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## Review Article

# Effect of Environmental Pollutants on Neurological Disorders

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## ABSTRACT

Environmental pollution is one of the leading causes towards the rise of the neurological disorders. All types of pollutants whether biodegradable and non-biodegradable both contributes towards different neurological issues and affects human life badly. The effect of these pollutants even affects the baby in the womb. Other than this environmental pollutant is also responsible for causing other complex disorders such as cancer, diabetes, heart diseases and many more. Different types of environmental pollution such as air, water, land, thermal, sound, radiation etc. have different impact on the neurological health of the individuals. Disastrous conditions as well as the areas with poor hygiene and cleaning facilities are also linked with the presence of or growth of harmful microorganisms and these are the sites that are accumulated with heavy metals such as lead, arsenic, mercury etc. Along with this noise pollution also affects our brain and nervous system and can cause complications even can cause depression among people. Similarly, the polluted water contains a number of pollutants and toxic metals which accelerates the process of aging and in longer term to cause neurodegenerative diseases. The role of nutrition is highly recommended in neurological disorders and complications as eating healthy diet and taking safety precautions in food preparations and proper handling of food in industries can decrease the chances of the occurring of such diseases. Concluding the facts of our study it has been seen that environmental pollutants triggers the oxidative stress and cause neurotoxicity and inflammation of the neuron cells which in longer term causes different neurodegenerative diseases.

## INTRODUCTION:

Environmental pollution is emission of any substance or energy into environment that cause short and long-term damage to ecological stability of earth or may down the standard of living [1]. Human Well-being influence by all kind of environmental impurities. The pollutant comprises the Wide-range of xenobiotics substances and discharge into environment in greater quantity compare to the normal range due to human activities. Environmental pollutants are categorized as biodegradable which are waste water, feces discharge and that can break down in normal situation and non-biodegradable which cannot break down easily such as heavy alloy, cleansing agents etc. Increase in industrial development and migration in cities became the major reason of toxic substances being immensely release into nature [2]. The complex interchange of genetic susceptibility and life incidents develop cognitive disorders for example chronic illness like schizophrenia that effect the way how the person think, or high in emotions or abrupt change in mood which is bipolar. Recent genetic studies show that one forty five genomes linked to schizophrenia. But genes alone are not an only factor for onset of cognitive disorders but different factors like environmental, genetics and neurochemical together contribute in onset or seriousness of these diseases. The main neurological and psychiatric diseases cover a wide span of genetical values, allowing environmental impacts to play a part [3]. Environment play a major role in child well-being, with rising proofs that few chemicals are harmful for the brain of individual. From the year of 1950, about 1 lac and forty thousand new chemicals have been manufactured [4]. Environmental pollution is a worldwide issue with various and considerable public well-being effects. There are so many factors which recognized as environmental factors which



increases the chances of illnesses like schizophrenia and all psychopathic disease, relatively there has been less evident about that pollution can also be a contributing factor in these diseases. In spite this is the reality that interaction between genotype and environment are now accepted as aspect of schizophrenia pathophysiology, and pollution can possibly bring out connection between cities birth and high risk [5]. Disease pathophysiology become complicated due to different components including gene related factors, chemicals, way of living, pollution in environment. The most dangerous chemicals are polycyclic aromatic hydrocarbons, heavy alloys, nitrogen oxides, particle pollution, and polychlorinated biphenyls, pesticides, and dioxins, additives use in food, antibiotics and hormones. There are uncountable pollutants and great number of them have never been estimated with regards to how toxic they are or how risky they could be for health, particularly those new chemicals who emerge every time as a result of connection to previous one. It is nearly not possible to determine the consequences of these new chemicals on human health. Earlier researches have showed a wide range of pollution related diseases. High prevalence of some cancers, elevated rate of diseases, cognitive impairment in children, occurrence of diabetes mellitus type 2, immune and respiratory system disorders and degenerative nerve diseases all of these has been linked with environmental pollution [6].

### **Types of Environmental Pollution**

The categories of environmental pollution are succeeding: Air, Water, Land, Thermal, Radiation and Marine Pollution.

### **Prevalence**

Environmental pollution is a major factor of illnesses and death rate globally, more dangerous to humans and animals which automatically increase the health care budget [6]. Neurological developmental diseases, neurological impairments and neuro-degenerative disease continue to increase around world dramatically. From the year of 1990-2010, Behavioral or mental related disorders increase more than thirty-seven percent, Parkinson's disease (PD) increased to seventy five percent, thirty percent upsurge in developmental disabilities called autism, a neurodevelopmental disorder called attention deficit hyperactivity disorder raised by sixteen percent. Dangerous exogenic chemicals are considered to be the reason of increases in different common or deadly and neurological related diseases [7]. Alzheimer's disease (AD) patients are probably increase by three time in coming decades as the population of world is becoming unending [8]. Different scientific researches show that environmental pollution account around 60% for depression, thirty two percent for bipolar diseases and twenty three percent for schizophrenia. Quality of air was analyst for the findings of bipolar disorders. Pollution of land was the analyst for the personality disorders. Results shows that environment specifically quality of air require more researches to make environmental helper aware about the risk of psychiatric and neurological disorders [3]. Health conditions associated with ageing, like dementia, developed as serious public health issues due to continuously increase in population of world. It is estimated that in 2001, about five million of European facing AD and it was expected to double in 2040. Prevalence of PD among the age over 85 is ten percent and AD prevalence is thirty percent. Factors related to environment play an important role in the pathophysiology of AD and PD [9]. Different cognitive and brain related diseases fall under the category of dementia which is a major term for different diseases. Studies show that dementia divide into AD or non- AD's dementia [10]. PD is a disease related to movement, AD is related to dementia including memory destruction or cognitive failure, when movement is not as much as it should be called hypokinesia, when movement is slow known as bradycardia, when movement is totally absent known as akinesia. Major risk is ageing. Neurodegenerative diseases severity increases due to interaction with metals, pollutants, solvents and toxin substance [11].

### **Etiology/Risk Factors**

Neurodegenerative diseases happen in later life when environmental related factors effects pre or postnatal period. Pesticides, toxic metals including aluminum, arsenic, mercury, and lead, nanoparticles have been associated in developing of AD because it can increase the production of beta amyloid and tau protein attachment to phosphate group causing age related amyloid (protein) plaques and neurofibrillary tangles are biomarkers of AD [12]. Exposure related encephalopathy risk is determined by age, sex and the microenvironment generated by the disaster related factors, in which different cultural, economic and social indicators of health are important [13].

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition described by impairments in three key behavioral domains: social deficits, impaired communication, and repetitive behaviors again. Various risk factors, including genetic, infectious, metabolic, and immunological, environmental, nutritional, and diabetes-related risk factors have been associated with the outcome [14]. The vicious cycle establishes so-called environmental enteropathy, a predominantly subclinical condition (even in the absence of diarrhea) caused by varying degrees of intestinal barrier dysfunction, the low-grade intestinal bacterial migration, low-grade local and systemic inflammation, and disrupted innate

immune responses in the gut. can affect growth and cognition and eventually lead to neurodegeneration as well as liver and metabolic disease later in life [13].

### **Mechanism involved in Neurodegeneration**

Environmental related factors cause biological related effects, main thing is to check the exposure routes. Specifically, in the case where particles affecting different systems and causing different kind of effects. To check the effects inhalable particles on nervous system or whether the compound reach to the brain it is necessary to check the exposure route of particles. After accumulation, a large number of particles goes to respiratory tract after eliminated through biliary drainage, or through absorption in macrophages which stay in the region of alveoli. Moreover, different engineered data shows that small number of particles which accumulate in airway can move to epithelial barriers with olfactory bulb and sensory to secondary pathways [9].

### **Effect of environmental Pollutants on Neurological Disorders**

Disturbed functioning of neurons results in neuro-degenerative disorders that involves PD and the AD. Air pollution and its detrimental effects on human health has now been recognized in many clinical and experimental studies [15]. It has been shown that Industrial fuels have affected millions of people by causing damage to their brain. And ultimately this brain damage will result in many cognitive disorders such as autism, attention deficit hyperactivity disorder (ADHD) and dyslexia. These impairments are increasing day by day [16]. Various toxic components present in air pollutants known as nanosized or precise particles enter in our central nervous system and stimulate innate immunity [17].

### **Noise Pollution**

Noise pollution is an undesirable source of sound, which may result in the unpleasant impacts on human capacity and also generate many kinds of psycho-pathies. One of the unauditory systems that is impacted by pollution mainly noise is the central nervous system and the brain. From revealed to auditory voices can activate the autonomic nervous system and endocrine system. This kind of noise can result in the cognitive disorder, including, Attention deficit, Communication difficulties, Learning defects, as well as Depression [18].

### **Water Pollution**

Polluting of water supplies seldom involves intense proof of poisoning yet rather includes a continuous and moderate impedance of health. This is because of constant low-dose manifestation that prompts bioaccumulation of water soluble amphiphilic natural poisons that can likewise be intense in lipid stores in body. When a threshold is reached, cell dysfunction may result. In this context, exposure to minute amount of water pollutants might represent a danger for expanded occurrence of slow advancing diseases that are by and large connected with aging or disabled development. A considerable lot of these problems include the central nervous system which is particularly defenseless to damage during development and afterward with increase of neurodegenerative changes during aging [19].

### **Industrial Pollution**

The organic toxic molecular compounds came into existence due to five major industries; petroleum refining, organic chemical and synthetic industries, steel mining and coal conversion, textile processing, and pulp and paper milling. However, industries alone are not totally accountable for exposure of the chemicals to the environment, Consumers also play a major role. Use of gasoline, aerosol sprays, pesticides, and fertilizers by humans are one of the leading causes of environmental pollution. Poor waste disposal techniques are causing the contamination of soil and its biota, which ultimately leads to many diseases caused by microorganisms. Heavy metal pollution, especially in industrialized countries is common to be seen and it is contributing to the environmental pollution [2].

High concentrations of organic pollutants are toxic but moderately low concentrations of organic pollutants are also potential to cause long term health complications in the human body and this toxicity can even pass to next generations. EDCs are associated with the causation of neurological disorders. Recently, public concern has been focused on the effects of EDCs on brain's function, along with an increase in neuropsychiatric disorders, including autism, attention deficit and hyperactivity disorder, learning disabilities and assertiveness. Several researchers suggest that exposure to EDCs can cause depression long with neural deterioration [20]. Perfluoroalkyl acids (PFAAs) are synthetic organic pollutants, found in the environment and may impact human health. PFAA impacts on neurobiological, neuroendocrine, and neurobehavioral outcomes. There are many mechanisms through which PFAAs may enter the brain and interrelate with biochemical endpoints to affect neurological function [21].

Exceptional weakness of the brain in the embryo isn't very much out of danger against modern synthetic substances. Industrial chemicals known or suspected to be neurotoxic to adults can also affect the developing cerebrum. The placenta doesn't hinder the entry of numerous ecological toxins from the maternal to the fetal blood circulation have been identified in umbilical cord. Blood and in excess of 200 unfamiliar synthetics furthermore, numerous ecological synthetic

compounds are moved to the newborn child through human breast milk. During fetal life and early infancy, the blood-cerebrum boundary gives just halfway insurance against the section of synthetic substances into the CNS. In addition, the human brain is incredibly delicate to injury brought about by harmful synthetic chemicals. Vitro studies show that neural stem cells are very sensitive to neurotoxic materials including methyl mercury. Some pesticides inhibit cholinesterase feature within the developing brain, role of acetylcholine before synapse formation. Thereby affecting the crucial regulatory Early-lifestyle epigenetic changes are also regarded to have an effect on next gene expression inside the mind [16, 22].

Mercury (Hg) is extensively recognized as a neurotoxic steel; besides it is able to act as a proinflammatory agent and immunostimulant, relying on man or woman publicity and susceptibility. Mercury exposure might also stand up from inner body pathways, consisting of via dental amalgams, preservatives in pills and vaccines, and seafood intake, or even from external pathways like, occupation, environmental pollution, and handling of steel items and cosmetics containing Hg. In susceptible individuals, continual low Hg publicity may additionally cause systemic inflammation, even exacerbating the already present autoimmune reaction in sufferers with autoimmunity. Mercury exposure can cause disorder of the autoimmune responses and worsen immunotoxic effects related to expanded serum autoantibodies titers. The cause of the existing record is to provide an important evaluation of the many troubles associated with Hg exposure and autoimmunity [23].

Microplastics are global environmental contaminants main to inevitable human publicity. Then again, little is known about the effects of microplastics in human fitness. Exposure may additionally occur by using ingestion, inhalation and dermal contact because of the presence of microplastics in merchandise, meals and air. In all organic systems, micro plastic publicity might also cause particle toxicity, with oxidative stress, inflammatory lesions and expanded uptake or translocation. The inability of the immune system to get rid of artificial particles may also cause chronic infection and growth threat of neoplasia. Moreover, microplastics might also release their components, adsorbed contaminants and pathogenic organisms. Nonetheless, understanding on microplastics toxicity continues to be confined and in large part influenced by using publicity concentration, particle houses, adsorbed contaminants, tissues concerned and personal susceptibility, requiring in addition studies [24].

#### **Role of Nutrients in Neurodegenerative Disease**

Neurodegenerative disease isn't curable, but progression of this disease can be slowed down by treating and managing the symptoms in certain ways. The drugs for treating those illnesses only reduce the cognitive impairment and behavioral problems, however they no longer prevent the progression of neurodegeneration. Healthy diet, life-style development and nutraceuticals focused on of oxidative strain, irritation, abnormal mitochondrial dynamics and the mitochondrial interaction with peculiar ailment-associated proteins and evaluation of impact of environmental contaminants such as occupational exposures to pesticides, can be a promising method inside the treatment of neurodegenerative diseases. Those improvements can be basis on company understanding of nutrigenomics and the customized management of individuals at danger [11].

#### **CONCLUSION**

To finish, environmental pollutants, especially air pollution, contributing to reason the various neurological issues and ill impact on human health. These environmental pollution motive harm to the critical anxious gadget, as they can enter in our frame either through ear (noise), or nasal cavity (air pollutants), cause disruption to blood brain barrier, main to harm of neurons, ensuing in neurological disorders.

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