Chapter – III

DESCRIPTION OF BACKACHE
Chapter – 3 DESCRIPTION OF BACKACHE

3.1 INTRODUCTION

Back pain is an extremely common phenomenon. According to one study, almost 80% of persons in modern society experience back pain at one or the other time during their life\(^1\). Before going in to the details of backache, let us see some relevant points.

3.11 Vertebral Column:

The vertebral column (spine), together with the sternum and ribs, constitutes the skeleton of the trunk of the body. The vertebral column makes up about two fifths of the total height of the body and is composed of a series of bones called vertebrae. The column measures about 71cm (28inches) in length in an average adult male, about 61cm (24inches) in an average adult female. The vertebral column is a strong, flexible structure that moves anteriorly, posteriorly, laterally and rotates. It encloses and protects the spinal cord, supports the head, and serves as a point of attachment for the ribs and the muscles of the back. Between the vertebrae are the openings called intervertebral foramina. The nerves that connect the spinal cord to various parts of the body pass through these openings.
The adult vertebral column contains 26 vertebrae. These are distributed as follows: 7 cervical vertebrae in the neck region; 12 thoracic vertebrae posterior to the thoracic cavity; 5 lumbar vertebrae supporting the lower back; sacrum and coccyx. Prior to the fusion of the sacral and coccygeal vertebrae, the total number of vertebrae is 33. The sacrum is a triangular bone, formed by the union of 5 sacral vertebrae. Fusion begins between 16 and 18 years of age and usually completed by mid twenties. The coccyx is also triangular in shape and is formed by the fusion of the last four coccygeal vertebrae. Fusion generally occurs between 20 and 30 years.

Between adjacent vertebrae, from the first vertebra (axis) to the sacrum, fibro-cartilaginous inter-vertebral discs are present. Each disc is composed of an outer fibrous ring consisting of fibro cartilage called the annulus fibrosus and an inner soft, pulpy, highly elastic structure called the nucleus pulposus. The discs form strong joints, permit various movements of the vertebral column, and absorb vertical shock. Under compression, they flatten, broaden and bulge from their inter-vertebral spaces.

Normal curves: The vertebral column shows four normal curves when viewed from the side. With the subject facing to the right, two curves are convex, and two are concave. The curves of the column, like the curves in a long bone, are important because they increase its strength. The curves also help maintain balance in the upright position, absorb shocks from walking, and help protect the column from fracture. In the fetus, there is only a single anteriorly concave curve. At approximately the third postnatal month, when an infant begins to hold its head erect, the cervical curve develops. Later, when the child sits up, stands and walks, the lumbar curve develops. The cervical and lumbar curves are anteriorly convex. They are called secondary curves because they are modifications of the fetal positions. The other two curves, the thoracic curve and the sacral curve, are anteriorly concave. They are called primary curves since they retain the anterior concavity of the fetus.
Abnormal curves: As a result of various conditions, the normal curves of the vertebral column may become exaggerated, or the column may acquire a lateral bend, resulting in abnormal curves of the spine. **Scoliosis** is a lateral bending of the vertebral column, usually in the thoracic region. This is the most common of the abnormal curves. It may be caused by a congenital condition in which vertebrae are malformed, chronic sciatica, paralysis of muscles on one side of the backbone, poor posture, and one leg being shorter than the other. **Kyphosis** is an exaggeration of the thoracic curve of the vertebral column. In tuberculosis of the spine, vertebral bodies may partially collapse, causing an acute angular bending of the vertebral column. In elders, degeneration of the intervertebral discs leads to kyphosis. Kyphosis may also be caused by rickets and poor posture. The term round shouldered is an expression for mild kyphosis. **Lordosis** is an exaggeration of the lumbar curve of the vertebral column. It may result from increased weight of abdominal contents as in pregnancy or extreme obesity, poor posture, rickets, and tuberculosis of the spine.
3.12 Typical Vertebra:

All the vertebrae are basically similar in structure, although there are variations in size, shape and detail in the vertebrae, in different regions of the spinal column. A typical vertebra consists of the following components.

1. The body is the thick, disc-shaped anterior portion that is the weight-bearing part of a vertebra. Its superior and inferior surfaces are toughened for the attachment of inter-vertebral discs. The anterior and lateral surfaces contain nutrient formation for blood vessels.

2. The vertebral arch extends posteriorly form the body of the vertebra. With the body of the vertebra, it surrounds the spinal cord. It is formed by two short, thick processes, the pedicles, which project posteriorly from body to unite with the laminae. The laminae are the flat parts that join to form the posterior portion of the vertebral arch. The space that lies between the vertebral arch and body contains the spinal cord. This space is known as the vertebral foramen. The vertebral foramina of all vertebrae together form the vertebral canal. The pedicles are notched superiorly and inferiorly in such a way that when they are arranged in the column, there is an opening between vertebrae on each side of the
column. The opening, the intervertebral foramen, permits the passage of a single spinal nerve.

3. Seven processes arise from the vertebral arch. At the point where a lamina and pedicle join, a transverse process extends laterally on each side, a single spinous process the lamina. These three processes serve as points of attachment for muscles. The remaining four processes form joints with other vertebrae. The two superior articular processes of a vertebra articulate with the vertebra immediately superior to them. The two inferior articular processes of a vertebra articulate with the vertebra inferior to them. The articulating surfaces of the articular processes are referred to as facets.

3.13 Intervertebral Disc:

Fibrocartilagenous Intervertebral discs are present between the adjacent vertebrae, from the first vertebra to the sacrum. The Intervertebral disc consists of three distinct components – the cartilage end-plates, nucleus pulposus and annulus fibrosus. The cartilage plates are thin layers of hyaline cartilage between adjacent vertebral bodies and the disc proper. The disc receives its nutrition from the vertebral bodies via these end-plates, by diffusion.
The nucleus pulposus is a gelatinous material which lies a little posterior to the central axis of the vertebrae. It is enclosed in annulus fibrosus, a structure composed of concentric rings of fibro-cartilaginous tissue. The nucleus pulposus is normally under considerable pressure and is restrained by the crucible-like annulus. The posterior longitudinal ligament is a strap-like ligament at the back of vertebral bodies and discs. The discs form strong joints, permit various movements of the vertebral column and absorb vertical shock. Under compression, they flatten, broaden and bulge from their intervertebral spaces.

3.14 Dermatomes:

A Dermatome is the cutaneous area developed from one embryonic spinal cord segment and receiving most of its innervations from one spinal nerve. The skin over the entire body is supplied segmentally by spinal nerves. This means that the spinal nerves innervate specific, constant segments of the skin. All spinal nerves, except C₁, supply branches to the skin. The skin segment supplied by the dorsal root of a spinal nerve is a dermatome. In the neck and trunk, the dermatomes form consecutive bands of skin. In the trunk, there is an overlap of adjacent dermatome nerve supply. Thus, there is little loss of sensation if only a single nerve supply to a dermatome is interrupted. Most of the skin of the face and scalp is supplied by the trigeminal (v) cranial nerve. Since the spinal nerves are associated with specific dermatome, it is
possible to determine which segment of the spinal cord or spinal nerve is malfunctioning. If a dermatome is stimulated and the sensation is not perceived, it can be assumed that the nerves supplying the dermatome are involved.

3.15 Muscles that move the Vertebral Column:

According to Gerard J Tortora and others, muscles that are involved in the movement of the vertebral column are –

### MUSCLES THAT MOVE THE VERTEBRAL COLUMN

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Splenius capitis</td>
<td>Ligamentum nuchae and spious processes of seventh cervical vertebrae and first three or four thoracic vertebrae.</td>
<td>Occipital bone and mastoid process of temporal bone.</td>
<td>Acting together, they extend the head and neck; acting singly, each laterally flexes and rotates head to same side.</td>
<td>Dorsal rami of middle cervical nerves.</td>
</tr>
<tr>
<td>Splenius cervicis</td>
<td>Spinous processes of third through sixth thoracic vertebrae.</td>
<td>Transverse processes of first two or four cervical vertebrae.</td>
<td>Acting together, they extend the head and neck; acting singly, each laterally flexes and rotates head to same side.</td>
<td>Dorsal rami of lower cervical nerves.</td>
</tr>
</tbody>
</table>
ERECTOR SPINAES (SACROSPINALIS): This is the largest muscular mass of the back and consists of three groupings iliocostalis, longissimus and spinalis. These groups, in turn, consist of a series of overlapping muscles. The iliocostalis group is laterally placed, the longissimus group is intermediate in placement, and the spinalis group is medially placed.

<table>
<thead>
<tr>
<th>Muscular Group</th>
<th>Primary Action</th>
<th>Secondary Action</th>
<th>Nerve Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iliocostalis (lateral) group:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iliocostalis lumborum (ilium = flank; costa = rib)</td>
<td>Iliac crest</td>
<td>Lower six ribs</td>
<td>Extends lumbar region of vertebral column</td>
</tr>
<tr>
<td>Iliocostalis thoracis (thorax = chest)</td>
<td>Lower six ribs</td>
<td>Upper six ribs</td>
<td>Maintains erect position of spine</td>
</tr>
<tr>
<td>Iliocostalis cervicis</td>
<td>First six ribs</td>
<td>Transverse processes of fourth to sixth cervical vertebrae</td>
<td>Extends cervical region of vertebral column</td>
</tr>
<tr>
<td>Longissimus (intermediate) group longissimus thoracis (longissimus = longest)</td>
<td>Transverse processes of lumbar vertebrae</td>
<td>Transverse processes of all thoracic and upper lumbar vertebrae and ninth and tenth ribs</td>
<td>Extends thoracic region of vertebral column</td>
</tr>
<tr>
<td>Longissimus cervicis</td>
<td>Transverse processes of fourth and fifth thoracic vertebrae</td>
<td>Transverse processes of second to sixth cervical vertebrae</td>
<td>Extends cervical region of vertebral column</td>
</tr>
<tr>
<td>Longissimus capitis</td>
<td>Transverse processes of upper four thoracic vertebrae</td>
<td>Mastoid process of temporal bone</td>
<td>Extends head and rotates it to opposite side</td>
</tr>
<tr>
<td><strong>Spinalis (medial) group:</strong> Spinalis thoracis (spinalis = racticed column)</td>
<td><strong>Spinous processes of upper lumbar and lower thoracic vertebrae.</strong></td>
<td><strong>Spinous processes of upper thoracic vertebrae.</strong></td>
<td><strong>Extends vertebral column.</strong></td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Spinalis cervicis</strong></td>
<td>Ligamentum nuchae and spinous process of seventh cervical vertebra.</td>
<td><strong>Spinous process of axis.</strong></td>
<td><strong>Extends vertebral column.</strong></td>
</tr>
<tr>
<td><strong>Spinalis capitis</strong></td>
<td>Arises with semi spinalis thoracis.</td>
<td>Inserts with spinalis thoracis.</td>
<td><strong>Extends vertebral column.</strong></td>
</tr>
</tbody>
</table>

**TRANSVERSOPINALIS:**

<table>
<thead>
<tr>
<th><strong>Semispinalis thoracis (semi = partially or one-half)</strong></th>
<th>Transverse processes of sixth to tenth thoracic vertebrae.</th>
<th>Spinous processes of first four thoracic and last two cervical vertebrae.</th>
<th><strong>Extends vertebral column and rotates it to opposite side.</strong></th>
<th>Dorsal rami of thoracic and cervical spinal nerves.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semispinalis cervicis</strong></td>
<td>Transverse processes of first five or six thoracic vertebrae.</td>
<td>Spinous processes of first to fifth cervical vertebrae</td>
<td><strong>Extends vertebral column and rotates it to opposite side.</strong></td>
<td>Dorsal rami of thoracic and cervical spinal nerves.</td>
</tr>
<tr>
<td><strong>Semispinalis capitis</strong></td>
<td>Transverse processes of first six or seven thoracic vertebrae and seventh cervical vertebra and articular processes of fourth, fifth and sixth cervical vertebrae.</td>
<td>Occipital bone.</td>
<td><strong>Extends vertebral column and rotates it to opposite side.</strong></td>
<td>Dorsal rami of cervical nerves.</td>
</tr>
<tr>
<td><strong>Multifidus (multi = many; findere = to split)</strong></td>
<td>Scarum, ilium, transverse processes of lumbar, thoracic and lower four cervical vertebrae.</td>
<td>Spinous process of a higher vertebra.</td>
<td><strong>Extends vertebral column and rotates it to opposite side.</strong></td>
<td>Dorsal rami of spinal nerves.</td>
</tr>
<tr>
<td><strong>Rotatores (rotate = turn on an axis)</strong></td>
<td>Transverse processes of all vertebrae.</td>
<td>Spinos process of vertebra above the one of origin.</td>
<td><strong>Extends vertebral column and rotates it to opposite side.</strong></td>
<td>Dorsal rami of spinal nerves.</td>
</tr>
<tr>
<td><strong>SEGMENTAL:</strong></td>
<td><strong>Superior</strong></td>
<td><strong>Inferior</strong></td>
<td><strong>Extends</strong></td>
<td><strong>Dorsal rami</strong></td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Interspinales (inter = between)</td>
<td>surface of all spinous processes.</td>
<td>surface of spinous process of vertebra above the one of origin.</td>
<td>vertebral column.</td>
<td>of spinal nerves.</td>
</tr>
<tr>
<td>Intertranseversarii (inter = between)</td>
<td>Transverse process of all vertebrae.</td>
<td>Transverse process of vertebra above the one of origin.</td>
<td>Laterally flexes vertebral column.</td>
<td>Dorsal and ventral rami of spinal nerves.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SCALENE:</strong></th>
<th><strong>Transverse</strong></th>
<th><strong>First rib.</strong></th>
<th><strong>Flexes and rotates neck and assists in inspiration.</strong></th>
<th><strong>Ventral rami of fifth and sixth cervical nerves.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior scalene (anterior = front; skalenos = uneven)</td>
<td>Transverse processes of third through sixth cervical vertebrae.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle scalene</td>
<td>Transverse processes of last six cervical vertebrae.</td>
<td>First rib.</td>
<td>Flexes and rotates neck and assists in inspiration</td>
<td>Ventral rami of third through eighth cervical nerves.</td>
</tr>
<tr>
<td>Posterior scalene</td>
<td>Transverse processes of fourth through sixth cervical vertebrae.</td>
<td>Second or third rib.</td>
<td>Flexes and rotates neck and assists in inspiration.</td>
<td>Ventral rami of last three cervical nerves.</td>
</tr>
</tbody>
</table>
3.2 MODERN CONCEPT WITH RESPECT TO BACKACHE:

Backache is a condition of pain due to sprain and strain of the muscles of the back, diseases of the inter-vertebral discs or the abnormalities of the vertebrae. Back pain is an extremely common phenomenon. Almost 80% of population in modern society experience back pain at sometime during their life.

3.21 Types of Low Back Pain:

There are five types of low back pain: local pain, pain referred to the spine, pain of spine origin referred to the legs or buttocks, radicular pain and muscular spasm according to Harrison.

Local pain is caused by processes that compress or irritate sensory nerve endings. They are usually due to fractures, tears or stretching of pain sensitive structures. The site of the pain is near the affected part of the spine.
Local pain that does not vary with changes in position suggests spine tumor or infection. Pain referred to the spine may arise from abdominal or pelvic viscera. The pain is usually described as abdominal or pelvic as well as spinal and is often unaffected by position of the spine. Pain of spine origin may be referred to the buttocks and legs. Diseases affecting the upper lumbar spine may refer pain to the lumbar region, groin or anterior thighs. Diseases affecting the lower lumbar spine may result in pain referred to the buttocks, posterior thighs, or rarely the calves or feet. Classic radicular back pain is usually sharp and radiates from the spine to the leg within the territory of a nerve root. Coughing, sneezing, or voluntary contraction of abdominal muscles (lifting heavy objects or straining at stool) often elicits radiating pain. The patient notices increased pain in postures that stretch the nerves and nerve roots. The pain associated with muscle spasm, although origin is not clear, is commonly associated with many spine disorders. The spasms are accompanied by abnormal posture, tensed paraspinal muscles, and dull pain. Back pain at rest or unassociated with posture should raise suspicion for underlying spine tumor, fracture, infection or referred pain from visceral structures. Leg pain initiated by ambulation or standing and relieved by the sitting or supine position is suggestive of spinal stenosis.

Mechanical low back pain is particularly associated with occupations that involve heavy lifting, bending or twisting such as manual practice or nursing, but people whose jobs involve awkward static posture or prolonged driving are also at increased risk. Episodes of occupationally related low back pain are twice as common in adults over the age of 40 years. The overall prevalence is similar in both sexes but recurrences are more common in men. Job dissatisfaction, depression, obesity, smoking, alcohol and socio-economic deprivation have also been implicated.

3.22 Epidemiology:

According to J Maheshwari, back pain is not common in children, but if present, it is often due to some organic diseases. In the case of adults
psychological factors play an important role in producing back pain. In adolescents, postural and traumatic back pains are common. In adults, ankylosing spondylitis and disc racticed are common. In elderly persons, degenerative arthritis, osteoporosis, and metastatic bone disease are usually the cause. Back pain is common in women who have had several pregnancies. People in sedentary jobs are more vulnerable to back pain than those whose work involves varied activities. Back pain is common in surgeons, dentists, miners, truck drivers, etc. A past history of having suffered from a spinal disease such as a traumatic or inflammatory disease may point to that as the possible cause of back pain. 

3.23 Clinical Features:

Mechanical low back pain is characteristically acute in onset and frequently associated with a definite history of lifting or bending. Radiation of pain to the thighs can be associated with sprains of muscles, ligaments and apophyseal joints, nerve root irritation. If the pain radiates down the back of the leg below the knee and aggravates by coughing, sneezing and straining at stool is usually associated with disc protrusion or due to nerve root compression.

Along with the above features, associated symptoms may point to the cause of back pain. Stiffness, especially in the early morning, is a prominent symptom in pain due to ankylosing spondylitis. There may be an associated limitation of chest expansion. In some rheumatic diseases, back pain may be the presenting feature, but on detailed questioning one may get a history of pain and swelling of other joints. Symptoms like paraesthesias, numbness or weakness may point to a lesion of the nervous tissue, or a lesion in close proximity to it (e.g., a disc racticed). A history suggestive of abdominal complaints, urogenital complaints, or gynaecological complaints may indicate an extra-skeletal cause of back pain. Mental status of the patient must be judged to rule out any psychological cause of back pain (hysteria, malingering, etc.). A patient suffering from an organic disease may have a significant underlying psychological disturbance also.
3.24 Examination of the back:

When the back is examined, the normal spine reveals normal thoracic and lumbar curves. Exaggeration of these normal curves results in kyphosis and lordosis. There may be lateral curvature of the spine called scoliosis or an asymmetry in the appearance of the paraspinal muscles, suggesting muscle spasm. Local back pain is often reproduced by palpation or percussion over the spinous process of the affected vertebrae. Localised tenderness may indicate ligament or muscle tear. There may be trigger points or tender nodules. A cold abscess may be present, indicating tuberculosis as the cause. Also, the movements of the spine should be tested. Flexion, by asking the patient to try to touch the toes without bending the knees, Extension, by asking the patient to bend backwards. Lateral bending, by running the hand down the side of the thigh as far as possible. Thoracic rotation, by turning round to the left and right as much as possible. Spinal movement may be absent in ankylosing spondylitis. In mechanical or osteoarthritic back problems, flexion and extension are reduced more than lateral movements. In intervertebral disc prolapsed, sustained lumbar extension may reproduce the low back pain and sciatic radiation. The straight leg-raising (SLR) sign and crossed SLR sign is tested to find out sciatica and nerve root lesions.

3.25 Investigations:

Radiological Examination X-rays of the lumbo-sacral spine (AP and lateral) and pelvis (AP) are useful in diagnosing metabolic, inflammatory and neoplastic conditions. Though, X-rays are usually normal in non-specific back pain, these provide a base line. CT scan shows most bony and soft tissue problems around the spine and spinal canal. Bone Scan may be helpful if a benign or malignant bone tumour is suspected on clinical examination but is not seen on plain X-rays. MRI scan shows the prolapsed disc, theca, nerve roots etc very clearly. Electromyography (EMG) findings of denervation, localized to the distribution of a particular nerve root, helps in localizing the offending disc in cases with multiple disc prolapsed.
3.26 Causes of Low Back Pain:

According to Davidson\textsuperscript{17}, causes of back pain are as listed below –

Mechanical Prolapsed intervertebral disc, lumbar spondylosis, spondylolysis/spondylolesthesis, spinal stenosis, congenital abnormalities and non specific causes

Inflammatory Infections, sacroilitis, ankylosing spondylitis and arachnoiditis

Metabolic Osteoporosis, osteomalacia, hyperparathyroidism and Paget’s disease

Neoplastic Metastases, myeloma, reticuloses, osteoid osteoma and intrathecal tumours

Referred Pain Peptic ulcer, pancreas, bowel, kidney, aortic aneurysm, endometriosis, ovary, retroperitoneal fibrosis, herpes zoster, hip disease and polymyalgia rheumatic

Other causes Scheuermann’s Osteochondritis, diffuse idiopathic skeletal hyperostosis (DISH) and fibromyalgia

According to Harrison\textsuperscript{18}, causes of back pain include –

Congenital anomalies of the lumbar spine Spondylolysis and spondylolesthesis

Trauma to the low back Sprains and Strains, Vertebral Fractures, dislocation and Lumbar Disk Disease

Other causes Spinal stenosis, facet hypertrophy and lumbar adhesive arachnoiditis

Arthritis Spondylosis and ankylosing spondylitis

Other Destructive Diseases Neoplasm, infection by bacteria, osteoporosis and osteosclerosis
Refered pain from visceral disease: Peptic ulcer, colitis, diverticulitis, endometriosis, carcinoma of the uterus

Postural back pain Chronic, non specific low back pain: A vague, diffuse back pain with prolonged sitting or standing that is relieved by rest

Psychiatric Disease Chronic low back pain may be present in patients with chronic anxiety states, depression, substance abuse and childhood trauma

API Book of Medicine lists the following causes\(^{19}\) for back pain –

Congenital Abnormal vertebral facets, sacralisation of L5 transverse process, and spondylolysis or listhesis between L5 and S1 vertebrae

Acquired Inflammatory, Infective – tuberculosis, discitis, epidural abscess, non-infective or rheumatologic – ankylosing spondylitis

Trauma Ligaments, muscles, vertebrae or annulus fibrosus with disc racticed

Vascular Abdominal aortic aneurysm – dissection, rupture, erosion of adjacent structures

Degenerative Disc disease, facetal arthropathy and spinal canal stenosis

Metabolic Osteoporosis and Paget’s disease

Mechanical Poor posture aggravated by obesity, pregnancy and over use

Refered Pain Renal, pancreas, duodenal ulcer and pelvic inflammatory disease

Soft tissue rheumatism, psychogenic and whole body vibration

**Prolapsed Disc** – The inter-vertebral disc consists of three distinct components – the cartilage end plates, nucleus pulposus and annulus fibrosus. The posterior longitudinal ligament is a strap like ligament at the back of the vertebral bodies and discs. The term ‘prolapsed disc’ means the protrusion or extrusion of the nucleus pulposus through a rent in the annulus fibrousus. The commonest level
of disc prolapsed is between L₄ – L₅ in the lumbar spine and C₅-C₆ in the cervical spine. In the lumbar spine, it is uncommon above L₃-L₄ level. As a consequence of disc rupture, the height of the disc is reduced. This affects the articulation of the posterior facet joints. This leads to degenerative arthritis.

Sciatic pain – This is usually associated with low back pain, but may be the sole presenting symptom. The pain radiates to the gluteal region, the back of the thigh, and leg. The pattern of radiation depends upon the root compressed. In S₁ root compression, the pain radiates to the postero-lateral calf and heel. In L₅ root compression, the pain radiates to the antero-lateral aspect of the leg and ankle. In a disc ruptured at a higher level (L₂-L₃ etc.), the pain may radiate to the front of the thigh. Often the radiation may begin on walking, and is relieved on rest. Sometimes, the patient complains of paraesthesias, most often described as ‘pins and needles’ corresponding to the dermatome of the affected nerve root. There may be numbness in the leg or foot, and weakness of the muscles. In cases with large disc material compressing the theca and roots, a cauda equina syndrome results, where the patient has irregular LMN type paralysis in the lower limbs, bilateral absent ankle jerks, with hypoaesthesia in the region of L₅ to S₄ dermatomes and urinary and bowel incontinence.

Congenital Disorders – Spina bifida and Transitional vertebrae are the congenital disorders. Spina bifida is a developmental anomaly marked by defective closure of the vertebral arch. A transitional vertebra is the one at the junction of two segments of the spine, so that the characteristic of both segments is present in one vertebra. It is common in the lumbo-sacral L₅-S₁ region.

Traumatic Disorders – Back strain and Compression fractures are the two traumatic disorders. Back strain (acute or chronic) arises from a ‘trauma’ sustained in daily routine activities rather than from a definite injury. People prone to back strain are athletes, tall and thin people, those in a job requiring standing for long hours and those working in bad postures, sedentary work and women after pregnancy. Acute ligament sprain may occur while lifting a
heavy weigh, sudden straightening from bent position, pushing etc
Compression fractures occur commonly in the thoraco-lumbar region

**Inflammatory Disorders** – Tuberculosis and ankylosing spondylitis are the two inflammatory disorders. Ankylosing spondylitis is characterized by limited spinal movements along with limitation of chest expansion.

**Degenerative Disorders** – Osteoarthritis (OA) is a degenerative joint disease primarily affecting the articular cartilage. Spinal stenosis is narrowing of the spinal canal in the whole of the lumbar spine, or more often, in a segment of the spine, commonly in the lumbo-sacral region. It may give rise to pressure or tension on the nerves of the cauda equina or lumbar nerve roots.

**Other Causes** – Some of the other causes include benign and malignant tumours in the spine and the spinal canal. Osteoporosis and Osteomalacia are other causes of back pain. Osteoporosis is by far the commonest metabolic bone disease. It is characterized by a diffuse reduction in the bone density due to a decrease in the bone mass. Osteomalacia, means softening of bones, primarily due to deficiency of vitamin-D. Common in those who lack exposure to sunlight. Spondylolysis is the breaking down of a vertebra. Spondylolisthesis is forward displacement of a vertebra over the one below it. It commonly occurs between L5-S1, and between L4-L5.

### 3.27 Treatment:

Treatment of back pain consists of rest, drugs, hot packs, spinal exercises, traction, corset and educating the patient regarding the prevention of back pain.

In the acute phase, absolute bed rest on a hard bed (a mattress is allowed) is advised. Bed rest for more than 2-3 weeks is of no use, rather, a gradual mobilization using aids like brace is preferred. Mainly analgesic- anti-inflammatory drugs are required. In cases with a stiff spine, muscle relaxants are advised. Physiotherapy consists of heat therapy (hot packs, short-wave diathermy, ultrasonic wave etc). Gradually, a spinal exercise programme is
started. Traction is given to a patient with back pain with lot of muscle spasm. It also sometimes helps in 'forcing' the patient to rest in the bed. Corset is used as a temporary measure in treating acute back pain, in back pain due to lumbar spondylosis, etc. Patient education includes education to avoid straining the back in daily activities such as sitting, standing, lifting weight, etc. Patients must be taught what they can do to alleviate the pain and to avoid injury or re-injury to the back.

3.3 YOGIC CONCEPT WITH RESPECT TO BACKACHE:

Good health was a by-product of their daily lifestyle in ancient times when people lived the yogic way. As health deteriorated due to man's changing lifestyle and values in recent years, yoga gained ground in its use as therapy. Yoga can prevent and cure many ailments. Yoga works on the inner senses and mind and it can tackle many major illnesses non-invasively.

Mind and body are very closely associated according to yoga. Any disturbance in the mind is expressed in the body, and vice versa. Mental stress produces many diseases like coronary and respiratory illness, peptic ulcers, and weak immune system. Maharsi Patanjali tells, impurities are destroyed and knowledge becomes effulgent till the maximum limit by practiced different limbs of yoga. He also tells, the misery yet to come can be avoided. Therefore, by following different limbs of yoga, one can get rid of the diseases.

Now it is explained backache and its treatment in classical texts of yoga and in ancient Indian texts like Caraka Samhita, Astanga Hrdaya and Mādhava Nidāna.

"Paścimatānāsana, important of all asanas, makes the movement of vāta proper, stimulates gastric fire" says Hathayagapradipika, an important classical text of yoga. Another classical text of yoga, Śiva Samhita tells – "By the practice of paścimatānāsana, success of vāyu – that destroys the multitude of suffering – is accomplished very quickly." These explanations
clearly indicate that, damage to the muscles and ligaments in the back mainly due to the poor blood circulation, can be overcome by practising paścimatānāsana. Therefore, paścimatānāsana can be used in the treatment of backache.\(^{25}\)

In Caraka Samhitā, while explaining the varieties of vāta disorders, he mentions, kubjatva – kyphosis, trikāgraḥah – Arthritis of sacroiliac joint and prsthagraha – stiffness of the back are among the most commonly manifested diseases caused by vāta.\(^{26}\) Also Caraka mentions grdhrasī i.e. sciatica, characterized by pain, aching in the waist, buttocks, thighs, knees and lower leg, is caused due to either aggravated vāta or aggravated vāta and kapha.\(^{27}\)

With respect to treatment, Caraka explains, when vāta is overcome in the colon, even the entire vitiated vāta dwelling in other parts of the body is automatically alleviated, like cutting of the tree at the root automatically results in the destruction of the whole plant.\(^{28}\)

Other texts explain the sciatica as follows -

In Astāngahrdaya of Vagbhata, sciatica is explained under the diseases of vāta “Tendons of the feet getting vitiated by māruta (vāta) cause pain moving towards the ankles or the toes and make the lifting of the thigh very difficult, this is called grdhrasī” i.e. sciatica.\(^{29}\)

Another text Suśruta Samhitā also explains grdhrasī i.e. sciatica The disease in which the two great nerve trunks (kandarā), which emanate from below the lower extremity of the thigh reach down to the bottom of the in steps and toes, and become stuffed or pressed with the enraged vāyu, thus depriving the lower extremities of their power of locomotion, is called grdhrasī.\(^{30}\)

Vāta, either alone or associated with kapha produces a disease called grdhrasī, according to Mādhava Nidānam of Mādhavākara It is characterized by stiffness (inability to move) and severe pain starting in the lumbar region moving downwards through thighs, knees, calves and feet Vāta causes rigidity of lower back and low and throbbing pain intermittently Vāta and kapha cause
stupor, heaviness and anorexia Pricking pain, irregular shape of the body parts, throbbing and severe stiffness of knee-joints and waist are profound if vāta alone is affected in grdhraśī. But if with kapha, there will be poor digestive ability, stupor, salivation and aversion to food are profound

Prthvi and ap are increased and vāyu and ākāśa are decreased in the back pain according to 26 tattva theory, one among the basic principles of yoga therapy. Therefore to decrease prthvī and ap, one has to reduce the consumption of tastes like madhura, amla and lavana in the food and should increase the consumption of tastes like katu, tikta and kasāya, to increase vāyu and akāśa.

Any physical problem, i.e. problem in annamayakośa has got interaction with prāṇamaya and manomayakośas according to pancakośa theory. Similarly the disturbance in manomayakośa percolates to the prāṇamaya kośa and annamaya kośas. The problem of long standing stresses begins in the manomaya kośa and manifests initially as irritability, emotional liability, excessive smoking or alcohol, sleep disturbance, difficulty in making decisions etc. Over the years this starts disturbing the prāṇamaya kośa and gives rise to digestive problems such as poor appetite, dyspepsia, constipation, flatulence, gastritis etc. Then at the annamaya kośa, as unexplained musculoskeletal pains either as muscle spasms, soft tissue pains, sprains, cramps or inflammations. A combination of some of these imbalances settles down in one particular part of the body showing up as recurrent episodes of acute or chronic musculoskeletal pains with no organically detectable cause.

Ill health is due to the imbalance of tridosas according to Tridosha theory. The imbalance responsible for low back pain is generally in the form of excessive vāta dosa or an imbalance of vāta and kapha dosas. Therefore, to reduce kapha, increase the consumption of food predominant with the taste of bitter, hot and astringent.

Now let us see the management of backache through yoga therapy.
3.31 Yogic Management of Backache:

Yoga therapy on backache works in the four levels, namely, relieving the pressure in the affected area, proper positioning of the body structures, overcoming the physical and mental dualities, and strengthening of the affected area. We will see the effect of different components of yoga therapy in the management of backache.

3.311 Life Style:

Life style plays an important role in the management of backache. Modern technological advances have made life easy with the aid of tools, gadgets and ever renewed transport facilities that have drastically reduced the need for physical activity. This is responsible for lesser stamina in the muscles all over the body in general and the strong thick postural muscles of the spine in particular. Once the level of physical activity reduces, the muscles become weaker and weaker. Wrong postures and curvatures of spine in our activities alter the line of weight transmission. This poses greater demands on some muscles that fall in this wrong line of weight transmission. These muscles, which are already weak, are now subjected to long duration of activity. They are made to remain in a state of partial contraction which they are not used to. Muscles get tired and when pushed beyond its capacity, trigger off pain sensors resulting in back pain. A little increased physical activity is too much for the untrained muscles. This makes one prone to multiple sprains and strains, muscle pulls and small injuries. These soft tissue injuries are most common in the neck and the lumbar spine. Whenever there is an underlying soft tissue or bony injury in the spine, the nature’s way is to protect the part by not allowing that part to move, by spasm of the long paraspinal muscles. Stress is the emotional and physiological response to demanding situations. The competitive, progressive fast life style poses too many demands on the emotional and the physiological coping mechanisms. Repeated long standing demands on these physiological responses lead to increased muscle spasm, mainly excessive contraction of the facial muscles and the postural muscles of...
the spine. Today's life style is full of such demanding situation without any
time for relaxation. This long standing spasm, in the already weak postural
muscles of the back, triggers off the pain nerve endings in these muscles, this
causes persistent back pain.\(^{37}\)

One can have a healthy lifestyle by incorporating *yama* and *niyama*. One
should control himself from disturbances like anger, worry and remain
composed. One should take nutritious and *sātvaka* food to maintain the proper
digestion and elimination, and have balanced state of mind. One should keep
proper sleeping habits – go to bed and wake up in proper time, should not keep
awake till late night. One should not excessively indulge in traveling, physical
strain beyond one's capacity. When the proper food is taken one could keep his
bowel movements perfect. Heavy, constipating food such as meat and oily
preparations are contra indicated. It is good to take cooked light grains and
cereals in the form of rice, chapathi etc., and salads using leafy vegetable,
carrots, radish, cucumber, and fresh citrus fruits. One should avoid refined,
processed and synthetic food.\(^{38}\) It is advised to take major portion of the food
during the day and the evening food should be lighter. This ensures proper
digestion. One should not eat now and then in between the meals. Also, the
patient should avoid jerky and hasty movements of the spine, long hours of
sitting or standing. Avoid lifting the weight from the ground straight unless the
individual bends over the knees and brings the weight nearer to the body. Use
hard bed for sleeping.\(^{39}\)

Proper posture of the body is very important. Poor posture puts a strain
on muscles and ligaments and leads to back pain. Good posture keeps the body
in proper alignment, relieving muscles of unnecessary stress and strain. When
we stand, the ears, shoulders, hips, and ankles should be in straight line. While
sitting, ears, shoulders and hips should be in line. Good posture keeps the
natural curves of spine in balance, and allows back muscles to support the spine
without additional strain.\(^{40}\) Most persons use one side of the body when they
are sitting or standing, unduly stressing the buttock muscle on that side. This
produces pressure on the sciatic nerve and pain on the side of the body that is over used. For example, a driver may experience pain in the buttock regions of that leg used more while driving.

### 3.312 Kriyas:

Now it will be discussed, the use of kriyas in the treatment of backache. *Agnisāra* is a kriya in which the abdominal recti are systematically moved to and fro, while standing in *utkatasana*. The practice cleans the digestive system and stimulates digestion. *Agnisāra kriyā* massages all the abdominal organs, strengthens the muscles and stimulates the associated nerves encouraging the best functioning of these organs. It promotes the correct secretion of digestive juices and thereby allows optimum assimilation of nutrients. It prevents and removes digestive problems such as constipation, indigestion and flatulence. The abdominal recti are toned and this helps in keeping the spinal column in a neutral position.

One can practice *mūlaśodhana* and *śankhapraksālana*. *Mūlaśodhana* is the practice which purifies the anus and rectum. *Mūlaśodhana* stimulates the nerves and blood vessels, encourages the whole eliminative system to function efficiently for regular free defecation. It cleans the area of hard, putrid waste material and cures constipation. *Śankhapraksālana* completely washes the intestines. *Śankha praksālana* expels all impurities from the digestive tract and thereby helps to purify the whole body. As excretion becomes proper, the vāta becomes balanced and this helps in overcoming backache.

### 3.313 Āsanas:

Āsanas are the important components of yoga therapy. When āsanas are practiced properly, there is no clash between the two opposite forces, dualities. On the contrary they work in coordination with each other. These two opposites may be two types of neural impulses like excitatory and inhibitory impulses or sympathetic and parasympathetic activities. The neuro-muscular activity takes place smoothly. E.g., contraction of the biceps and the relaxation
of the triceps of the arm occur at the same time which helps smooth bending and stretching of the elbow joint. This opposite type of functions or forces, make the body, and working of the body and mind in a smooth harmonious manner. So, if the āsanas are done in a proper way, there would be no clash between these internal opposite mechanisms.

Āsanas counteract the instability in the body. This instability or tremor, called angamejyatva, is due to chronic disturbances in the muscular tone, which lead to the imbalance in the muscular activity. This tonic imbalance could be corrected by practiced āsanas. Āsanas also overcome the imbalance in other functions of the body like endocrinial secretion. They overcome emotional conflicts, stresses, tensions etc. In this manner āsanas make our body and mind strong and healthy. The practice of āsanas bestows stability, health and lightness to body and mind. “Kuryāt tadāsanam sthairyam ārogyam cāngalāghavam”, says Hathapradipika.

In stressed condition, muscles of the spine become tensed and this gradually alters the nature of the spine leading to back pain. Low back pain can also result if the abdominal muscles are weak because the abdominal muscles work with the back muscles to stabilize the spine so that the spine is kept in a neutral position. If the abdominal muscles are weak, the abdomen drags the spine forward producing constant strain on the spinal muscles.

When we practice the āsanas, the muscles are precisely positioned and alignment is given before the stretch commences. The regional blood flow changes, without any reflex change in any other parameter. As there is no repetitive body movement, the muscles do not get exhausted. Therefore the muscles remain healthy throughout life.

Āsanas like trikonāsana, pārśvakonāsana give uniform lateral stretch to all the muscles of the trunk, massage the disc and are very useful in lateral disc prolapse.
Stretching of the posterior inter-vertebral joints gives relief from pain as pressure on the disc is reduced and the spasm of nerves, muscles and ligaments released. It also improves blood supply to the injured area and allows better healing. The muscles and the ligaments become soft and elastic, improving ligament and the tone of muscle. This prevents the recurrent problems and future practiced at a different level. The joints and spinal muscles are properly aligned and provide relief from pain in both the lumbar and sacroiliac regions.

Āsanas like Paścimatānasana, strengthen the spinal and back muscles by the rigorous stretching that they undergo and also help to correct any misalignment of the individual vertebrae or the spine in general, according to Swamy Satyananda Saraswati. Additionally these āsanas increase separation between neighboring vertebrae, and help to ensure that the nerve fibers, located between each pair of adjoining vertebrae, become free of interference from the vertebral discs. In this way many ailments caused by the weak and misaligned spine can be relieved or eliminated. These poses also squeeze the stagnant or semi stagnant blood from the spinal areas, particularly the pelvis and lower back, returning the blood for re-circulation and purification. On terminating the āsana, the increased volume of enriched blood flows into the back muscles, the spinal cord, the nerve ganglia and racticed that surround the spine, and the parts of the parasympathetic that emerge from the spine in the pelvic region. This effectively removes waste matter and toxins and supply of nourishment to the muscles and nerves is enhanced. This in turn leads to efficient functioning of these extensive parts of the body. The spinal nerves have connections with most of the organs and therefore, their improved operation will have beneficial repercussions in many seemingly unrelated regions and organs of the body. In this way many organic malfunctions can be rectified and the organs gain their lost vitality. Besides the improved blood supply, the nervous system in and around the spine is also generally stretched during the forward bending poses. This tends to invigorate the whole system, together with the organs and parts of the body that they innervate. In Paścimottānsana, apart from the good stretching of the spinal muscles, from
the back of neck to the back of heels, the abdominal organs get massaged well and it improves the blood supply to that region.

In *Pavanamuktāsana*, the simultaneous flexion of the knees and hip joints enhances the intra abdominal pressure, and even the last parts of the large intestine and rectum acquire a straightened position for easy passage of flatus. This āsana adds to the suppleness and agility to the muscles around the knees and hip joints. The muscles over the lower part of spine also get gently stretched.49

*Bhujangāsana* effects extension of the spine. Often the spine gets bent forward but hardly gets an opportunity to get stretched backwards. *Bhujangāsana* tones up the paravertebral muscles alongside the spine and prevents inter-vertebral discs from slipping out.50 *Bhujangāsana* imparts a progressive bend to the spine starting in the region of the neck i.e. cervical vertebrae, and proceeding vertebrae by vertebrae, towards the region of the lumbar vertebrae. In this way, it loosens the articulations between the vertebrae and also relaxes the back muscles. Regular practice of this asana makes even the most rigid spine flexible, and can remove even the most painful types of backache. It acts on the chief causes of backache, it removes mental tension, releases any compression of the spinal and related nerves, removes general fatigue and helps to relax tense muscles. The progressive curving of the spine during *bhujangāsana* is very useful in correcting minor displacement of vertebrae or in rectifying any incorrect curvature of the spine. In this way, it can remove round shoulders, hunched back and general spinal deformities.51

*Śalabhāsana* strengthens most muscles of the back and abdomen and helps to prevent the occurrence of back ailments. It stimulates the spinal nerves and improves the numerous functions of the body that they innervate. The asana is useful in relieving sciatica, by simultaneously stretching the sciatic nerves and separating the offending, adjoining vertebrae in the lower spine, which tend to squash these nerves and cause pain.52 *Śalabhasana* complements *Bhujangāsana* and these two āsanas relieve undue pressure on the vertebrae.
and inter-vertebral discs. The pressure effect on the abdomen and hence on the intestines is good for indigestion and flatulence. *Dhamūrāsana* also gives the same effect.

*Asanas* like *Bhāradvājāsana*, *Ardhamatsyendrāsana* are very much beneficial by improving the conditions of the nerves in and around the spine. Youthfulness can be maintained together with improvement in general physical health by practicing these *āsanas*. When we practice these *āsanas*, the muscles and nerves of the back on one side are contracted, while stretching the muscles and nerves on the other side. When the trunk is turned in the opposite direction, the process is the same, but reversed. The overall result is a good compression and extension of these nerves and muscles. Because of this, circulation is improved and sluggish or stagnant blood in the entire back is replaced by purified blood. This helps to remove toxins and re-vitalizes the muscles and nerves of these regions. The twisting of the vertebral column also prevents any tendency of adjoining vertebrae to fuse together, this being particularly prevalent with elderly people. This *āsana* also produces a feeling of tranquility, side by side with vitality.

According to S Dutta Ray, by the practice of *ardhamatsyendrāsana*, the muscles of the neck also get stretched and the shoulder joints become free for smooth movements. The abdominal organs get squeezed to one side while the other half remains relaxed. This is supposed to be good for appetite, gastric acidity and intestinal movements. This relieves the nerves that come out of the vertebral column and their blood supply also improves.

The vital force that activates life is known as *prāna*, according to yoga. Swamy Satyananda Saraswati says, *prāna* is divided into a solar and a lunar flow. If they are in harmony with each other, then physical health and mental stability are assured, together with enhanced spiritual awareness. It is a subtle force which flows in channels or *nādis* throughout the body, ensuring smooth functioning of all the organs and protecting the whole body against diseases.

The *prānac* channels can become congested. By doing inverted poses, the
direction of flow of prāna can be reversed and the channels can be decongested. For e.g., when a pipe becomes blocked, the sediment causing the blockage is easily removed by forcing fluid in the opposite direction. By maintaining unimpeded prāna channels, the life force can perform its duties efficiently.

Many āsanas bend the spine in the region of the back in a forward direction. Sarvāṅgāsana is one of the few āsanas, including halāsana, which bends the vertebral column forward in the region of the neck, thus āsana improves the articulation and suppleness between the individual cervical vertebrae. Halāsana is one of the best āsanas for developing and maintaining a supple spine. A definite relationship appears to exist between the flexibility of the spine and a person’s physical condition and mental attitude. Youthfulness is characterized by a supple spine, while senility is characterized by a rigid spine. By helping to maintain or develop a flexible spine, halāsana keeps the body youthful and full of vitality. In Halāsana the hands and legs stretched in opposite directions give full stretch to the spinal muscles at the back.

Through śavāsana, deep levels of physical as well as mental relaxation are achieved.

3.314 Pranayama:

Bhastrikā prānāyāma opens, cleans and rejuvenates the closed alveoli, impurities and stagnant air are eliminated from the lungs. This leads to efficient gaseous exchange resulting in better health of the whole body and increased vitality. Bhastrikā balances the tridosas. The balancing of vāta improves the blood circulation at the capillaries level, overcoming the damage to the muscles and ligaments in the back due to the poor blood circulation. Therefore, practice of bhastrikā, makes the muscles and nerves to function more efficiently. As a result of this, gastric fire increases. Bhastrikā removes the impurities from the body, improves the flow of prāna throughout the body,
which helps to remove the disease in the subtle level and induces good health. Gheranda Samhita says “By practicing bhastrikā day by day one will gain health and there will be no disease or suffering.”

Ujjāyī prānāyāma has many subtle influences on the body and mind. The slow and deep breathing results in immediate calmness of the mind and body and brings a harmony in them. The sound at the throat soothes one physically as well as mentally, and helps in relieving the ailments even if they are originated in the mind. The prolonged exhalation in recaka produces predominance of parasympathetic branch of Autonomic Nervous System and therefore one feels calm and relaxed as well as balanced in mind, after this prānāyāma.

Anuloma viloma prānāyāma induces calmness of mind by regulating the flow of prāna in the body. It helps to remove the congestion or blockage of the nādis and thereby allows the free flow of prāna. The gaseous exchange becomes more efficient and this purifies the whole body, increasing the overall health of the body including resistance to disease. The soothing effect of this prānāyāma on the nervous system reduces various emotional tensions and one feels relaxed and light. This will have bearing upon the emotional behavior of the individual if one practices it over a long period. Calmness and the mental relaxation are easily felt immediately after the practice of Anuloma viloma prānāyāma.

3.315 Meditation Techniques:

Meditation is the great mean of controlling the mind. Meditational practices induce mental tranquility. By meditation one can rectify the problems, conflicts and other disturbances deep rooted in the mind. Ajapa japa or soham meditation brings mental peace and concentration of mind. Practice of antarjamauna leads to inner tranquility and silence. Here one should be intensely alert to all activities within the mind. But one should not become involved in any experience, should remain a detached observer. Thus the
suppressed thoughts in subconscious mind get exhausted and peace of mind will be gained.

3.3.16 Relaxation Techniques:

Deep relaxation is a powerful mind-body technique that can ease the back pain by relaxing the spasming, painful muscles so that back can stretch and move a little. Deep relaxation reduces the agitation and quiets the mind, which in turn, reduces activity in the sympathetic nervous system while activating the parasympathetic system. Reduced sympathetic nervous system activity, along with increased parasympathetic activity, helps to relax muscles, allowing them to release chronic tension that has often been stored up for years. When muscles relax, the capillaries in the muscles those were previously compressed open up. This results in improved blood flow to the muscles and decongestion of the tissues in the area. By this inflammation and swelling in the injured back get reduced, resulting in healing. Improved blood flow provides greater oxygen and nutrition supply, and more efficient removal of toxins from the muscles.

Deep relaxation also helps to reduce the risk of recurrent back injuries. According to Sri Parmanand Aggrawal, a stiff tense spine is much more susceptible to injury than a flexible one, and learning to relax will help to keep the muscles of back soft and flexible. This avoids further injury or damage to the back. As stress affects both the mind and the body, deep relaxation, which works on both the levels, is especially effective for healing painful back conditions that have occurred during times of significant stress. When body is relaxed, it exerts a calming and stabilizing influence on the mind. When the mind is relaxed, it exerts a powerful tranquilizing and relaxing effect on the body. When both mind and body are relaxed, stress is released and healing occurs.

_Yoganandrā_- Through the systematic practice of _yoganandrā_, tensions can be progressively released. Muscular tension is related to the body, leads to
imbalance in the nervous system and endocri nal secretions. These imbalances can be removed by the deep relaxation attained in the state of yoganidrā. Emotional tensions, due to various dualities such as love/hate, profit/loss, success/failure, happiness/unhappiness, are more difficult to erase. This is because we are unable to express our emotions freely and openly. Often we refuse to recognize them, so they are repressed, and the resulting tensions become more and more deep rooted. It is not possible to relax these tensions through ordinary sleep or relaxation. A method such as yoganidrā can tranquilize the entire emotional structure of the mind. Mental tensions are the result of excessive mental activity. Throughout our life, the experiences registered by our consciousness are accumulated in the mind. From time to time these explode, affecting our body, mind, behavior, and reactions. When we are sad, angry, or irritated, we often attribute that condition of the mind to some superficial cause. But the underlying cause behind man’s abnormal behavior lies in the accumulated tensions on the mental plane. Yogamāra enables to relax deep down into the realms of the subconscious mind, thereby releasing and relaxing mental tensions, and establishing harmony in all facets of our being.

References:


3 Ibid, page – 178, 179


6 Ibid, page – 305, 306


16 Ibid, page – 247, 248


19 Dr Siddharth N Shah, Editor in Chief, API Text Book of Medicine, The Association of Physicians of India, Opp Wadia Children's Hospital, Parel, Mumbai 400012, 7th Edition, 2003, page – 1149


21 Swami Vivekananda, Raja Yoga, Advaita Ashrama, 5 Dehi Entally Road, Calcutta – 700014, June 1999, page – 204

22 Ibid, page – 186


25 Dr K Krishna Bhat, Dean-Faculty of Science & Technology, Professor and Chairman, Dept of Human Consciousness & Yogic Sciences, M Sc Yogic Science Class Lecture


32 Dr K Krishna Bhat, Dean-Faculty of Science & Technology, Professor and Chairman, Dept of Human Consciousness & Yogic Sciences, M Sc Yogic Science Class Lecture

33 Ibid

34 Dr R Nagarathna, Dr H R Nagendra, Yoga for Back Pain, VivekanandaYoga Research Foundation, Swami Vivekananda Yoga Prakashana, 19, Eknath Bhavan, Gavipuram Circle, Kempegowda Nagar, Bangalore – 560019, December 2008, page – 32, 33


36 Dr K Krishna Bhat, Dean-Faculty of Science & Technology, Professor and Chairman, Dept of Human Consciousness & Yogic Sciences, M Sc Yogic Science Class Lecture

38 Dr Swami Karmananda, Yogic Management of Common Diseases, Yoga Publication Trust, Bihar School of Yoga, Munger, Bihar, page – 157, 163

39 Dr M M Gore, Dr D R Vaze, Dr S A Kulkarni, Dr J P Oak, Yoga Therapy for Selected Diseases, Kaivalyadhama, Lonavala, Dist Pune – 410403, 2008, page – 53, 54

40 Shri Parmanand Aggrawal, Back-care through Yoga (Compilation of articles and Notes), Kaivalyadhama Ashram, Lonavala, Dist Pune – 410403, August 2009, page – 52, 53

41 Swami Satyananda Saraswati, A Systematic Course in the Ancient Tantric Techniques of Yoga and Kriya, Yoga Publication Trust, Bihar School of Yoga, Munger, Bihar, 2008, page – 161,163

42 Ibid, page – 419, 421

43 Ibid, page – 311, 342


45 Hatha Pradipika, Chapter 1, Sloka 17, Swami Digambaraji and Pt Raghunatha Shastri Kokaje (Edited), Hathapradipika of Swatmarama, Kaivalyadhama, SMYM Samithi, Lonavala, Pune- 410403, Maharashtra 2nd Ed, 1998, page – 9

46 Shri Parmanand Aggrawal, Back-care through Yoga (Compilation of articles and Notes), Kaivalyadhama Ashram, Lonavala, Dist Pune – 410403, August 2009, page – 52, 53


50 Ibid, page – 73


52 Ibid, page – 75


57 Ibid, page – 56

58 Ibid, page 68, 69

60 Swami Satyananda Saraswati, A Systematic Course in the Ancient Tantric Techniques of Yoga and Kriya, Yoga Publication Trust, Bihar School of Yoga, Munger, Bihar, 2008, page – 762


63 Digambaraji, Dr M L Gharote (Edited), Gheranda Samhita, Kaivalyadhma, SMYM Samithi, Lonavala (India) – 410403, 2nd Edition 1997, page 135

64 Swami Satyananda Saraswati, A Systematic Course in the Ancient Tantric Techniques of Yoga and Kriya, Yoga Publication Trust, Bihar School of Yoga, Munger, Bihar, 2008, page – 173


66 Swami Vivekananda, Raja Yoga, Advaita Ashrama, 5 Dehi Entally Road, Calcutta – 700014, June 1999, page – 179


68 Swami Vivekananda, Raja Yoga, Advaita Ashrama, 5 Dehi Entally Road, Calcutta – 700014, June 1999, page – 179


70 Ibid, page – 582, 584
71 Ibid, page – 736

72 Shri Parmanand Aggrawal, Back-care through Yoga (Compilation of articles and Notes), Kaivalyadhama Ashram, Lonavala, Dist Pune – 410403, August 2009, page – 25-28