THE ROLE OF ALCOHOL CONSUMPTION IN THE DEVELOPMENT OF TYPE 2 DIABETES

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Type 2 diabetes mellitus (T2DM) is one of the most significant global health threats, with its prevalence steadily rising worldwide. According to the International Diabetes Federation (IDF), approximately 537 million adults were living with T2DM in 2021, and this figure is projected to reach 643 million by 2030. The primary pathophysiological mechanisms of T2DM—insulin resistance and β-cell dysfunction—are closely influenced by energy balance, dietary behavior, genetic predisposition, and environmental factors.

For decades, nutrition and physical activity have been recognized as the main modifiable determinants of T2DM risk. However, alcohol consumption has recently emerged as another modifiable factor significantly influencing diabetes development [5,6]. Systematic reviews and meta-analyses indicate a *U-shaped* association between alcohol intake and T2DM: moderate consumption may reduce risk, whereas heavy alcohol use significantly increases it .

Several meta-analyses report that moderate alcohol consumption can decrease T2DM risk by approximately 20–30%. For example, Koppes et al. found that moderate drinkers had significantly lower odds of developing diabetes compared to non-drinkers, although this effect varies depending on the type of alcohol (wine, beer, spirits) and the amount consumed.

Conversely, clinical studies consistently show that high levels of alcohol consumption increase T2DM risk. In men, consuming more than 14 servings of spirits per week increased the likelihood of diabetes by 1.82 times. Japanese cohort studies similarly reported an independent association between heavy drinking and higher incidence of newly diagnosed T2DM.

Thus, the relationship between alcohol intake and T2DM is complex and biphasic: moderate consumption may exert a protective effect in some cases, whereas excessive intake increases risk substantially. This paper aims to analyze the epidemiological and biological mechanisms underlying this relationship, dose–response dynamics, and potential preventive strategies.

Alcohol Consumption and Risk of Type 2 Diabetes

A substantial body of evidence (Baliunas et al., *Diabetes Care*, 2009; Knott et al., *BMJ*, 2015; *BMC Endocrine Disorders*, 2023) demonstrates that: Low or moderate alcohol intake may slightly improve insulin sensitivity in certain populations; Heavy drinking, however, increases T2DM risk by 1.5–2 times, regardless of gender or ethnicity.

Biological Mechanisms: How Alcohol Influences T2DM Risk.

Hepatic lipid dysregulation: Alcohol disrupts liver lipid metabolism, increasing triglyceride synthesis and contributing to hepatic steatosis. This loss of metabolic balance accelerates insulin resistance; Toxic effects on pancreatic β-cells: Chronic alcohol exposure impairs β-cell function, reduces insulin secretion, and promotes apoptosis;

Systemic insulin resistance: Excessive alcohol intake promotes inflammation, oxidative stress, and hormonal imbalance, all of which impair insulin signaling pathways.

As a result, glucose homeostasis becomes progressively dysregulated, leading to chronic hyperglycemia and eventual T2DM onset.

The interaction between alcohol consumption and T2DM development is multifaceted. While moderate alcohol intake may provide some metabolic benefit, heavy and chronic consumption is consistently associated with elevated T2DM risk. Given the rising global burden of diabetes, understanding the metabolic implications of alcohol is crucial for developing effective prevention strategies.

References.

1. Baliunas DO, Taylor BJ, Irving H, Roerecke M, Patra J, Mohapatra S, Rehm J. Alcohol as a risk factor for type 2 diabetes: A systematic review and meta-analysis. Diabetes Care. 2009 Nov;32(11):2123-32.
2. Huang, YZ., Luo, F., Ran, X. et al. Association between alcohol consumption and risk of type 2 diabetes in Japan: a population-base longitudinal cohort study. Sci Rep 15, 630 (2025).
3. Kao WH, Puddey IB, Boland LL, Watson RL, Brancati FL. Alcohol consumption and the risk of type 2 diabetes mellitus: atherosclerosis risk in communities study. Am J Epidemiol. 2001 Oct 15;154(8):748-57.
4. Knott C, Bell S, Britton A. Alcohol Consumption and the Risk of Type 2 Diabetes: A Systematic Review and Dose-Response Meta-analysis of More Than 1.9 Million Individuals From 38 Observational Studies. Diabetes Care. 2015 Sep;38(9):1804-12.
5. SY, Z., NN, J., & MM, I. The use of local legumes in the diet therapy of chronic hepatitis. Toshkent tibbiyot akademiyasi axborotnomasi.
6. Ikramova, N. A., Mirsagatova, M. R., Jalolov, N. N., Kasimova, K. T., Sultonov, E. Y., & Sadirova, M. K. (2025, April). THE EFFECT OF THERMAL LOAD ON THE BODY OF OUTDOOR WORKERS: ANALYSIS BASED ON MEDICAL AND HYGIENIC INDICATORS. International Conference on Advance Research in Humanities, Applied Sciences and Education.

7. Salomova, F. I., Mavlonov, A., & Abdukadirova, L. K. (2024). Talabalar o'rtasida gastritning tarqalishi va to'g'ri ovqatlanishning ahamiyati.
8. Kobiljonova, S. R., Jalolov, N. N., Sharipova, S. A., & Mirsagatova, M. R. (2022). SPECTRUM OF CAUSE-SIGNIFICANT ALLERGENS CAUSING POLYNOSIS IN CHILDREN.
9. Qizi, A. M. X., & O'G'Li, J. N. N. (2023). Jismoniy faollik orqali stressni boshqarish. Ta'lim fidoyilari, 13(1), 19-20.
10. Umedova, M. E., & Jalolov, N. N. (2025, April). The role of interactive educational technologies in the modern education system. International Conference on Advance Research in Humanities, Applied Sciences and Education.
11. Umedova, M. E., & Jalolov, N. N. (2025, April). Integration of multimedia tools in the educational process and their importance. In The Conference Hub (pp. 95-98).
12. Jalolov, N. N., Rakhimov, B. B., Imamova, A. O., & Sultonov, E. Y. (2023). PROPER NUTRITION OF ATHLETES. MARTIAL ARTS.
13. Niyazova, O. A., & Mirsagatova, M. R. (2024). THE STUDY OF RISK FACTORS FOR THE DEVELOPMENT OF CARIES IN PUPILS OF THE FIRST GRADES IN SECONDARY SCHOOLS.
14. Саломова, Ф. И., Ахмадалиева, Н. О., Ниязова, О. А., & Хайруллаева, Л. Г. (2022). Изучение и гигиеническая оценка питания студентов Высших учебных заведений (узбекистан, германия).
15. Ниязова, О. А., & Хайитов, Ж. Б. (2018). Гигиеническая оценка питания учащихся медицинских колледжей. Прикладные информационные аспекты медицины, 21(3), 63-66.
16. Niyazova, O. A., Yuldasheva, F. U., & Norqulov, S. J. (2025, March). SLEEP HYGIENE OF STUDENTS. In Innovate Conferences (pp. 13-16).
17. Хайитов, Ж. Б., Бурибоев, Э. М., & Ниязова, О. А. (2023). Исследование и оценка фактического питания детей и подростков спортсменов. Academic research in educational sciences, 4(TMA Conference), 449-454.
18. Ниязова, О. А., & Валиулин, Р. И. (2022). Изучение и гигиеническая оценка фактического питания студентов (Doctoral dissertation, Doctoral dissertation, Молодежный инновационный вестник. Научно-практический журнал).
19. Ниязова, О., & Саломова, Ф. (2022). Studying changes in the health state of school children arising from incorrect fiting.
20. Niyazova, O. A. (2018). Study of the influence of physical education on the functional state of the organism of pupils of comprehensive schools. Medical Scientific Bulletin of Central Chernozemye (Naučno-medicinskij vestnik Central′nogo Černozem′â), (73), 54-58.