




ANABOLIC ANDROGENIC STEROID USE DISORDER: A PUBLIC HEALTH ISSUE

ANABOLİK ANDROJENİK STEROİD KULLANIM BOZUKLUĞU: BİR HALK SAĞLIĞI SORUNU

¹Servet Birgin İRİTAŞ , ²Bedirhan Sezer ÖNER 

¹Ankara Yıldırım Beyazıt University Faculty of Medicine, Department of Forensic Medicine, Ankara, Türkiye

²Amasya University, Faculty of Medicine, Department of Forensic Medicine, Amasya, Türkiye

Review Article

Received: 19/03/2025, Accepted: 27/04/2025

*Corresponding author: sezeroner@hotmail.com

Abstract

Androgenic-anabolic steroids (AAS) are synthetic substances derived from the male hormone testosterone. According to the current scientific literature, these substances are widely used, particularly by athletes and bodybuilders, to enhance muscle mass. Beyond their use in sports, AAS are increasingly misused by a broader population seeking muscle growth without an increase in fat mass, making AAS abuse a significant public health concern. Due to the physiological, psychological, and social effects associated with AAS use and its widespread prevalence, healthcare professionals should identify patients who may be at risk and stay informed about scientific studies on the adverse health effects of these substances.

The physiological, psychological, and social consequences of AAS use pose serious risks to users' overall health and have far-reaching effects on society. Sudden cardiac death, which has been linked to the use of performance-enhancing drugs, is the most common medical cause of death among athletes. This study highlights the public health significance of AAS use disorder, examines the reasons behind its widespread use, and explores its effects on health and available treatment options. Additionally, it underscores the importance of requesting AAS analyses, which are not routinely performed in forensic autopsy procedures, particularly in cases of suspicious deaths among athletes.

Keywords: Anabolic Androgenic Steroid, Adverse Effects, Forensic Toxicology, Sudden Cardiac Death, Public Health.

Öz

Androjenik-anabolik steroidler (AAS), erkeklik hormonu olan testosterondan türetilen sentetik maddelerdir. Mevcut bilimsel literatüre göre, bu maddeler özellikle sporcular ve vücut geliştirme yarışmalarına katılanlar tarafından kas kütlesi artırma amacıyla yaygın olarak kullanılmaktadır. AAS'nin spor alanında kullanımı dışında, yağ kütlesinde artış olmadan kas kütle artışı sağlamak üzere daha geniş kitleler tarafından suistimal ediliyor olması, AAS'yi önemli bir halk sağlığı endişesi halinde getirmiştir. AAS kullanımına bağlı gelişen fizyolojik, psikolojik ve sosyal etkiler ile yaygın kullanımı nedeniyle, sağlık profesyonelleri AAS kullanma potansiyeli bulunan hastaları tanımalı ve bu maddelerin olumsuz sağlık etkileri hakkında yapılan bilimsel çalışmaları takip etmelidir.

AAS kullanımının yol açtığı fizyolojik, psikolojik ve sosyal etkiler, kullanıcıların genel sağlığını tehlikeye atmakta ve toplum genelinde geniş çaplı etkilere neden olmaktadır. Performans artırıcı ilaçların kullanımıyla da ilişkilendirilmiş olan ani kardiyak ölüm, sporcularda en yaygın görülen tıbbi ölüm nedenidir.

Bu araştırma, AAS kullanım bozukluğunun halk sağlığı açısından önemini vurgulamakta, yaygın kullanım nedenlerine, sağlık üzerindeki etkileri ve tedavi yöntemleri ile özellikle sporcularda görülen şüpheli ölüm vakalarında adli otopsi uygulamaları rutininde yapılmayan AAS analizlerinin talep edilmesinin katkılarına dair bir bakış sunmaktadır.

Anahtar Kelimeler: Anabolik Androjenik Steroid, Yan Etkiler, Adli Toksikoloji, Ani Kardiyak Ölüm, Halk Sağlığı.

1. Introduction

Anabolic-androgenic steroids (AAS) are synthetic compounds that mimic the effects of male hormones such as testosterone. Although primarily used to enhance bodybuilding, muscle mass, and athletic performance, AAS carry significant risks to both physical and psychological health. Beyond the well-documented somatic effects, AAS misuse can provoke psychological and behavioral changes and may lead to dependency, potentially causing irreversible health consequences if left untreated. In a study by Torissi et al. of 33 individuals with a history of AAS misuse or phenotypic features suggestive of AAS use, medical records were available for 24 cases; none had a personal or family history of heart disease before age 50. Additionally, toxicological analyses were negative in four cases (Torissi et al., 2020).

The cardiovascular system is one of the most affected systems by the side effects of AAS use. The most well-known cardiovascular events include impaired left ventricular function associated with hypertrophic cardiomyopathy, myocytolysis, and fibrosis, as well as arterial thrombosis, pulmonary embolism, and left ventricular hypertrophy (Hernández-Guerra et al., 2019).

The World Health Organization (WHO) has stated that AAS use is not limited to athletes and is increasingly prevalent due to aesthetic concerns. Particularly among young individuals, the pressure to enhance muscle mass and the pursuit of an ideal body image are key factors driving AAS use (Gibbons et al., 2020).

1.1. Prevalence of Anabolic Androgenic Steroid Use

AAS use is not limited to athletes; it has spread to a broader population, particularly due to the perception of aesthetic perfection promoted through social media. Young individuals, in particular, turn to these substances in pursuit of a muscular and fit appearance. According to the U.S. National Institute on Drug Abuse (NIDA), anabolic steroid misuse is most commonly observed among male weightlifters in their 20s and 30s. The Monitoring the Future study commissioned by NIDA reported that in 2024, an estimated 0.6% of 8th-grade students, 0.7% of 10th-grade students, and 1% of 12th-grade students admitted to misusing steroids within the past year. These findings indicate that steroid use remains a concerning issue even among high school students (NIDA, 2024).

A study conducted in Turkey has also shown an increase in the use of AAS (anabolic-androgenic steroids) among university students. Research indicates that young people are turning to AAS to enhance their body image and physical attractiveness (Demirtaş & Yalçın, 2017). Additionally, it is noted that this usage is increasingly normalized through social media, and societal pressures further reinforce this trend.

1.2. Reasons for AAS Use

The primary motivation behind AAS use, particularly among young people, is to enhance physical appearance and attractiveness, as well as to improve athletic performance. The perception that a muscular and strong physique is ideal drives young individuals to use such substances.

Another group where AAS use is prevalent includes those experiencing dysmorphophobia, a condition defined as an excessive mental preoccupation with one's physical appearance, regardless of whether there is an actual physical flaw. Individuals with body dysmorphic disorder (BDD) constantly perceive their bodies as flawed in terms of shape, leading them to desire a more muscular and larger physique, which often results in the use of AAS (Gruber & Pope, 2019).

1.3. Negative Effects of AAS Use

While users often expect an increase in muscle mass and improved performance, excessive and uncontrolled use can lead to various health problems. Despite the adverse effects of AAS use, dependency—characterized by chronic AAS consumption—can still occur (Kanayama et al., 2019). According to a model of AAS addiction, the first stage, known as the "myoactive" phase, involves the use of high doses of AAS in combination with a specific diet and intense weight training. The second stage is marked by continued high-dose AAS use, which leads to the development of brain reward mechanisms, thereby contributing to misuse and addiction (Brower, 2002). AAS addiction can severely disrupt users' psychological health by directly affecting brain functions through changes in body chemistry. In most AAS users, low levels of gonadotropins and testosterone have been detected even after discontinuing the substance, demonstrating its negative effects on the reproductive system. Long-term complications of AAS use in women include hirsutism, acne, temporal male-pattern hair loss, voice deepening, and clitoromegaly. Additionally, menstrual irregularities in women may predispose them to long-term cardiovascular diseases, stroke, and other cardiovascular problems (Anawalt, 2019; Bahrke & Yesalis, 2004; Christou et al., 2017).

Cardiovascular risks associated with AAS use include myocardial dysfunction, left ventricular hypertrophy, coronary atherosclerosis, hypertension, life-threatening arrhythmias, and sudden death. Additionally, long-term use leads to increased LDL levels and decreased HDL levels, further elevating the risk of cardiac adverse events (Baggish et al., 2017; Christoffersen et al., 2019; Vanberg & Atar, 2010).

AAS use can precipitate psychiatric and behavioral disorders, manifesting as depression, anxiety, anger outbursts (so-called "steroid rage"), and even psychosis. In an observational study by Christoffersen et al. individuals who misused AAS showed elevated

aggression and violent behavior, as well as a ninefold greater risk of criminal activity and subsequent imprisonment (Christoffersen et al., 2019).

1.4. Prevention and Treatment Approaches

Treating AAS use disorder requires a multidisciplinary approach. According to available evidence, the most effective treatment methods include discontinuing AAS use, managing withdrawal symptoms, combining cognitive and behavioral therapies, and providing symptomatic treatments. In particular, psychological support for individuals can help change misconceptions about body image and assist in combating AAS dependency. Organizing educational programs to explain the potential harms of AAS use may encourage individuals to avoid these substances. Given that young people, among whom AAS use is prevalent, also have high social media usage, awareness campaigns conducted through social media platforms could be an effective strategy to prevent AAS use.

2. Conclusion

Anabolic-androgenic steroid (AAS) use disorder represents a significant public health concern, affecting not only athletes but also the general population—particularly young people—due to its rising prevalence among youth. In addition to the physical and psychological health risks associated with AAS use, the potential for dependency highlights the critical need to raise awareness, provide education and guidance, prevent widespread use, and facilitate access to treatment through effective health policies and public health strategies. Furthermore, in forensic medicine practices, routine AAS analyses are not currently performed in cases of suspicious death. However, when a physical phenotype suggestive of AAS use is observed, conducting AAS analyses on body fluids, tissues, and hair samples can offer crucial support to macroscopic findings and significantly contribute to determining the cause of death.

Conflicts of interest: No conflict of interest.

Funding Statement: This research received no grant from any funding agency, commercial or not-for-profit sectors.

References

- Anawalt, B. D. (2019). Diagnosis and management of anabolic androgenic steroid use. *The Journal of Clinical Endocrinology & Metabolism*, 104(7), 2490–2500. <https://doi.org/10.1210/jc.2019-00084>
- Baggish, A. L., Weiner, R. B., Kanayama, G., Hudson, J. I., Lu, M. T., Hoffmann, U., & Pope, H. G. (2017). Cardiovascular toxicity of illicit anabolic-androgenic steroid use. *Circulation*, 135(21), 1991–2002. <https://doi.org/10.1161/CIRCULATIONAHA.116.026945>
- Bahrke, M. S., & Yesalis, C. E. (2004). Abuse of anabolic androgenic steroids and related substances in athletes and nonathletes. *The Physician and Sportsmedicine*, 32(3), 3–12. <https://doi.org/10.3810/psm.2004.03.198>
- Brower, K. J. (2002). Anabolic steroid abuse and dependence. *Current Psychiatry Reports*, 4(5), 377–387. <https://doi.org/10.1007/s11920-996-0006-2>
- Christoffersen, T., Andersen, J. T., Dalhoff, K. P., & Horwitz, H. (2019). Anabolic-androgenic steroids and the risk of imprisonment. *Drug and Alcohol Dependence*, 203, 92–97. <https://doi.org/10.1016/j.drugalcdep.2019.06.010>
- Christou, M. A., Christou, P. A., Markozannes, G., Tsatsoulis, A., Mastorakos, G., & Tigas, S. (2017). Effects of anabolic androgenic steroids on the reproductive system of athletes and recreational users: A systematic review and meta-analysis. *Sports Medicine*, 47(9), 1869–1883. <https://doi.org/10.1007/s40279-017-0709-z>
- Demirtaş, M. İ., & Yalçın, H. (2017). Anabolik steroidlerin kullanım sıklığı ve sağlık üzerindeki etkileri: Üniversite öğrencileri üzerine bir çalışma [The frequency of anabolic steroid use and its effects on health: A study on university students]. *Sağlık Bilimleri Dergisi*, 5(2), 67–74.
- Gibbons, S. E., Dunne, E. M., & McMahon, E. (2020). Public health perspectives on anabolic steroid use. *Journal of Public Health*, 42(1), 18–27. <https://doi.org/10.1093/pubmed/fdz123>
- Gruber, A. J., & Pope, H. G. (2019). The effects of anabolic steroids on mood and behavior. *Psychological Medicine*, 49(12), 1995–2005. <https://doi.org/10.1017/S0033291719001110>
- Hernández-Guerra, A. I., Tapia, J., Menéndez-Quintanal, L. M., & Lucena, J. S. (2019). Sudden cardiac death in anabolic androgenic steroid abuse: A case report and literature review. *Forensic Science Research*, 4(3), 267–273. <https://doi.org/10.1080/20961790.2019.1633761>
- Kanayama, G., Brower, K. J., Wood, R. I., Hudson, J. I., & Pope, H. G. (2009). Anabolic-androgenic steroid dependence: An emerging disorder. *Addiction*, 104(12), 1966–1978. <https://doi.org/10.1111/j.1360-0443.2009.02734.x>
- National Institute on Drug Abuse (NIDA). (2024, July 11). Anabolic steroids and other appearance and performance enhancing drugs (APEDs). Retrieved March 13, 2025, from <https://nida.nih.gov/research-topics/anabolic-steroids>

Torrise, M., Pennisi, G., Russo, I., Amico, F., Esposito, M., Liberto, A., Cocimano, G., Salerno, M., Li Rosi, G., & Di Nunno, N. (2020). Sudden cardiac death in anabolic-androgenic steroid users: A literature review. *Medicina*, 56(11), 587. <https://doi.org/10.3390/medicina56110587>

Vanberg, P., & Atar, D. (2010). Androgenic anabolic steroid abuse and the cardiovascular system. *Handbook of Experimental Pharmacology*, 195, 411-457. https://doi.org/10.1007/978-3-642-02824-1_16