

The Effect of Alcohol on Decision-Making: Potential Impact on Early Cancer Detection

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Efeito do Álcool na Tomada de Decisão: Potencial Impacto na Detecção Precoce do Câncer

El Efecto del Alcohol en la Toma de Decisiones: Posible Repercusión en la Detección Precoz del Cáncer

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INTRODUCTION

Although causing a huge impact on public health, alcohol is one of the most popular drugs in the world, and has a function in society and in several cultures¹. The association of alcohol use with the sensation of exhilaration and relaxation just like the relief experienced after the use in situations of stress, anxiety and depression makes it very attractive, leading to repeated use and, consequently, the formation of damaging habits, which, on their turn, create deficits in the reward system, considered a cognitive process. These deficits lead to increased stress of the individuals and compromise executive functioning².

In 2023, data of the Surveillance of Risk Factors and Chronic Diseases Protection by Phone Investigation (Vigitel)³ indicated that 20.8% of the Brazilian population aged 18 years or older had the habit of alcohol abuse, men (27.3%) more than women (15.2%), but the latter with rising trend.

The consequences aggravate as early as the act of drinking initiates impacting activities of the daily life and social relations of the individual, in addition to making cessation more difficult⁴. Prefrontal cortex of the adolescent is still in formation and the reward system is hyperactivated, making adolescents more sensitive to the effects of alcohol and less affected by its negative aspects⁵.

The use of alcoholic beverages is an important risk factor for various chronic diseases as well as for cancer, the second cause of death in Brazil. Described as a carcinogenic substance for human beings, the 15th Report of Carcinogens of the US Department of Health and Human Sciences presents strong evidences of alcohol action on the development of mouth, larynx, esophageal, liver, colorectal and breast cancer⁷.

There is no safe dose for alcohol consumption. Although it is not possible to define what would be a safe consumption, as lower the use, lower is the risk of developing diseases⁸.

DEVELOPMENT

Beyond alcohol carcinogenic action, the prolonged use causes cognitive impairments and structural brain changes⁹. There are several neuropsychological deficits associated with the chronic use of alcohol within cognitive neuroscience where executive dysfunction emerges as the most prevalent and clinically significant^{10,11} compromise. The executive functions primarily located on prefrontal cortex encompass a complex set of high-order cognitive processes. These functions are crucial to modulate objective-driven behavior and effective adaptation to new or challenging contexts that can compromise the adherence to actions of primary or secondary prevention. According to Bechara et al.¹², prefrontal cortex of these users suffers alterations, leading to damages of the decision-making process.

From the biological perspective of decision-making, it is assumed that it is the result of different stages as: (1) the identification of existing possibilities; (2) evaluation of risks, losses and gains as well as expected time range between action and its consequences; (3) the choice of action or behavior; (4) analysis of the observed consequences based on the expected consequences and (5) improvement of prospective representations through learning the effects of actions¹³.

The connectivity of cortical/structural areas located on the prefrontal cortex is essential for the performance of executive functions¹⁴. The wide connection prefrontal cortex has with other cortical areas and subcortical regions contributes to the definition of different neuronal networks able to control behavior. Neuronal networks involve synapses and neurotransmission. Glutamate, the primary excitatory neurotransmitter in the central nervous system is essential to process information involved in cognitive functions and their signaling is affected by alcohol¹⁵.

The chronic use of alcohol promotes persistent structural and functional alterations that cause disorders of the connections between prefrontal cortex and other

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cortical areas further to subcortical regions. Thus, executive functions can be compromised. Pfefferbaum et al.¹⁶ showed that the chronic use of alcohol in human beings leads to the observation of different patterns of activity of the prefrontal cortex, suggesting changes of how the brain processes an executive task even if the individual is not impaired to perform these tasks.

A study conducted by Dao-Castellana et al.¹⁷ indicated glucose metabolism reduction caused by chronic alcohol abuse on medial and dorsolateral prefrontal cortex regions. Earlier, in 1993, Adams et al.¹⁸ published an article where glucose metabolism reduction on medial prefrontal cortex was correlated with poor ability of abstract thinking and capacity to change cognitive strategy in face of environmental demands evaluated by the Wisconsin Card Sorting Test (WCST).

In addition, multitask skills of alcohol dependent individuals are impaired, reflecting working-related memory deficits. This cognitive function is associated with high-risk decision-making pattern, suggesting a connection between the work-related ability and propensity of these individuals to make hazardous choices¹⁹.

It is known that the chronic alcohol use can lead to structural brain alterations and cognitive damages⁹. One study investigated the presence of dysexecutive syndrome (DES) in 17 patients with chronic alcoholism without amnesia who were already alcohol-free and detoxed for at least three weeks (self-report). The results indicate significant impairments in areas of executive functions, although with preserved memory and intelligence, suggesting that DES can affect a considerable portion of patients with chronic alcoholism¹⁰.

Therefore, it is possible to assume that cognitive impairment caused by alcohol interferes in the adherence to drinking cessation treatment²⁰ and whether the alterations of prefrontal cortex of alcohol users can harm the identification of warning signs for some types of cancer and affect the ability of decision-making in seeking medical care. McCaffrey et al.⁹ brought up to what extent patients with head and neck cancers actually understand the dimension of the disease, given that approximately 16% of them have impaired executive functions related to the decision-making process.

A study conducted by Ahmed et al.²¹ evaluated the relation between alcohol use and adherence to selfcare behavior in individuals with diabetes. With data of 65,996 adults, the study showed that alcohol use was inversely associated with adherence to recommended behavior as glucose monitoring, medications, diet and exercise. In addition, individuals who interrupted alcohol use had best adherence to these behaviors.

Any initiative to organize the primary prevention health attention aiming the interruption of alcohol use depends on the user adherence and can be compromised because as Cunha and Novaes²⁰ affirmed, it is necessary to adopt cognitive rehabilitation techniques that minimize the alterations found in chronic alcohol users.

Likewise, it is possible that alcohol related impairments also affect the time range since the individual notices any signal or symptoms and the decision to seek medical care²². In his study of alcohol-use disorders, Schukit²³ shows that women with these disorders take less time than men between the beginning of their issues and finding medical care.

There is abundant scientific literature about alcohol as carcinogenic substance and its effect on the brain, but little about how cognitive alterations caused by chronic alcohol consumption can interfere in cancer prevention, through adherence to actions to stop substance use, preventing the development of alcohol-related malignant tumors, or timely search for medical assistance when an alteration is identified and needs to be investigated.

It is believed that more studies are necessary to understand the direct impact of alcohol on cognition and decision-making of the patients with cancer, their understanding of the disease and search and adherence to the treatment. Other articles^{9,24,25} have also addressed this matter.

CONCLUSION

Early cancer detection is one of the core pillars of disease-related therapeutic success and mortality reduction. Adherence to preventive strategies as screening tests and acknowledgment of initial signs and symptoms strongly depends on the individual's cognitive ability to evaluate risks, prioritize their health and act proactively. Specifically abusive or chronic alcohol consumption in this context appears to be a critical factor of interference on health-related decision-making.

CONTRIBUTIONS

All the authors contributed substantially to the study design, acquisition, analysis and interpretation of the data, writing and critical review. They approved the final version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

DATA AVAILABILITY STATEMENT

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