The bacterial Neurological disorder: A mini-review

Mojgan Sheikhpour[1*], Maryam Naghinejad[1], Maryam Ebrahimi Vargoorani[1,2], Vahid Amiri[1]

[1]Pasteur Institute of Iran, Iran
[2]College of Basic Sciences, Iran

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Background: Neuro infections have been demonstrated as the infectious aspect of neuro disorders, which caused a series of disabilities and even death. Treatments and rehabilitation expenditures of these disorders have played a significant role in the social and economic conditions of the community. Up to now, there hasn't existed this kind of mini-review study, which is concentrated on the etiology of these infections from published articles.

Methods: This manuscript attempts to collect the principal bacterial pathogens of neuro infections. As well as, this investigation mentioned the sections of tissues that the disorders and the symptoms of these illnesses were involved in.

Results: This mini-review was presented that meningitis is known as the inflammation of the meninges, which *Streptococcus pneumonia*, *Haemophilus influenza type b*, and *Neisseria meningitides* are the boldest pathogens. Following that, bacterial encephalitis could involve the brain parenchymas with the prevalence of *Mycobacterium tuberculosis*. The brain abscess with *Enterobacteriaceae* as a current agent occurred in whole brain tissue. Also, in Alzheimer's disease, Gram-negative bacteria have dramatic effects. In the peripheral nervous system, Lyme disease is a zoonosis multi-systemic illness with the effect of *Borrelia burgd*orferi. Botulism and tetanus are diseases that lead to conquer the peripheral nervous system by respectively the *Clostridium botulinum* and *Clostridium tetani* toxins. These two diseases are often controlled by the vaccine, although many areas have inadequate coverage and after the accident does vaccination.

Conclusion: The bacteria can affect the different parts of the nervous system and lead to death, and painful complications such as brain stroke, dementia, seizure, fever, hearing loss, vomit, and many other hardships. Indeed, this manuscript aims to provide researchers with initiating a new insight into the causative agents of these bacterial diseases.

Introduction

Bacteria, mycoplasma, viruses, and protozoa could permeate into the nervous system, and lymphatic vessels via the sinuses and induced the tense infectious disorders. Nervous infections have been explained to be an infectious aspect of neurological ailments, leading to death or a series of inabilities. These disorders have performed a significant character in the economic and social conditions of society due to their high cost of treatment and rehabilitation. Also, the immunization level of people has a relation with their age and the geographic zone. Because of this, low-income countries couldn't cover vaccination well, many children will have affected. Of course, developed countries are also affected by these infections, although much less has been reported. For example, infant mortality rates are reported to be about 40- 58% in developing countries, while only 10% are estimated in developed countries. In the chapters of these statement bacterial infections of the central nervous system (CNS) and the peripheral nervous system (PNS) were illustrated with detail. Indeed, the common pathogenies of these neuro illnesses besides the location of these occurrences are reported in this manuscript as a purpose.

Bacterial infections of the central nervous system

Meningitis, brain abscess, Alzheimer's disease (AD), and also encephalitis were discovered as a series of CNS illnesses, which they could have bacterial causes. Grandgirard et. al stated that the swelling of the brain in reply to a variety of bacterial pathogens is called bacterial meningitis (BM). The presence of bacteria in the cerebrospinal fluid activates immune cells. As well as, *Streptococcus pneumonia* (SP), *Haemophilus influenzae type b* (Hib), and *Neisseria meningitides* (NM) were observed as the commonest causative agents of BM with different rate of mortality. Another article demonstrated that, in infants with less than a month old, *Listeria monocytogenes* (LM), *Group B streptococci*, and *Enterobacteriaceae* were more isolated pathogens. Furthermore, encephalitis is also an autoimmune inflammation of brain tissue. Meningitis and encephalitis are more common in men than women, and fever, headache, neck stiffness, and vomiting are commonly reported symptoms. Brain abscesses have been described as a purulent infection in the brain originating from *Enterobacteriaceae* and *mycobacteria*, which are also common in meningitis and encephalitis too [8, 9]. AD has been characterized as a brain-destroying disease that could be directly linked to bacterial infection. An article in 2016 stated that gram-negative bacteria could be present in the parenchyma of the brain and normal arteries, and could be associated with AD such as *Escherichia coli* and *Helicobacter pylori* [11, 12]. As a result, SP, Hib, and NM are the major contributor in meningitis, which involve the meninges. Also, encephalitis and brain abscess could form with the series agents of meningitis pathogens. Moreover, anomalous accumulation of bacteria such as Helicobacter pylori, etc. could cause AD.

Bacterial infections of the peripheral nervous system

LD, botulism, and tetanus are infectious diseases of the PNS with the bacterial origin. LD has been studied as a bacterial disease in this chapter; this disease is introduced in humans and animals and is transmitted by Ixodes spp. Early symptoms of the infection include an inflamed area and a rash on the skin, fever, headache, and fatigue. The disease is multi-systemic and could affect the joints, heart, and nervous system in late manifestations. LD is widely known as a native disease in Europe and North America, and its cause is known as *Borrelia burgdorferi*; which is a type of spirochete. The bacterium's life cycle has also been seen in small mammals and mites. Botulism has also been described as a neurological disease in humans and warm-blooded animals, which is led to muscle paralysis. The pathogen that causes botulism has different groups and could also enter the body mainly through contaminated food. Toxins from *Clostridium botulinum* as the agent pathogen could lead to permanent paralysis of the PNS. Tetanus is defined as a severe neurological disease in humans and warm-blooded animals too; which is led to seizures. The causative agent of this disease is *Clostridium tetani*, which enters the host body more through the wound. Severe forms of the disease cause respiratory arrest and eventually death.. As a conclusion, In PNS infections, LD is a multi-systemic disease with *Borrelia Burgdorferi* agent, while botulism and tetanus are also PNS diseases that toxins of *Clostridium botulinum* and *Clostridium tetani* are involved in creating the diseases, respectively.

Conclusion

Meningitis, encephalitis, brain abscess, and AD are known as infectious diseases of the CNS. Each of them affects the part of the brain and spinal cord. Of course, sometimes the consequences of these diseases are related to the PNS. In general, pathogens stimulate the immune system to cause an inflammatory or autoimmune reaction. Indeed, BM causes, without considering of the incidence rate, have gram-negative bacteria agents such as Hib, NM. On the other side, the large family of *Enterobacteriaceae* as gram-positive agents has been observed. In this manuscript, it is stated that a series of common bacteria in meningitis could also cause bacterial encephalitis or meningoencephalitis, the type of disease is named according to the target tissue. The *Enterobacteriaceae* family plays a very important role in the development of neurological diseases, including brain abscesses, which are the accumulation of pus in the parenchymal tissue of the brain. In infectious AD, gram-negative bacteria are more effective. Botulism, tetanus, and LD are infections of the PNS that are positive for the pathogens of botulism and tetanus. In general, these neurological diseases could cause some problems such as stroke, dementia, seizures, fever, hearing loss, vomiting, and many other problems. In the end, these neurological diseases affect the poorest countries the most, although they are still seen in developed countries.

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