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### Multiple Sclerosis

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# Multiple Sclerosis

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## What is Multiple Sclerosis?

Multiple Sclerosis (MS) is an idiopathic, chronic, auto-immune, inflammatory disease of the central nervous system (Balto et al., 2017). First discovered over 150 years ago, MS is now the most common chronic inflammatory disease affecting the central nervous system (CNS). Affected individuals now make up a group of over 2 million people across the globe, with at least 400,00 of those affected being Americans (Reich, Lucchinetti, & Calabresi, 2018). MS is characterized by recurrent events of inflammation in the CNS, resulting in demyelination and damage to axons in the brain, spinal cord, and various nerves throughout the CNS, namely the optic nerve (Bishop & Rumrill, 2015). Due to the chronic nature of the disease, with its unpredictable and intermittent demyelination episodes, MS is a known prevalent cause of disability and loss of function in young to middle-aged adults (Zostawa, Adamczyk, Sowa, & Adamczyk-Sowa, 2017).

## Topic Selection

The topic of MS was selected out of a place of hope and fear. I come from a family with an unfortunately thick history of Multiple Sclerosis, with a paternal grandfather, two great uncles, as well as my own mother who have suffered, or are still suffering from the disease. Though my mother has luckily been in remission for ten years, the rest of my family has not been as fortunate. Their diagnoses and struggles, as well as my fear of even a slight genetic link pushes me to know as much as I can about the disease for my family's sake, my sake, and for that of any future patients who may also have this chronic disease. I have hope that with the continuing research that we will better understand the cause of MS, and with that, know better prevention strategies, and even a cure.

## Pathophysiology of MS

MS affects both the gray and white matter of the CNS. It is a chronic, and progressive auto-immune disease with no known cause at present (Herranz et al., 2016). There are thought to be some genetic and modifiable factors to the development of MS, including obesity, smoking, sedentary lifestyle, high sodium intake, and low vitamin D levels. Females make up approximately three times the number of males affected by MS. There also appears to be a connection between the development of MS and the Epstein-Barr Virus (EBV), with almost all patients with MS having a history of EBV infection (Zostawa et al., 2017).

The process in which demyelination occurs and plaque is formed is complex. The process involves activated T and B immune cells that cause inflammation to occur through the wrongful recognition of autoantigens from the myelin (Fard, 2016). Through auto-immune responses, the myelin sheaths are destroyed by attacks from the activated T cells. Myelin in a neuron covering that aids in the facilitation of axonal conduction of signals between the brain and other parts of the body through the spinal cord. With the destruction of myelin sheaths, the communication between brain and body is affected, causing the messages to not be sent or received effectively or correctly. The damaged myelin is then replaced with areas of scar tissue with subsequent plaque formation, further damaging nerve conduction (Bishop & Rumrill, 2015).

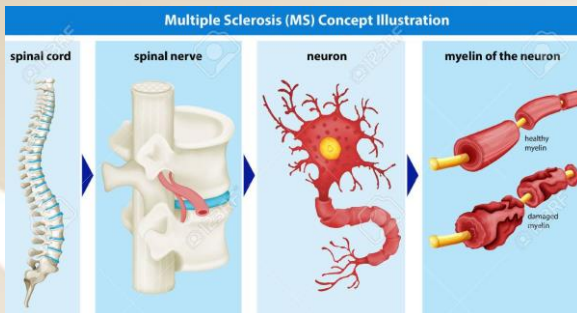


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## Signs and Symptoms

Due to the progressive destruction of myelin and the formation of plaque, the patient will develop various signs and symptoms related to the areas of specific nerve damage. These signs and symptoms include:

- Pain- more than 75% of MS patients report that pain is their most significant symptom. This pain includes central neuropathic pain, musculoskeletal pain, and headaches (Senders, Borgatti, Hanes, & Shinto, 2018).
- Cognitive disfunction, including memory loss affects up to 50% of individuals with MS (Fritz et al., 2016).
- Vision loss- monocular vision loss from optic neuritis, double vision loss from brainstem plaque (Reich et al., 2018).
- Limb ataxia, limb weakness, and sensory loss due to transverse myelitis or lesions on the cerebellum (Reich et al., 2018).
- Progressive neurologic deterioration hallmarked by ambulation impairment and loss of continence (Reich et al., 2018).

## Significance of Pathophysiology

Though somewhat understood how MS occurs through the destruction of myelin and subsequent plaque formation and loss of function, there is still much to be understood about who MS affects, when, and why, especially in regards to how the disease progresses in each individual. It is unknown whether MS has a multitude of causes or one single, specific trigger for development, though most research points to various factors.

- Women, especially women of childbearing age, are the most likely to be diagnosed with MS than their male counterparts, suggesting there may be a hormonal factor to MS development (Bishop & Rumrill, 2015). The frequency of relapse can also increase in the first three month post partum, also indicating that there may be a hormonal factor. Relapses are also more likely to occur during times of stress, both physical and psychological (Sevim, 2016).
- There have been more than 200 gene variants that increase the risk of MS, and a two to four percent risk for development in those with a first degree relative with MS (Reich et al., 2018).
- As a progressive disease, relapse and exacerbations are common throughout the chronic disease course. Whether lesions will continue to grow and form into plaques, or even remyelinate is still not understood (Reich et al., 2018).
- During an MS relapse, demyelination and axonal transection can and do occur, which can lead to permanent disability. Further demyelination leads to increased lesions in number or in size, and subsequent greater amounts of plaque formation, further progressing the neurologic dysfunction (Sevim, 2016).
- Prognosis of MS is largely related to the frequency of relapses. The higher the relapse occurrence in the first five years, and the areas of involvement, such as the spinal cord or brain stem, are indicators of a poorer prognosis than those with few relapses (Sevim, 2016).
- There are four major types of MS that can help to classify and predict the clinical course of MS. The most common is relapsing-remitting (RRMS), which affects roughly 85% of newly diagnosed individuals. RRMS can progress to secondary-progressive MS (SPMS). It occurs in about 50% of RRMS patients, and shows worsening neurologic dysfunction. The remaining 10-15% of initial MS cases are considered primary-progressive (PPMS). In PPMS, neurologic dysfunction symptoms appear at time of diagnosis, but there are no periods of relapse or remission, just worsening function. 5% or less of initial MS diagnoses are progressive-relapsing (RPMS). This is similar to PPMS, but with periods of relapse and remission (Visaria, Thomas, Gu, Singer, & Tan, 2018).

## Diagnostics

A diagnosis of MS can be made one of two ways. The first, though rarely done, is through directly sampling the CNS tissue through a biopsy. The CNS tissue may produce biomarkers that can aid in the diagnosis and prognosis of MS. The most commonly utilized, and most reliable for early diagnosis of MS is through magnetic resonance imaging (MRI). With an MRI, the diagnostic team can see the entirety of the CNS and visualize any demyelination (Reich et al., 2018).

## Nursing Implications

As a chronic, progressive, neurologic disease, the role of the nurse is very important in disease management and education, and support. Though no cure exists, there are 15 approved medications for disease management as of December 2017 (Reich et al., 2018). The role of the nurse in disease management is seen by educating the patient on the importance of taking the disease-modifying therapies (DMTs) as prescribed even when signs or symptoms may not be present, or when the patient does not feel any improvement. The first line of DMTs are self injectable, and have a low rate of compliance, leading to further dysfunction development (Visaria, et al, 2018).

MS patients also need the support of nurses throughout the course of their disease. As a disease primarily being diagnosed in early adulthood, what are supposed to be the most productive years of life, MS patients may feel uncertainty and fear regarding their diagnosis. They may feel shame as their body starts to weaken, feels foreign, or if they lose control of bladder and bowel. Their dignity is hurt through the disease process, but the nurse is able to support the patient through active listening, reassurance, and the ability to answer any questions the patient may have.

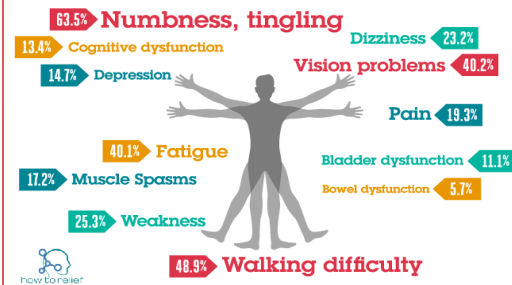


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## Conclusion

To conclude, MS is a chronic, autoimmune, inflammatory disease of the CNS that leads to neurological dysfunction. The pathophysiology involves activated T cells wrongly attacking and destroying the myelin sheaths of neurons which aid in the conduction of signals between brain and body. Damaged myelin is replaced with scar tissue which can form into plaques, further damaging the routes of communication between brain and body. This process leads to the development of neurologic dysfunction of the affected nerves. Primarily affecting females in the early to middle adulthood, the disease's prognosis is related to the number of relapses and how rapid the disease progresses. No one single cause has yet been identified in MS, but risk factors include gender, obesity, tobacco abuse, low vitamin D levels, as well as over 200 genetic variants that can increase the risk of development. There currently is no cure, so treatment is based on disease modification and maintenance, and the prevention of relapse.

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