

Toxic Effect of Alcohol in Adolescence: A Review

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Abstract

The main focus of this study is to diagnose the toxic effect of alcohol in adolescent youngsters. Alcohol is the neurotoxic agent and causes destruction in brain system. It can interfere with the activity of regular neurotransmitters. It influences on ion channels and release GABA, which inhibit the release of glutamate and cause disastrous effect on the nervous system. Alcoholism in teenage causes damage in maturation of brain and reduce the development of frontal lobe of brain. Girls show more adverse effect than boys. Negative alcoholic history of adolescent drinker also causes severe influence on them. Psychological study reveals the symptoms of alcoholism such as risky sexual contact, depression, anxiety, shivering, sweating, suicidal risks and heavy vehicle accidents. Drinkers may suffer from traumatic injuries. Other symptoms include headache, hyperventilation, vomiting, change in appetite habit, weight loss, eczema, disturbance in sleep and muscle weakness. It concludes that, adolescent drinker has reduced decision-making capability, have immature development of brain and have reduced memory storage ability. Alcohol should be banded until age of 21 years. More findings require educating people about dangerous activity of alcoholism. Therapeutic strategies should be used to treat diseases related to alcoholism. Future research studies should combine the idea of biological and environmental elements as bases for increased alcohol consumption effect.

Keywords: Alcoholism; Toxicity; Adolescence; Maturation; Destruction; Hippocampus; Cortical activity; Reduction

Introduction

Nervous system consists of brain and spinal cord. It controls all the body functions. Sensory receptor channel sends all the information to central nervous system CNS and impulses through motor neuron [1]. Neurotoxins are the poisonous chemical substances that cause destruction in nerve tissues.

They can interfere with the activity of CNS. They show adverse influence on CNS and can damage the brain cells. Neurotoxins such as alcohol can effect on function in both developing and mature nervous system [2]. All the body systems can be affected but the brain is very sensitive to toxicity. Nervous system can be affected by the activity of toxicity [3]. Some neurotoxins may have immediate affect and last for few hours for example alcohol and fumes. Other may have long lasting effect for years such as effect on breathing rate. A substance may be beneficial as well as neurotoxic at different concentrations. For example, small amount of vitamin A is beneficial for the body but large amount of vitamin A cause diverse effect [2].

Diagnosis of toxicity in body

Limited application is available for the etiologic diagnosis of neurotoxic activity disorder in Laboratory. Laboratory toxicological tests can only diagnose acute poisoning in patients or a patient exposed to neurotoxic chemicals with prolong life span [3]. Detailed history required for diagnosis of neurotoxicity of alcohol. Location of home, quality of alcohol, time course and other possible associated symptoms as well as work environment of the patient is also required. This history can guide a physician to detect neurotoxicity of different drugs and alcohol. Electro physiologic studies as well as electromyography are important to detect the organic basis of symptoms.

Damaging effect of toxicity

Alcohol and other neurotoxic substances affect neuromuscular junction. It can inhibit the function of neurons. They have ability to cause paralysis due to blockage of ion channels it can cause nervous system arrest and sometime can cause death of nerve tissues [4]. Effect of toxicity depend upon which type of neurotoxins are used and what is its concentration in body. Alcohol and other beverages cause disastrous effect in adolescence age [5].

Mechanism of activity

Activity of alcohol depends upon the concentration of its usage. Neurotoxins act on ion channels either block them or

reduce their activity. They act as depressant and interact with the activity of neurotransmitter. Some neurotoxins show presynaptic activity in which neurotransmitters are inhibited to release. Other shows postsynaptic activity in which impulse prevent transfer of signals. Alcohol mostly shows postsynaptic activity and can potentiate the action of gamma amino-butyric acid (GABA). GABA is important inhibitory neurotransmitter, which inhibits the effect of glutamate. As glutamate is the major excitatory neurotransmitter, that is inhibited by GABA. So, it badly influences on the working of brain. It causes miserable effect on cognition and motor services of brain. Alcohol also accelerates the release of endorphins, which stimulates the desire of alcohol consumption [6].

Effect of alcohol during adolescence

Adolescence is the age of development and maturation of brain. It last from the period of childhood to adulthood. In this period, a person can increase its communication skills for specific demands [7]. It is studied that neurotoxins such as alcohol, ethanol and nicotine exposure during adolescence could damage the maturation of brain, which result in deficiency of behavioural and cognitive development [8]. Recent neuroimaging studies have verified that ethanol can directly affect the cognitive functions. It can also increase anxiety and leads to drug addiction (**Figure 1**). Ethanol and alcohol have adverse effect on hormonal function [7].

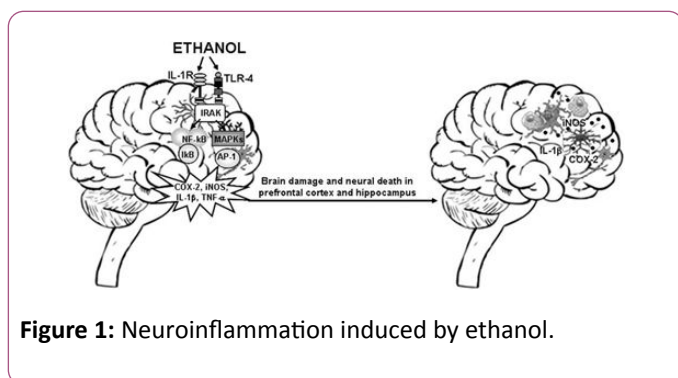


Figure 1: Neuroinflammation induced by ethanol.

Effect of neurotoxins on development of CNS

In adolescence different types of neuromaturation processes are performed. Three main processes are proliferation, pruning and myelination. New connections are produce during proliferation with in the brain. Size of the brain increases [6]. Grey matter maturation is known as pruning. Myelination is the process in which fatty acid tissues are added around the neuron to protect it from environmental influences. This process is very sensitive and reduced by alcohol and other neurotoxins. Neurotoxins decrease the efficiency of myelination and pruning [7]. Thus, effect on hippocampus and reduce decision-making abilities. If alcohol effects on hippocampus then person is ineligible to make good decisions and its memory will reduce [6].

Brain structural changes in adolescent alcohol usage

Grey matter volume: Cross-sectional magnetic resonance imaging (MRI) studies show the morphological and physiological changes in brain during adolescent drinking. It has been studied that youngers who have diagnosed long duration of drinking have smaller hippocampal volume than normal individuals [9]. Frontal lobe controls higher order activities and is associated with emotional activities and cognitive activities etc. In adult, related with heavy alcohol usage, have smaller prefrontal region [10]. Prefrontal lobe is more sensitive to toxic material as this portion continually develop during adolescence, so it shows more morphological changes. Girls show more adverse effect than young boys. These outcomes purpose that gender may show fluctuation in damaging effect of alcohol [11].

Effect on hippocampus: In hippocampus, the volume of grey matter also affects with neurotoxins. Magnetic resonance imaging (MRI) techniques were commonly used to show deficits in maturation [6]. In a study, it is revealed that youngers who do not use neurotoxin in diet have greater hippocampal volume on right site than on left and have superior verbal learning abilities. Ethanol is responsible in formation of fatty acid ethyl ester in brain and cause inflammation [12].

Cortical thickness: Normally in adolescent, cortical thinning is extensive and show strong synaptic connection. Heavy drinking during the age of 16-19 influences on cortical thickness. Female have more thickness in four left frontal brain region than drinker male. Thickness in left frontal cortices leads to poorer visuospatial, inhibition, and consideration presentations for female drinker and worse responsiveness for male bingers. This means that poor development in female during adolescent causes venomous effect on brain maturation [13].

Genetics, vulnerability, and brain function: Alcoholic family history impacts on working of memory system. These children show defects in prefrontal, parietal and cerebellar region and show functional alternation [14]. This type of youngers shows low connectivity between frontal and cerebellar region. They also show poor connectivity between posterior parietal and dorsolateral prefrontal brain region [15].

Spatial working memory performance deficits: Special working memory have showed defects in those individuals who are related to heavy alcoholism for at least one year. Neuroimaging technique have clear this deficit. The gap was more prominent in right hippocampus and prefrontal cortex [6].

Psychological symptoms of adolescent drinker

Psychological study diagnosed the symptoms of young drinker. The study explained that young drinkers are more depressed and have risk of sexual contact. They suffer with heavy vehicle crashes. They also show high suicidal and drowning rate [16]. They are more likely involved in other drug

usage. They often aggressive and violent on people. They are stubborn and more obstinate. They may also suffer with traumatic injuries of brain. Other symptoms include headache, hyperventilation, vomiting, change in appetite habit, weight loss, eczema, disturbance in sleep, muscle weakness, irritability and sweating [6].

Significance of forbidding alcohol

It is revealed that alcoholism is a serious issue in our society now a day. It influences on personal as well as professional life. Health is a wealth. A healthy person enjoys all the charms of life as compared to a drinker. He can think positive and can make good decision. Alcohol reduce the capacity of thinking and also cause memory problem. So those persons who are forbidding alcohol can enjoy healthy and happy life as compared to drinkers [17-21].

Conclusion

It is concluded that alcohol damage our new generation day by day and cause confirmative memory defects in young brain. Alcoholism in adolescence is most vulnerable. Adolescence is very susceptible age for drinking and cause long time memory defects. It is concluded that preventive measures should be taken to control young drinkers. Alcohol should be band until age of 21 years. More funding requires educating people about dangerous activity of alcoholism. Therapeutic strategies should be used to treat diseases related to alcoholism. Future research studies should combine the ideas of biological and environmental elements as basics for increased alcohol consumption effect.

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