UNIT 24 MULTIPLE SCLEROSIS

Structure

24.1 INTRODUCTION

In this Unit, you will read about multiple sclerosis (MS) which has been recognized as a disability under the RPwD Act, 2016. It is a neurological condition; this means it is caused due to the damage to the nerves (neurons). This damage causes the symptoms of MS. You will read about the causes of the disease and the various strategies for managing and treating Multiple Sclerosis.

Objectives

After reading this Unit, you will be able to:

- understand multiple sclerosis as a neurological disease often disabling the patient;
- identify the symptoms of multiple sclerosis;
- describe the risk factors and complications for people with multiple sclerosis;
- explain the course of the disease and its progression; and
- state the various management and treatment options available for multiple sclerosis.

24.2 UNDERSTANDING THE NATURE OF MULTIPLE SCLEROSIS

To grasp how multiple sclerosis (MS) affects the nervous system, you need to know how the nervous system works and the structure of the nerve cell (also called neuron).

24.2.1 Basic Functioning of the Nervous System

Let us understand how the nervous system operates. Our sense organs (eyes, ears, skin, nose, tongue) contain sensory nerves. These sensory nerves contain sensory receptors which pick up information from the environment and convey it to the brain. So our major sensory receptors are the receptors of vision, receptors of hearing, receptors of balance (located in the ears), receptors of taste, receptors of smell and receptors of touch on the skin. These pick up signals of touch, light, sound, smell and temperature. This action is referred as **signal reception.**

Once signal (information) is detected, the sensory receptors transmit the signal via nerves to the brain and spinal cord. The brain makes sense of the signals and decides what action to be taken. This is called **information processing.** Then the brain sends the signals to muscles in the part of the body that has to carry out the required action (by either relaxing or contracting the muscles). This is called **muscle action triggering.**

To understand this, think what happens when you touch a hot object. The sensory nerves in the skin of your hand transmit the message to the brain and nearly instantaneously, the brain is able to interpret the information received from the sense of touch, takes a decision and sends a signal back via the nerves to the muscles of the hand to contract and withdraw. In conclusion, the nervous system of an individual can be compared to a sophisticated communication system. It takes in information from the environment that surrounds us, processes it in our brain, and then eventually converts it into commands that can be carried out by the rest of our body parts, such as our arms and legs, so that they can react appropriately.

24.2.2 Structure of Neuron

Neurons are cells and are the fundamental units of the brain and the nervous system. Each neuron can be divided into three parts: Cell body, Dendrites and Axon.

- The **cell body** contains the nucleus and is responsible for maintaining the health and function of the nerve cell.
- **Dendrites** are branch-like structures around the cell body that receive signals from other neurons and conduct electrical messages toward the cell body.
- **Axon** is a long and slender protrusion that extends away from the cell body and is responsible for conducting electrical impulses to the dendrites of the next neuron. It is covered with a fatty substance called myelin, which acts as an insulating layer. Schawan cells are the cells that form the myelin sheath engulfing the axon. In between the Schawan cells there are Nodes of Ranvier which are uninsulated parts (gaps) on the axon.

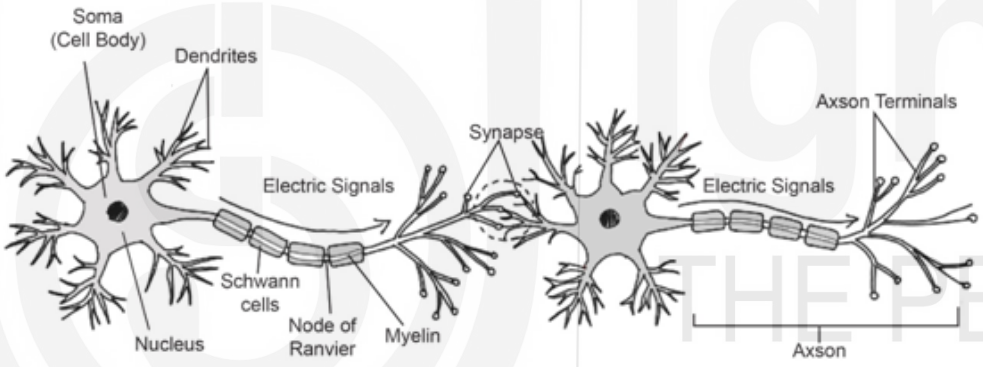

Fig. 24.1: Structure of neuron and synapse connection

Myelin and Its Role

The myelin sheath acts as a protective layer around the axon. The myelin helps the signal to travel faster and move along the axon. You can think of a nerve cell as the electrical wire and myelin as similar to the outer coloured plastic covering (insulation) of the electrical wires. The myelin sheath helps in better conduction of electrical impulses along the nerves.

Role of Immune System in MS

The immune system has a big role to play in MS. Immune System is the human body's defense system. It consists of a system of cells, tissues, and organs that work together to safeguard the body against infection and diseases that are caused due to bacteria, viruses, fungi, and parasites (these are called pathogens).

B cells produce **antibodies** against **antigens. An antigen** could be a substance from the environment such as chemicals, bacteria, viruses, pollen or it may also be formed inside body. The presence of the antigen alerts the body to produce antibody in response. **Antibodies** are proteins that protect

the body from foreign invaders by identifying and neutralizing antigens.

In multiple sclerosis the immune system turns against the body itself and starts to attack the central nervous system, specifically the myelin sheath covering the nerve cells. It causes inflammation and damage to the myelin sheath. This disturbs the normal transmission of nerve signals, giving rise to the symptoms and advancement of MS. Depending upon which nerve cells are affected, the symptoms appear accordingly. As more and more damage take place, the symptoms increase.

Check Your Progress Exercise 1

1) Match Column A with appropriate explanation of the terms in Column B

Column A	**Column B**
1. Myelin Sheath	Body's defense system against infection and disease
2. Dendrites	Condition where the immune system attacks myelin, disrupting signal transmission
3. Immune System	Substance that triggers an immune response
4. Demyelination	Protective layer around axons that aids in fast signal transmission
5. Sensory Receptors	Branch-like structures that receive signals from other neurons
6. Antigen	Detects environmental information like touch, smell, and temperature

24.3 IMPACT OF MULTIPLE SCLEROSIS ON NEURONS

As you have understood in Multiple Sclerosis the immune system mistakenly attacks the myelin sheath. The myelin gets damaged or lost. This may happen partly or the myelin may be lost throughout the axon. This condition is referred to as demyelination. This damage disrupts (interrupts) the normal flow of electrical signals between neurons in several ways and reduces the effectiveness of signal transmission as discussed further.

1) **Slowed Signal Transmission:** In the absence of myelin, the conduction of electrical impulses along the axon is significantly slower. This can lead to a delay or incomplete passage of messages between neurons, resulting in symptoms such as numbness and weakness.
2) **Signal Blockage:** Demyelination can, in extreme circumstances, result in the entire elimination of the ability to transmit signals. This can lead to a severe loss of function in the affected areas, which can ultimately result in some degree of disability.
3) **Axonal Damage:** Demyelination that lasts for an extended period of time might expose the underlying axon, making it susceptible to harm. The damage to the axon is usually permanent and so the symptoms due to MS continue to increase. In other words MS is progressive in nature.

DEMYELINATION PROCESS

Shown below is an illustration of two nerve cells. The normal one on the left has a healthy axon, protected by myelin (insulation covering the nerve), and is able to transmit signals at a very fast speed – similar to electricity traveling along an electrical wire. The nerve cells affected by Multiple Sclerosis on the right shows damage to the myelin, and as a result, signals do not travel well along the nerve.

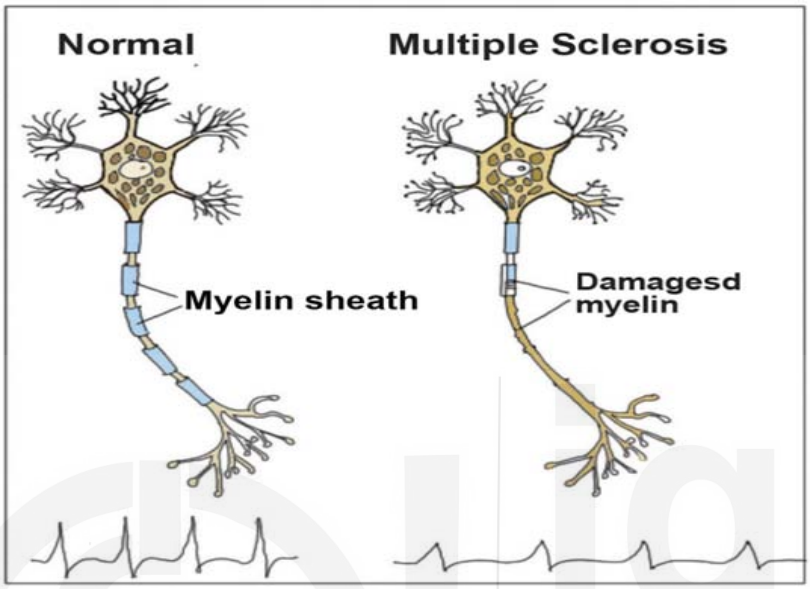

Fig. 24.2: Impact of Demyelination

24.4 SYMPTOMS OF MULTIPLE SCLEROSIS

The symptoms of multiple sclerosis differ from person to person. The intensity of symptoms varies too. Some people experience mild effects or no visible impacts. Others face serious symptoms that lead to disability. The extent of damage to the myelin sheath determines how severe these symptoms are. Light, surface-level damage results in less severe symptoms. More extensive or deep destruction of the sheath leads to more noticeable symptoms.

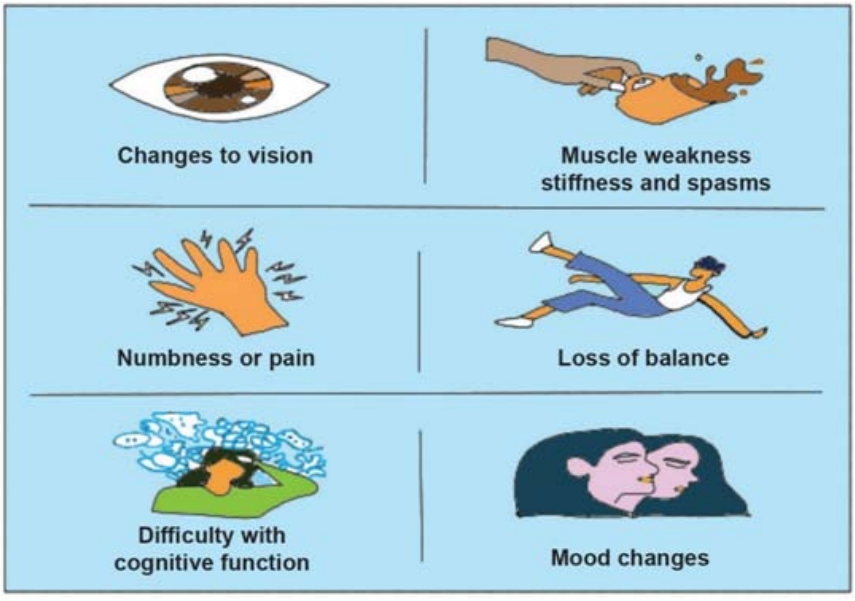

Fig. 24.3: Some Common Symptoms of Multiple Sclerosis

The disease has active and quiet stages. Symptoms occur rapidly during active phases and stop or become dormant at other times. These symptoms are usually experienced on one side of the body or can be bilateral involving both the sides of the body and the trunk region. The symptoms greatly affect the person's quality of life.

Let us understand the symptoms in detail.

24.4.1 Numbness and Weakness

To understand the symptom of numbness and weakness, let us understand about the types of muscles in the body. There are two categories of muscles— involuntary muscles (muscles that cannot be controlled) and voluntary muscles (muscles that can be controlled). For instance, we can flex (contract and expand) the muscles of our hands or legs, as these are voluntary muscles while the muscles of the heart are involuntary and function in the body without our interference.

In MS the voluntary muscle movements are involved because the motor nerves are damaged. Numbness occurs due to the impaired transmission of sensory signals from the affected sensory nerves to the brain. Weakness results from the disruption of signals from the motor nerves that carry messages from the brain to the muscles.When the transmission of signals is slow or absent, the muscles do not get the correct signals to act and will weaken or become partially paralyzed.

Numbness and weakness may occur on one side of the body and involve the arm and leg on that side (unilateral) or it may be both sides (bilateral). The most frequently involved limbs are the legs and, as a result, the person's ability to move and maintain balance is affected.

When the nerves of the trunk region are affected, it might influence the person's balance and coordination, in addition to causing pain. The degree of numbness and weakness can range from mild to severe both in the short-term and the long-term.

24.4.2 Tingling Sensations

Individuals who suffer from multiple sclerosis (MS) frequently experience tingling sensations in their arms or legs (extremities) (called paraesthesia). They experience sensations of pins and needles on the skin, or a crawling sensation on the skin. This is one of the most frequent manifestations of MS.

24.4.3 Electric-shock Sensations: Lhermitte's Sign

If the myelin sheath of the nerves in the neck area is affected, then on moving the neck in a certain way, the person may feel a shock-like electric sensation (jolt) that travels down the spine, maybe even into the arms and legs. This is called Lhermitte's sign.

This sensation generally occurs when the person bends the neck forward, thus stretching and compressing the damaged nerves. It is a very short sensation, lasting only a few seconds, but can be quite startling. Sometimes it can get triggered by coughing or sneezing, though this is less common.

24.4.4 Coordination and Gait Issues

Suppose you are entering a room and start to feel a little off balance? For people with MS, this can be a common reality and something which they have to face daily. Coordination and gait problems may be present which can make movement and walking a challenge. Movement can be affected by MS as this ailment attacks those parts of the brain and spinal cord that are involved in this processed (mobility). Cerebellum (part of brain), which has major role in coordination may be affected causing difficulty in movements or lack of coordination called 'ataxia'. Further, the sensory pathways can get damaged which makes it difficult for a person to recognize the location of one's body parts when in motion. Gross motor movements (i.e. movements involving the large muscles of the shoulder, thighs, hands and legs) will appear stiff rather than fluid.

24.4.5 Visual Problems

Optic Neuritis: The eye is connected to the brain through the optic nerve, which transmits information about what the person sees to the brain. In MS, the optic nerve develops a swelling (condition is called optic neuritis). This is one of the most prevalent types of vision difficulties that patients with multiple sclerosis face. Because of this, for a person with MS, moving the eye can cause discomfort. The person may lose some or all of his/her vision in that eye. The duration of this tends to range from a few hours to many days. Vision often improves automatically over the course of a few weeks to a few months, but effects can sometimes linger for a longer period.

Double Vision (Diplopia): MS can also produce double vision — that is, two views of one object. This occurs as MS can influence the neurons regulating eye movement, so causing misalignment of the eyes.

Blurry (unfocussed) Vision may be the result of optic neuritis or other damage in the visual pathways of the brain due to multiple sclerosis. Due to this, it may be difficult to concentrate on things or read**.**

24.4.6 Speech Problems

Multiple sclerosis (MS) affects the nerves that transmit speech impulses from the brain. Because of this the speech may be slurred – i.e., the words are not pronounced clearly. Further, some persons have problems with swallowing.

24.4.7 Vertigo

Have you ever had this sensation as though you are moving, even though you are not actually moving? It is one of the symptoms that persons with MS may experience. This shows issues with balance. When MS damages the nerves of the brainstem or the pathways in the inner ear which are responsible for maintaining balance, then it is possible to develop vertigo. Let us read the symptoms of vertigo.

- **Dizziness**: Person feels light headed or like one is going to faint.
- **Spinning Sensation**: Person might feel as if the head is spinning, or the world is spinning around you.

- **Balance Issues**: This can make it hard to stand or walk without feeling wobbly.

24.4.8 Sexual, Bowel, and Bladder Dysfunction

Multiple sclerosis (MS) can have an effect on the nerves that regulate the sexual functions, as well as bladder and bowel functions.

Problems with the bladder include the sensation that you need to urinate right now, the desire to go frequently, and the leakage of urine.

Bowel Issues like difficulty passing stools or even leaking stools.

Sexual Dysfunction: Men may experience difficulties with achieving or maintaining erections, as well as issues with ejaculation. Women may experience diminished feeling, dryness, or difficulties in attaining climax.

24.4.9 Fatigue

The fatigue that is associated with multiple sclerosis is not the same as tiredness; rather, it is a profound exhaustion that can make it difficult to carry out even the most basic of tasks. It is possible for a person to wake up in the morning with a lot of energy and be ready to go, but by the end of the day, they may be completely fatigued. There is a feeling of fatigue and weakness in the muscles. Exhaustion can present itself in a number of ways, including difficulties in concentrating or thinking clearly.

24.4.10 Mood Disturbances

Mood abnormalities in multiple sclerosis can range from anxiety and despair to uncontrollable shifts in mood. Mood disturbances can arise as a direct consequence of the disease's effects on the brain as MS can cause damage to parts of the brain that are involved in mood regulation, altering the normal function of those areas. Or mood disturbances can be a response to the difficulties and stress associated with managing a long-term illness.

Types of Mood Disturbances

- **Depression:** Chronic melancholy, diminished engagement in activities, alterations in appetite or sleep patterns, sensations of despair.
- **Anxiety:** Extreme anxiety, irritability, a sense of being on edge, difficulty concentrating, and bodily symptoms such as a racing heart are all signs of anxiety.
- **Mood Swings:** Fluctuations in mood, characterised by abrupt shifts from a state of happiness to sudden feelings of sadness or anger.
- **Pseudobulbar Affect (PBA):** Exaggerated or inappropriate episodes of laughter or weeping that occur involuntarily.

Check Your Progress Exercise 2

1) Enlist any six main symptoms for multiple sclerosis.

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2) What is demyelination and how it impacts message transmission?

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24.5 CAUSES AND RISK FACTORS FOR MULTIPLE SCLEROSIS

The specific origin of MS is still unidentified. But it is clear that it is an autoimmune disease. As you have understood this means that the body's immune system which is supposed to protect the body actually starts harming the body. In MS the body starts attacking the myelin that is a fatty substance that coats the nerve fibers. This damage interferes with the flow of information along the nerves, and this is the cause of the various symptoms found in Multiple Sclerosis.

The below given factors do not always lead to the person getting multiple sclerosis (MS), but they do increase the possibility that a person will develop this disease. If a person is aware of these, then the person and his/her healthcare practitioner will be in a better position to keep an eye out for early warning signs and to take preventative steps with regard to your health.

These could be the risk factors:

Age: MS can show up at any age, but it is most commonly diagnosed between the ages of 20 and 40.

Sex: Women are more likely to get relapsing-remitting MS than men, by about two to three times. This means that the symptoms of the disease will come and go in cycles. We have discussed further in the unit meaning of relapsing-remitting MS.

Family History: If one has a parent or sibling with MS, the chances of getting the disease are higher.

Infections: Some viruses, like the Epstein-Barr virus (which causes mononucleosis), have been linked to MS.

Climate: MS is more common in places with temperate climates (mild and moderate weather, not too hot or too cold).

Vitamin D Levels: Low levels of vitamin D and not getting enough sunlight are linked to a higher risk (chances) of MS.

Genetics: Certain genes, especially one on chromosome 6p23, have been associated with MS.

Obesity: Being overweight, particularly during childhood and teenage years, can increase the risk of MS, especially in girls.

Other Autoimmune Diseases: If the person has other autoimmune conditions like thyroid disease, type 1 diabetes, or inflammatory bowel disease, the risk of MS is slightly higher.

Smoking: If one smokes and show early symptoms of MS, the person is more likely to get a confirmed diagnosis of relapsing-remitting MS.

24.6 PROGRESSION OF THE DISEASE

The disease multiple sclerosis (MS) progresses in different ways in different individuals. Everyone's MS journey is unique because the disease can take different paths. It might get worse, or it could have ups and downs in symptoms and health. The following are three distinct ways in which the disease progresses:

24.6.1 Relapsing-Remitting MS (RRMS)

In some types of MS, there are explicit ups and downs, twists and turns. This is referred as relapsing-remitting Multiple Sclerosis.

- **Relapses**: These are the "downs" or episodes where new symptoms appear or old ones get worse. This can happen over days or weeks.
- **Remissions**: After the relapse, the person goes "up" again, where symptoms improve partially or even completely. These periods can last for months or even years.

When the person has a relapse, the person might notice new symptoms such as tiredness or weak muscles. In remission, the person could feel normal again. Sometimes temporary changes such as hot weather or a high temperature can make the symptoms worse for a short time –these are pseudo relapses, which are different from actual relapses.

24.6.2 Secondary-Progressive MS (SPMS)

Approximately 20% to 40% of individuals diagnosed with relapsing-remitting multiple sclerosis (RRMS) will advance to secondary-progressive MS (SPMS) within a time frame of 10 to 20 years. The following are the features of this condition:

- **Steady Progression**: Instead of the clear ups and downs, there is a gradual worsening of symptoms.
- **Mobility Issues**: This often includes increasing problems with walking and movement.
- **Periods of Remission**: The person might still have some periods where symptoms improve, but these become less frequent over time.

24.6.3 Primary-Progressive Multiple Sclerosis (PPMS)

In this condition, the symptoms only become worse over a period of time **Gradual Onset**: Symptoms start slowly and continuously get worse.

- **No Relapses**: Unlike RRMS, there are no clear episodes of relapse and remission.
- **Continuous Progression**: The symptoms just steadily progress over time.

Why This Matters?

Knowing the different ways in which the disease can progress can help the person to anticipate changes and collaborate with the healthcare team to effectively manage symptoms.

24.7 IMPACT ON DAILY LIFE

Multiple sclerosis (MS) can have a profound impact on various aspects of daily life, affecting both physical and mental well-being. Here are some key areas where MS can affect a person's functioning.

1) **Physical Functioning is impacted.** Muscle stiffness or spasms cause difficulty in moving smoothly, making tasks such as walking, climbing stairs, or even sitting comfortably a challenge. Mobility and independence may be restricted by severe weakness or paralysis, particularly in the legs, necessitating the use of wheelchairs or other assistive devices.

    a) **Bladder and Bowel Dysfunction** can result in problems such as a strong and sudden need to urinate, frequent urination, and the inability to control urination, which can interrupt daily routines and activities, necessitating many visits to the toilet and occasionally causing accidents.

    b) **Sexual Dysfunction**: Challenges in sexual function can affect intimate relationships and overall quality of life.

2) **Cognitive Functioning is affected.** Memory lapses and poor concentration problem make it difficult to remember things and cause difficulty in staying focused. This can make work, managing household tasks, and social interactions more difficult.

    Slower processing of information results in slower thinking. Difficulty in finding words to express one's thoughts can affect communication and productivity.

3) **Emotional and Mental Health problems may surface. Mood Disorders** such as depression, anxiety, and mood swings can affect relationships, work performance, and general well-being.

4) **Social Isolation** resulting due to physical limitations and mood changes can lead to reduced social interactions and feelings of isolation.

5) **Seizures**: Though rare, seizures can be alarming and disrupt daily activities, requiring immediate medical attention and long-term management strategies.

24.8 MANAGEMENT AND TREATMENT

A comprehensive approach that incorporates medicine, changes in lifestyle, and supportive therapy is required for the management of multiple sclerosis (MS). Protection of myelin, reduction of inflammation, and preservation of neuronal function are the primary goals of effective management and therapy of multiple sclerosis. The various approaches for management and treatment of Multiple Sclerosis are as follows:

24.8.1 Medication

There is currently no known cure for multiple sclerosis; however, medicines can alleviate symptoms, decrease the frequency of relapses, and delay the

progression of the disease. Side effects and additional outcomes are possible with medications. The effects of medical therapies are not being covered in this Unit; only a fundamental understanding of a variety of methods has been discussed.

- **Disease-Modifying Therapies (DMTs)**: These drugs are prescribed to slow down the progression of Multiple Sclerosis and reduce the frequency and intensity of relapses. They function by specifically targeting and counteracting components of the body's immune response in order to prevent worsening of an MS patient's disease.
- **Steroids:** These medicines help to reduce inflammation during an MS relapse and can hasten healing.
- **Symptom Management**: Medications have the ability to manage certain symptoms such as muscle stiffness, pain, urinary problems, and depression.

24.8.2 Lifestyle Changes

Lifestyle adjustments are key components in managing multiple sclerosis, along with medication interventions. Regular physical activity is beneficial for one's overall well-being. Engaging in low-impact activities like walking, swimming, or yoga helps preserve muscle strength, flexibility, and overall fitness, which is crucial for managing and improving the quality of life for individuals with MS.

Furthermore, it is imperative to maintain a nutritious diet. Consuming a diverse range of fruits, vegetables, low-fat proteins, and nutritious fats helps to sustain an optimal body weight and overall well-being.

Equally crucial is obtaining sufficient sleep. Ensuring a regular sleep routine and providing conducive sleep conditions can effectively lessen fatigue, a typical symptom of MS, and enhance overall energy levels. These lifestyle changes help with both physical well-being and emotional health, allowing those with multiple sclerosis to better manage the illness.

24.8.3 Mental Health Support

- **Counselling and Therapy:** Regular therapy sessions with a psychologist or counselor can greatly benefit people with MS. These professionals provide a safe space to explore and manage emotions, helping individuals address issues such as depression, anxiety, and mood changes. Multiple sclerosis (MS) is frequently associated with depression and anxiety because of its enduring effects on everyday functioning. Therapists can instruct clients in coping strategies, provide strategies for managing stress, and provide emotional support to assist them in effectively dealing with the difficulties of living with MS.
- **Cognitive-behavioural therapy (CBT)**: Cognitive Behavioural Therapy (CBT) works on managing problems by changing one's way of thinking and behaving towards those problems. Cognitive Behavioural Therapy (CBT) is a highly effective component of psychotherapy treatment for addressing mental health problems that arise from Multiple Sclerosis

(MS). It pertains to transforming detrimental cognitive processes and behaviours into beneficial ones. Cognitive Behavioural Therapy (CBT) equips individuals with highly valuable techniques to confront the emotional and psychological challenges arising from Multiple Sclerosis (MS), such as the uncertainty of symptoms and the burden of living with a long-term illness. Cognitive Behavioural Therapy (CBT) can significantly improve psychological well-being and enhance quality of life by fostering resilience and boosting adaptive thinking.

- **Support Groups**: One powerful thing that persons with MS may do is join support groups which offer guidance and comfort. As members share their experiences, both good and bad, these organisations foster a sense of belonging and community. People with multiple sclerosis (MS) sometimes find solace and understanding in conversing with those who understand. Practical advice on managing symptoms, locating resources, and navigating healthcare systems can be found in support groups as well. People with multiple sclerosis (MS) can find the strength and inspiration to endure the tough elements of the disease by sharing experiences and supporting each other.

24.8.4 Complementary Support

- **Physical Therapy:** Physical therapy is highly beneficial as it involves specific exercises and techniques designed to improve a patient's mobility and stability. Physical therapists instruct clients in activities that are advantageous for their specific condition, leading to enhanced muscle strength, improved coordination, and ultimately reducing the risk of falls.
- **Occupational Therapy:** Occupational therapy is an essential and distinctive aspect of care for individuals with multiple sclerosis. Occupational therapists assist clients and their families in adapting and adjusting different tasks and routines at home and work to reduce the chances of getting injured, among other related responsibilities. This can include advisable changes such as grab bars in the bathroom or kitchen, adaptive utensils for cooking or a proper working station at the office. Thus, through its pragmatic goals, occupational therapy supports patients' long-term independence, as well as increases the efficiency of their daily functioning.
- **Speech Therapy:** Therapy is helpful for patients who develop speech or swallowing problems; the latter often arises with MS as nerves to muscles in the mouth and throat may be damaged. Speech therapists educate their patients on how to improve the manner of speech and voice and correct the disturbances in fluency and in the choice of safer ways of swallowing. These therapies can help augment the communicative skills and minimize the probability of adverse outcomes, for example, of choking or aspiration pneumonia, which improve the subject's quality of life.
- **Mindfulness and Meditation:** Relaxation and emotional well-being can be achieved through mindfulness meditation. One way people with multiple sclerosis (MS) deal with the unpredictability of their condition

is by practicing mindfulness, which is paying attention in the here and now without judgement.

- **Acupuncture and Massage:** In addition to alleviating pain, these therapies help in relaxation. It should be with proper medical guidance and precautions taken as supplementary assistance.

24.8.5 Managing Vision Problems

Diseases related to multiple sclerosis (MS) can lead to severely problematic eyesight. There are many approaches that are used to manage these symptoms. To alleviate inflammation along the optic nerve, corticosteroids are sometimes provided to patients with optic neuritis. Although these medications can hasten recovery, they are often taken for shorter periods because of the adverse effects. When person with visual problem wear glasses with a prism in them, it can correct double vision by changing the amount of light that reaches one's eyes. This helps the brain to make sense of the overlapping pictures and form a clearer, more cohesive picture. To avoid staring at two different images at once, some people use a technique called patching, which involves covering one eye. In the long term, DMTs (Disease Modifying Therapies) can aid with managing visual problems by reducing the frequency and severity of MS relapses. By slowing the disease's course, DMTs can improve visual health and lessen visual disruptions.

24.8.6 Managing Vertigo

Vertigo could compromise balance and interfere with regular tasks. Medication can help with symptoms of vertigo and other conditions connected with this. Many times, physical therapy is advised along with medication. Vestibular rehabilitation program (VRT) helps with coordination and balance, therefore enabling the brain to adjust to variations in the vestibular system. For those with MS, physical therapy helps control vertigo and enhances quality of life.

24.8.7 Regular Medical Care

Assessment of disease progression and subsequent treatment modifications should be carried out through consistent consultations with a neurologist. Additionally, this may necessitate routine MRI scans and other diagnostic procedures to assess the disease's activity and inform treatment decisions.

Check Your Progress Exercise 3

Write any three aspects of daily life that are impacted in a patient of Multiple Sclerosis.

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24.9 SUMMING UP

- MS is a chronic neurological condition often leading to disability. **Multiple sclerosis** happens when the immune system (system that helps the body to fight against infections and other diseases) attacks the myelin sheath of the nerves in the brain and spinal cord. Instead of guarding against viruses and bacteria, the immune cells turn on the body's own myelin sheath.
- **Neurons** are fundamental units of the nervous system. They transmit electrical and chemical signals. MS disrupts these signals by damaging the myelin sheath, leading to various symptoms. Neurons consist of three main parts: the cell body (soma), dendrites, and axon. The axon, covered by myelin, ensures efficient signal transmission along the nerves.
- MS leads to **demyelination**, which slows or blocks electrical signal transmission. Prolonged demyelination can result in permanent axonal damage. Symptoms vary widely and can include numbness, weakness, tingling, electric-shock sensations, coordination and gait issues, visual problems, speech problems, vertigo, sexual and bladder dysfunction, fatigue, and mood disturbances.
- The exact cause of MS is unknown, but it is an autoimmune disease. Risk factors include age, sex, family history, infections, climate, genetics, obesity, other autoimmune diseases, and smoking.
- Relapsing-Remitting MS (RRMS): Characterized by episodes of new or worsening symptoms (relapses) followed by periods of partial or complete recovery (remissions). It is the most common form of MS.
- Secondary-Progressive MS (SPMS): A progression from RRMS where symptoms steadily worsen over time, with fewer or no relapses and remissions. This form occurs in 20-40% of those with RRMS within 10-20 years.
- Primary Progressive Multiple Sclerosis (PPMS): In this symptoms start progressing slowly and with time get worse. There is degradation in condition with time.
- Management and Treatment: While there is no cure for MS, treatments focus on managing symptoms, slowing disease progression, and improving quality of life. These can include medications, physical therapy, and lifestyle changes.

24.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

1) 1-d, 2-e, 3-a, 4-b, 5-f, 6-c

Check Your Progress Exercise 2

1) 1) Numbness or Weakness
   2) Coordination and Gait Issues
   3) Visual Problems

4) Electric-shock Sensations
5) Vertigo
6) Fatigue

2) Demyelination is the process where the myelin sheath, the protective layer around nerve axons, is damaged or destroyed. This sheath helps in the fast and efficient transmission of electrical signals between neurons. When myelin is damaged, signals travel more slowly, can be disrupted, or may not reach their destination at all. This leads to symptoms like numbness, muscle weakness, and coordination issues, as seen in multiple sclerosis, where signal transmission is severely impaired due to demyelination.

Check Your Progress Exercise 3

1) 1) Muscle stiffness or spasms cause difficulty in moving smoothly, making tasks such as walking, ascending stairs, or even sitting comfortably a challenge.
   2) Cognitive functioning is impaired because of memory lapses and concentration problem thus making it difficult to remember things or difficult staying focused can make work, managing household tasks, and social interactions more difficult.
   3) Emotional and social health can be impacted due to depression, anxiety, and mood swings can affect relationships, work performance, and general well-being.

24.11 SUGGESTED READINGS AND REFERENCES

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