmission of the forces.\(^{4}\)
1.8 Patho mechanical Manifestations:

During Low Back Pain lower back is moved less during functional tasks\(^{45}\) and there is greater asymmetry and variability in performance.\(^{46}\) There is a consistent decrease in the velocity of movement.\(^{47}\) Muscles are activated in a dys-coordinated manner in static and dynamic situations.\(^{48}\)

Injury to back due to loading forces causes:

- **Inappropriate motor control responses by lumbar musculature or,**
- **Inadequate stabilization of lumbar spine - prior to sudden loading\(^{49}\)**

Activities commonly associated with onset of low back pain are lifting, bending, lowering, and twisting. The body position commonly associated with most of these activities is **trunk flexion.** Such apparently innocuous tasks as working over a counter, making a bed, ironing, shaving, and washing dishes shift the weight of the trunk over the anterior pelvis. This anterior weight shift or standing in a lordotic posture causes an anterior rotation force on the pelvis.

If the anterior pelvis is not supported adequately by the abdominal muscles, the pelvis will rotate anteriorly and downward around the acetabula. Because the posterior ligaments of the sacrum are loosened when the innominates move anteriorly on the sacrum\(^{50}\) and the thin sheath of anterior sacroiliac ligaments offers only scant protection, the SIJ is vulnerable to dysfunction anteriorly. As the sacrum is wider anteriorly than posteriorly, any movement of the innominates anteriorly on the sacrum tends to spread the innominates and may cause them to wedge or bind.

McConnell and Teall described the condition in which the ilium is forward, the ischium backward, and the innominatum thrown downward on the sacrum, which causes an apparent lengthening of the limb.\(^{51}\) Chamberlain identified this downward rotation and fixation of the innominate bone on the sacrum by using stereoscopic roentgenograms and special positioning techniques.\(^{50}\) He also found that "the patient's acute sacroiliac symptoms have almost invariably been on the side of the high pubis" when the patient is standing.\(^{50}\)
1.9 Risk Factors:

(i) Age:

A study indicates an increasing risk of low back pain with age until the fifth decade of life\(^52\) thereafter, the relative risk decreases in men but not in women. The risk of disc herniation at the L4-L5/L5-S1 levels also increases until the 5\(^{\text{th}}\) decade, and the risk of disk herniation at the L2-L3/L3-L4 levels is greater in people over 50 years old.\(^53\)

(ii) Sex:

Cross-sectional studies show little or no differences in the relative risk of low back pain between the sexes until the 5\(^{\text{th}}\) decade of life.\(^54\) Thereafter the risk is greater in women.\(^52,53\) However the risk of low back symptoms for disc herniation are greater in men than in women.\(^55\)

(iii) Pregnancy:

Low back pain is also common during pregnancy\(^56\) and the relative risk ratio is approximately 3 to 1 in multiparous versus nulliparous.\(^57\) In the case of pregnancy, the pain usually ameliorates once the child is delivered.

(iv) Hereditary factors:

There is some evidence that low back pain has a genetic component.\(^60\) In a recent study examining the COL9A2-gene, which codes for one of the polypeptide chains of collagen IX, an allele of this gene was identified that is associated with intervertebral disc disease.\(^58\) A genetic antecedent is also present in specific but rare conditions associated with low back pain like congenital spondylolisthesis and Scheuermann’s disease.

(v) Body weight/height/physical fitness:

Some studies indicate that body weight and height are related to the prevalence and incidence of low back pain while others do not find such a correlation.\(^59\) Lots of attention has been paid to physical fitness and sports in relation to low back pain and it is thought that low back pain is more common in the physically unfit.\(^60\)
(vi) **Smoking:**

The relation between smoking and LBP has been described by several investigators$^{61}$ and many explanations have been postulated such as: 1) coughing from smoking increases the internal abdominal pressure and the intradiscal pressure and thus strains the spine$^{62}$ 2) nicotine reduces vertebral body blood flow, disc nutrition will be reduced promoting disc degeneration$^{63}$ 3) smoking may be associated with anxiety and depression, which exacerbate or prolong back pain.$^{64}$

(vii) **Occupation:**

Certain movements and actions related to work (bending, twisting, vibration, heavy lifting)$^{60}$ are also important in relation with low back pain. Job satisfaction might be as important as the physical burden of labor itself in being free from low back pain.

(viii) **Physical Work:**

The most frequently reported are heavy physical work, frequent bending, twisting, lifting, pulling and pushing, repetitive work, static postures and vibrations may also leads to LBP.$^{65}$

(ix) **Psychosocial Problems:**

Psychosocial risk factors like stress, distress, anxiety, depression, cognitive dysfunction, pain behavior, job dissatisfaction, and mental stress at work can also leads low back pain.$^{65}$ During the past decades, numerous factors, such as psychological characteristics,$^{66}$ lifestyle factors,$^{67}$ employment,$^{68}$ and social factors$^{69}$ have been considered risk factors for developing LBP. These psychosocial factors even become more important in the development of chronic low back pain.$^{70}$

(x) **Miscellaneous Factors:**

Some activities – such as jogging and running on cement roads rather than cinder tracks, heavy lifting, and prolonged sitting (especially in cars, trucks, and poorly designed chairs) –can provoke back pain. Many studies have found that inadequate strength and endurance of the back muscles are significant risk factors.$^{71,72}$
1.10 Etiology:

In principle, any of the structures of the lumbar spine that receives an innervation could be a source of low back pain. Accordingly, back pain could arise from any of the ligaments, muscles, fasciae, joints or discs of the lumbar spine.

(i) **Tumors, infections and fractures** are quite uncommon as causes of LBP. The prevalence of tumors is 0.7% and that of infections less than 0.01%. About 4% of people seen with LBP in primary care have compression fractures.

(ii) **Ligament sprains** are attractive explanations for LBP. Some studies report a 10-15% prevalence of interspinous ligament pain, diagnosed by local anesthetic blocks.

(iii) **Dural pain** can be a source of LBP and referred pain. It is conceivable that the dura mater could be involved in inflammatory reactions to prolapsed disc material in the epidural space, but this model has only been explored anatomically.

(iv) **Spondylolysis** is most often asymptomatic, but is perhaps a cause of pain in athletes.

(v) **Sacro-iliac joint pain** accounts for some 20% of patients while **zygapophyseal joint** accounts for some 10-15% of patients. Nevertheless its pathology remains unclear.

(vi) **Discogenic pain** caused by internal disc disruption accounts for some 40% of patients and the prevalence of prolapsed intervertebral disc is about 1% to 3%.

(vii) **Spondylarthropathies and spinal deformities** commonly involve the whole spine. Spondylarthropathies have been reported to occur at a rate of 0.8 to 1.9% of the general population.

(viii) **Psychological factors** are an important part of the chronic LBP experience. Pincus et al. cite distress/depressive mood as integral psychological factors in the transition from acute to chronic LBP.

(ix) **Physical causes:** Trauma to the back caused by a motor vehicle crash or a fall among young people and lesser traumas, osteoporosis with fractures are antecedents to back pain of known origin in most instances. Specific causes account for less than 20% of cases of back pain: the probability that a particular case of back pain has a specific cause is only 0.2%. 


1.11 Pathogenesis:

A high percentage of patients with pain in the low back have no identifiable pathology. Although it is believed that most patients with low back pain have an underlying anatomic pain generator driving the symptoms. Potential pain generators include myofascial tissues, facet joints, discs, nerves, ligaments, and bony structures. Figure 6: Pathways between Low back pain and disability (Waddell, 1993).

![Figure 6: Pathways between Low back pain and disability (Waddell, 1993).](image)

Figure 7: Possible mechanisms of low back pain.

![Figure 7: Possible mechanisms of low back pain.](image)

Spinal Degeneration and Low Back Pain:

Degenerative changes affect all structures of the motion segment, including the intervertebral discs, facet joints, and ligaments. The spinal degeneration process is initiated in the intervertebral disc resulting in secondary changes in the facet joints and ligaments because of load shifts from the disc to these structures. Only in exceptional cases facet degeneration can occur without preceding signs of disc degeneration. In addition it has been reported that facet joint pathology may accelerate the degenerative process of the disc.
The progress of spinal degeneration can be divided into three phases as suggested by Kirkaldy-Willis. In **Phase I (dysfunction)**, changes in biochemical composition, physiology, and biomechanics of the motion segment may result in clinical symptoms. When these changes result in increased mobility at the affected level and cause symptomatic instability it is called **Phase II (instability)**. In **Phase III (stabilization)**, the motion segment will stabilize because of biochemical alterations and spinal osteophyte formation.

### (1) Degenerative changes of the intervertebral disc:

Biochemical changes in the nucleus pulposus include decrease in the proteoglycan concentration and water content, and an increase in collagen and collagen proteoglycan binding. In early adult life, the proteoglycans make up about 65% of the dry weight of the nucleus but this decrease to about 30% at the age of 60. The proteoglycans also become smaller, lighter in molecular weight, and their composition changes. The water content of the nucleus changes from about 88% at birth to about 65-70% at the age of 75. The collagen content and the collagen binding of the nucleus pulposus increases and the fibril diameter of the collagen increase as well. The collagen type II of the nucleus starts to resemble the type I collagen of the anulus fibrosus. In the anulus fibrosus, the collagen content also increases but the average fibril diameter decreases. The concentration of the elastic fibers in the anulus decreases from 13% at age 26 to 8% at age 62.

When the nucleus becomes more fibrous and drier its ability to exert fluid pressure and to transmit weight weakens. There will be less radial pressure being build up in the anulus fibrosus and the anulus will be subjected to greater vertical loads. The collagen lamellae also may become more fibrillated and in combination with the mechanical overload of the anulus it may give rise to cracks and fissures.

### (2) Degenerative changes of the facet joints:

The degenerative changes of the facet joints are similar to osteoarthritis in other synovial joints. Biochemically, quantitative and structural changes occur in the cartilage proteoglycan and collagen. In continuation of structural degeneration of cartilage focal and diffuse erosions may occur with full thickness loss of cartilage as a result. In addition erosive changes of the cartilage may induce proliferation and increase of its matrix...
synthesis. The resulting osteochondrophyles produce sclerosis of subchondral bone and subchondral bone cyst formation.\textsuperscript{103} Pain from an arthrotic facet joint may be provoked by free nociceptive nerve endings and mechanoreceptors abundantly present in the facet capsules.\textsuperscript{104} They can be activated by inflammatory and immune responses or by mechanical factors.\textsuperscript{105} Furthermore, in facet degeneration, a well known cause of pain radiating in one or both legs is compression of nerve roots in the lateral recess of the spinal canal due to hypertrophied joints or synovial cysts.\textsuperscript{106}

\textbf{(3) Degenerative changes of the ligaments and muscles:}

With increasing age ligamentous and muscular changes occur including disorganization of ligament and muscle fibrillar and cellular alignment, selective increase of collagen degradation over formation, and proteoglycan decrease associated with loss of water.\textsuperscript{107} Pain symptoms may result from their contribution in spinal stenosis.\textsuperscript{108}

\textbf{(4) Degenerative changes of the vertebral bodies and end-plates:}

With aging, the vertebral end-plate, originally part of the growth plate of the vertebral body, becomes thinner, its growth zone decreases and will contain less proliferating cells, and ossification will take place at the peripheral areas.\textsuperscript{109} At the age of about twenty, the subchondral bone plate is formed which separates the vertebral end-plate from the vertebral body. Because of the subchondral bone formation and because of further ossification with aging and degeneration, the nutrition of the avascular disc progressively decreases which causes biochemical changes in the disc.\textsuperscript{109}

The trabeculae in the vertebral body change in size and pattern with aging and degeneration, resulting in decreased vertebral body strength and density.\textsuperscript{110} Characteristic is the loss of horizontal trabeculae, particularly in the central part of the vertebral body.\textsuperscript{110} With the loss of vertebral body trabeculae, less of the compressive load is borne by the trabecular bone and much more by the cortical bone.\textsuperscript{111} Consequently, the vertebral body becomes less resistant to deformation and injury. The end-plates may, partly due to lacking support of the underlying bone,\textsuperscript{112} develop micro fractures which can accelerate the degenerative process and contribute to the occurrence of low back pain.\textsuperscript{87}

Fractures of the end-plate may extend to a degree that allows nuclear material to extrude into the vertebral body, a phenomenon known as \textbf{Schmorl’s nodes}. These Schmorl’s nodes in the cascade of factors causing low back pain remains unsolved.\textsuperscript{113}
1.12 Clinical Manifestations:

The main symptoms of Low Back Pain are:

- Pain in the lumbo sacral region with/without referred pain; It may be increased by the patient adopting a certain position, by movement, or by the imposition of an external load (e.g., during lifting).
- The pain may be continuous or intermittent, with the first episode usually occurring between the ages of 20 and 55 years.
- No specific anatomical substrate;
- Mechanical in nature: morning stiffness and reduced bodily functioning;
- Favorable prognosis: spontaneous convalescence after one week in 50% and, after three months in 95% of the cases;
- Not associated with fever or weight loss;

These cannot only be characterized by pain, but also by discomfort and/or stiffness.\textsuperscript{114}

Since catastrophizing forms a part of the fear of movement/(re)injury model, the role of it may also have an impact on activities of daily living\textsuperscript{115} and consequent decrease in physical activity.\textsuperscript{116}

Such kinesiofobical behavior is particularly detrimental since decreased recreational activity leads to deconditioning, which further impacts emotional well being.\textsuperscript{117,118} Despite the fact that chronic pain can contribute to an increase in negative emotions and stress, which in turn may increase pain perception and levels of disability,\textsuperscript{118} only 15-30\% of patients with chronic low back pain suffers of additional distress.\textsuperscript{119}

(a) \textbf{Biological factors}, such as decreased mobility, decreased muscle strength or decreased coordination.

(b) \textbf{Psychological factors}, such as a fear of movement or faulty cognition about low back pain.

(c) \textbf{Social factors} related to the work setting or to the support and acceptance offered by family and friends.
1.13 Investigations:

In particular, plain radiography (X-Ray) of the spine yields little information. X-Ray findings such as disc space narrowing, osteoarthritis of facet joints, subluxations, disc calcifications, Schmorl’s nodes, sacralization, spondyloysis, severe lordosis, and severe lumbar scoliosis were commonly having association with LBP. On X-rays, 79% of patients between 50 and 65 years of age have narrowing, sclerosis, or osteophytes.

A recent review of the diagnostic imaging literature (magnetic resonance imaging, radionuclide scanning, computed tomography, radiography) concluded that for adults younger than 50 years of age with no signs or symptoms of systemic disease, diagnostic imaging does not improve treatment of low back pain. For patients 50 years of age and older or those whose findings suggest systemic disease, plain radiography and simple laboratory tests can almost completely rule out underlying systemic diseases.

In Magnetic resonance imaging (MRI), 14% of patients aged younger than 40 years and 28% of patients aged older than 40 years have major abnormalities. The majority of asymptomatic abnormalities on MRI are bulges and protrusions but not extrusions. Imaging studies should be ordered in patients with progressive neurologic deficits, failure to improve, history of trauma, and those at elevated risk for malignancy or infection.

Serum or urine protein electrophoresis is the best initial diagnostic test for multiple myeloma given that many patients will have a normal bone scan. A history suspicious for vertebral cancer combined with an elevated Erythrocyte sedimentation rate (ESR) has a positive correlation for vertebral cancer.

Blood tests can help diagnose infection in patients with back pain. Fever, elevated ESR, leukocytosis, and elevations in C-reactive protein level can all be indicative of infection. Blood cultures demonstrate bacteremia in up to 72% of cases of acute osteomyelitis. Electro diagnostic tests are reserved for recalcitrant cases.

Biopsies of multifidi in patients with LBP also show abnormalities. Atrophy of type II fibres, and internal structural changes of type I fibres, giving them a ‘moth-eaten’ appearance, have been seen. The presence of dysfunction in the deep abdominal muscles in subjects with chronic LBP has also been reported.
1.14 Differential Diagnosis:

Low back pain has many causes. An exact diagnosis and anatomic pain generator may not always be evident, especially at the first visit. The main objectives of the diagnostic process are to assess the severity and identify the type of the low back pain.

For most patients with low back pain a thorough history taking and brief clinical examination is sufficient. The primary purpose of the initial examination is to attempt to identify any ‘red flags’ and to make a specific diagnosis.

Diagnostic Triage:

(1) History Taking:

One systematic review of 9 studies evaluated the accuracy of history in diagnosing low back pain in general practice. The review found that history taking does not have a high sensitivity and high specificity for radiculopathy and ankylosing spondylitis. The combination of history and erythrocyte sedimentation rate had a relatively high diagnostic accuracy in vertebral cancer (level A).

(2) Physical Examination:

The purpose of the examination is to identify factors that may either hamper or facilitate treatment, and to assess the patient’s level of physical fitness and degree of participation.

The priority in the examination procedure follows this line of clinical reasoning. The first priority is to make sure that the problem is of musculoskeletal origin and to rule out non-spinal pathology. The next step is to exclude the presence of serious spinal pathology. Suspicion therefore is awakened by the history and/or the clinical examination and can be confirmed by further investigations.

The next priority is to decide whether the patient has nerve root pain. The patient’s pain distribution and pattern will indicate that, and the clinical examination will often support it. If that is not the case, the pain is classified as **Non-specific low back pain**.
The starting points in any examination are the disabilities and problems with participation that were identified during history taking (Ex: problems in maintaining a sitting position, in picking up an object from the floor, or in standing up from a lying position). The physical therapist will try to identify the impairments (Ex: decreased muscle strength in the back extensors, decreased lumbar spine mobility, or decreased physical fitness) that may be related to the disability and participation problems.

If, based on the findings revealed by history-taking, the physical therapist suspects nerve root compression, he will carry out a neurological examination and an assessment of muscle strength, sensibility, and the tendon reflexes of the spinal nerves involved. If neurological tests give positive results, the physical therapist should contact the referring physician.

One systematic review of 17 studies found that the pooled diagnostic Odds Ratio for straight leg rising for nerve root pain was 3.74 (95% CI 1.2 – 11.4); sensitivity for nerve root pain was high (1.0 – 0.88), but specificity was low (0.44 – 0.11). All included studies were surgical case-series at non-primary care level. Most studies evaluated the diagnostic value of SLR for disc prolapse. The pooled diagnostic Odds Ratio for the crossed straight leg raising test was 4.39 (95% CI 0.74 – 25.9); with low sensitivity (0.44 – 0.23) and high specificity ((0.95 – 0.86). The authors concluded that the studies do not enable a valid evaluation of diagnostic accuracy of the straight leg raising test (level A).

The types of physical examination and physical tests that are recommended show some variation. Neurological screening, which is largely based on the straight leg raising test (SLR), plays an important role. Undertake diagnostic triage consisting of appropriate history taking and physical examination at the first assessment to exclude serious spinal pathology and nerve root pain. If serious spinal pathology and nerve root pain are excluded, diagnose the low back pain as non-specific low back pain.

(3) **Psycho Social Factors:**

One systematic review found that there is strong evidence that psychosocial factors play an important role in low back pain and disability, and moderate evidence that they are important at a much earlier stage than previously believed (level A).
1.15 Management:

1. Medical Management:

 Drug therapy offers temporary relief, especially for acute back pain, but it is rarely of material benefit in people with chronic back pain.

 Paracetamol and non-steroidal anti-inflammatory drugs bring the pain to a tolerable level, but they probably should not be taken for long periods of time. (The self-medication directions usually restrict use to 12 days)\(^1\)

 Initial therapy with acetaminophen and nonsteroidal anti-inflammatory drug, or cyclooxygenase-2– (COX-2) specific inhibitor is recommended.\(^3\)

 Muscle relaxants can be effective when there is significant muscle spasm present, but benefits must be balanced with their sedative properties.\(^4,5\)

 Tramadol can be an effective analgesic and has mild selective serotonin reuptake inhibitor properties, but side effects are common.\(^6\)

 Amitriptyline has been most extensively studied in neuropathic pain, but its risks of sedation, anticholinergic side effects, and falls in elderly patients is higher than other agents within the class.\(^13\)

 Corticosteroids should be avoided even by injection as placebo injections seem to work just as well as active injections, and neither give more than temporary relief.\(^2\) Epidural corticosteroid injections are indicated only for radiculopathys.\(^14\)

 An extensive body of evidence supports the effectiveness of short-acting opioids for moderate to severe pain.\(^10\)

 Long-acting opioids are appropriate when other treatment modalities have been inadequate and the demonstrated improvement in functionality with the opioid therapy outweighs side effects.\(^11\)

 If pain is not responsive to opioid therapy or functionality does not improve, then the opioid should be discontinued.

 Adjuvant tricyclic antidepressants and anticonvulsants are effective in patients with underlying depression or a neuropathic component to their pain.\(^12\)
2. Surgical Management:

Ideally, surgery is performed only after failure of spontaneous or assisted repair of the injured spinal structure. Failure of repair is classified into 4 categories:

* Skeletal repair failure following fatigue overload. This is the problem of adolescent spondylolysis.
* Failure of the disk to repair itself. The problem may emerge as a herniated disk or persistent back pain secondary to internal tears in the disk with subsequent painful derangement.
* Failure of connective tissue repair, that is, the degenerative process. Degenerative problems are usually seen in older persons. Many special demands and trade-offs are involved in the surgical care of these patients.
* Failure of previous surgery because of inappropriate technique or inappropriate selection of surgical candidates.

(1) Failure of skeletal repair:

The choice of surgical procedures for spondylolysis and spondylolisthesis is narrow, at least compared with that available for other spinal disorders. The type of fusion that is most widely advocated is posterior lateral fusion.

In posterior lateral fusion, the lateral pedicle, the facet joints, the pars interarticularis, laminae, and transverse processes are freed of soft tissue and decorticated to allow the blood supply of the bone to be exteriorized. This is done either from a midline incision with exposure to the tips of the transverse processes of all tissue or from a lateral inter-muscular exposure on either side of the spinous processes. Usually, a bone graft from the pelvis is used.

During a single-level fusion procedure, blood loss is usually not excessive, and blood may not need to be replaced during surgery. When more significant blood loss occurs, blood aspirated during surgery can be passed through recycling equipment known as a cell saver and returned to the patient. Internal fixation is seldom necessary in adolescent spondylolisthesis fusion surgery.
(2) Failure of disk repair with herniation:

The disk, because of its avascular status, has the smallest number of cells per unit area of any tissue. The potential for repair is thus greatly diminished compared with that in other connective tissue. Our lordotic posture places unusual stresses on the disks at the L4 and L5 levels: about 90% of all lumbar disk herniations occur at these 2 levels. Degrees of herniation vary, ranging from a small protrusion to complete extrusion of disk material into the spinal canal (sequestered disk).

There are 3 general categories of surgical correction. Laminotomy is the traditional approach. The disk material is removed under direct vision through a small posterior incision, and the nerve root is visualized directly. The offending material is removed mechanically with specialized grasping instruments. Surgical exposure is minimized.

Microdiskectomy is the same procedure, but special magnification, an operating microscope, and special retractors and tools are used. In microdiskectomy, surgical exposure is further minimized. Advocates of microdiskectomy note that with this technique there is less soft tissue injury caused by intervention and, thus, less postoperative morbidity; patients undergoing microdiskectomy usually spend only 1 or 2 days in the hospital.

Diminished nerve function in older persons is sometimes secondary to impingement by an arthritic facet joint or narrowness of the nerve canal or both, and additional removal of surrounding degenerative tissue is necessary to fully decompress the nerve root. A small amount of bone is removed from the inferior and superior aspects of the lamina to broaden the area of exposure; the offending disk material is easily removed, and minimal injury to the neuro structures is expected. After removal of disk material, the spinal canal and nerve root canal are probed to ensure that no additional fragments or compression is present.

An even more minimally invasive technique for correction of disk protrusion is now emerging with the use of an Arthroscope. With the use of local anesthetic, the instrument can be placed in the disk or neuro foramen and, with special equipment, disk material can be removed. It is performed without general anesthesia in same-day surgery centers.
(3) Failure of internal disk repair:

None of the surgical solutions is ideal. Three are now advocated:

- Posterior lateral fusion,
- Anterior interbody approach with fusion,
- Disk excision without fusion

The most rational approach would be to remove the disk totally and replace it with a substitute. Although several designs of total disk replacements have been proposed and some clinical trials have been accomplished, considerable time will pass before disk replacement is a reliable clinical remedy.

An anterior lumbar interbody fusion is performed through an abdominal retroperitoneal approach. With this type of approach no nerve root damage is expected. However, in the mobilization of the vessels, tears may be created in the vena cava or iliac vessels unless the procedure is done with considerable skill.

The anterior annulus fibrosus is incised, and disk material is removed. Once all of the disk material is removed and the intervertebral disk space is widened, plugs or squares are cut out of the superior and inferior end plates. Matching dowels or rectangles of bone are then impacted into this space. The bone grafts, which may be autogenous or cadaveric grafts, are mechanically matched to fit the recipient site.

Lumbar disc herniation is the most common cause of sciatica. Excellent results following discectomy have been reported. In one study, excision of a herniated disc provided rapid relief of sciatica in eighty-six of eighty-seven selected patients.

Spinal fusion, a surgical operation that may involve the use of interbody cages, bone grafts or posterior spinal instrumentation, is used to relieve the pain and increase mobility and function.

Complications risked in surgery (spinal fusion) include dural tears, bleeding, neurologic deficits and infection. Although the rate of spinal fusion procedures to address low-back pain have increased dramatically in North America, the evidence supporting the use of this procedure is weak; its superiority over conservative approaches has not been established.
3. **Conservative Management:**

Bed rest is not recommended. Patients are advised to stay as active as possible and continue normal activities. A Cochrane systematic review evaluated 9 trials with a total of 1435 patients, and concluded that bed rest is not effective and may have slightly harmful effects on low back pain.\(^{146}\)

Corsets and low back belts: These have not been shown to reduce the intensity of back pain or to be effective for primary prevention of low back pain.\(^{147}\)

The concept builds on the obvious fact that inactivity leads to a general loss of functional performance. The function of the tissues involved in the injured area becomes progressively worse as the time of disuse increases. The concept of functional restoration has been used successfully to treat patients with LBP in intensive multidisciplinary team treatment programs.\(^{148}\)

Stretching, ice, and heat are all effective.\(^{149}\) although there is no definitive evidence supporting the effectiveness of massage, many patients find it helpful.\(^{150}\)

Recently, there have been trends toward an active exercise approach for the treatment of back pain.\(^{151}\) Generally, the efficacy of this approach has been supported.\(^{152}\) Exercise therapy is included in the formal training of chiropractors\(^{153}\) and has been utilized by chiropractors for the management of low back pain since the early part of the 20th century.\(^{153}\)

Back schools generally offer group sessions on such topics as spinal anatomy, causes of lower back pain, muscle function, posture, lifting techniques, etc. These have been found to be effective in reducing time off work when conducted in the workplace but have not been effective in other environments.\(^{154}\)

Spinal manipulation involves a range of manual (hands-on) maneuvers that stretch, mobilize or manipulate the spine, surrounding tissues and other joints in order to relieve spinal pain and improve mobility.\(^{155}\) Treatment sometimes involves a high velocity thrust, a technique in which the joints are adjusted rapidly.\(^{155}\) Often these thrusts are accompanied by popping or snapping sounds.\(^{155}\) The technique results in the brief stretching of joint capsules and is believed to reset the position of the spinal cord and nerves, allowing the nervous system to function at its best.\(^{156}\)
A pressure biofeedback unit, an inflatable inelastic bag connected to a pressure gauge and an inflation device, has been proven to be useful clinical tool for assessment and to enhance training in selective muscle contraction in lumbar stabilization exercise (Jull et al, 1993). In addition, a pressure biofeedback unit can monitor the movement of the abdominal wall indirectly by recording a change in pressure (Cairns et al, 2000).

Spas, moist heat, and cold cabinets, which were introduced in Japan but which are used in some rehabilitation centers in Western countries, may be useful, but most treatments have not been validated, as responses notoriously are difficult to interpret.

Passive modalities, such as topical heat therapy, are commonly used in conjunction with physical exercise during low back rehabilitation. Most forms of topical heat, including hydro collator packs and heating pads, do not allow the patient to remain mobile during treatment. Therefore; their use for the treatment of acute low back pain may oppose current recommendations. Recently, a lightweight disposable heat wrap has been developed to administer continuous low-level topical heat to the low back, while allowing the user to remain mobile during wear. Previous work has demonstrated that continuous low-level heat wrap therapy is effective for the treatment of acute low back pain in terms of providing pain relief and decreasing muscle soreness and disability. It is unknown, however, if continuous low-level heat wrap therapy improves functional ability or results in additional functional benefits when combined with rehabilitative exercise.

The use of TENS and Acupuncture-Like Transcutaneous Electrical Nerve Stimulation (ALTENS) has been reviewed as a treatment for patients with chronic back pain by the Cochrane Collaboration.

Cognitive behavioral therapy and physical fitness may have the most to offer in terms of treatment, although studies that suggest this are not conclusive. In appropriate clinical settings and selected patients, support groups, counseling, addiction therapy, or relaxation therapy can all improve outcomes. Educational resources such as brochures, lectures, and questions and answer sessions, among others, from part of the healthcare professional have shown to reduce fear avoidance beliefs, increase physical activity, and help patients return to work without restrictions.
1.16 Prognosis:

The prognosis for acute LBP is relatively favorable. A significant percentage of sufferers, probably over 50%, do not consult a health care professional for the problem. Among those who do seek care, most will experience rapid improvement in pain and disability within the first three months. Beyond this time the majority no longer consults and will continue to experience only low levels of pain and disability, and most have returned to work and their usual daily activities. In a small group of acute patients, the problem fails to resolve as it should. Perhaps 10% will go on to develop chronic, disabling LBP.

In an open population, the prognosis is usual favorable. In an estimated 75–90% of patients, back pain disappears spontaneously within 4–6 weeks. In the population of patients who visit primary care physicians specifically because of low back pain, the prognosis is a little less favorable; with 65% being free of their complaint after 12 weeks. Low back pain often recurs. Seventy-five percent of patients who seek help from their primary care physician experience at least one relapse within a year.

However, persistent low back pain does not necessarily indicate a less favorable prognosis. In 80–90% of cases, patients’ complaints diminish spontaneously within 4–6 weeks. Approximately 65% of patients who consult their primary care physician are free of symptoms after 12 weeks. Recurrent low back pain is common.