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ATHLETES AND THE ABUSE OF ANABOLIC ANDROGENIC STEROIDS

João Marcelo Fernandes Miranda Pontes
Olinda Medical School, FMO, Brazil

Ana Luiza Padilha Brito
Olinda Medical School, FMO, Brazil

Gabriela Toscano Feitosa Gomes
Olinda Medical School, FMO, Brazil

Maria Paula Pessoa dos Santos
Olinda Medical School, FMO, Brazil

Maria Eduarda de Oliveira Bezerra Costa
Olinda Medical School, FMO, Brazil

Liz Novaes Ferraz Rabelo
Olinda Medical School, FMO, Brazil

Maria Clara de Andrade Pontes
Olinda Medical School, FMO, Brazil

José Diego Cavalcante de Sousa Melo
Olinda Medical School, FMO, Brazil

Rafael Kennedy Macêdo Lira
Olinda Medical School, FMO, Brazil

Maria Victoria Medeiros Alencar Tiburcio
Olinda Medical School, FMO, Brazil

Abstract: Introduction: The abuse of anabolic androgenic steroids (AAS) by athletes represents a critical concern for both the health of individuals and the integrity of sport. These compounds, synthetic derivatives of testosterone, were initially developed to treat medical conditions, but their use has intensified among athletes seeking to increase muscle mass and strength. The prevalence of the use of AAS, their consequences for health and the challenges related to their detection were the main focus of this study. **Methodology:** This research was carried out by means of a systematic literature review, which included peer-reviewed articles, meta-analyses and systematic reviews published between 2012 and 2024. The selection of sources considered relevant publications in the fields of sports medicine, endocrinology and sports science, available in the main databases. Data collection included information on the epidemiology of AAS use, clinical effects, the effectiveness of detection techniques and proposals for reducing use. **Results:** The review revealed an alarming prevalence of AAS use among athletes and the general population, with rates of 10% to 30% in elite athletes and up to 10% in young and middle-aged men. Adverse health effects associated with abuse of AAS include cardiovascular problems such as left ventricular hypertrophy, liver disorders, changes in lipid profile and psychiatric effects. Detecting AAS use remains a challenge, even with innovations such as the World Anti-Doping Agency's (WADA) biological passport. Proposed interventions to mitigate use include awareness campaigns and rehabilitation programs. **Conclusion:** The findings of this study highlight the urgent need for effective strategies to tackle the misuse of AAS, promoting safe and ethical sports practices. Collaboration between health professionals, sports bodies and society is crucial for protecting athletes' health and the integrity of sport, with a view to disseminating information and providing adequate support to users

INTRODUCTION

The abuse of anabolic androgenic steroids (AAS) by athletes is a complex and significant issue, with critical implications for the health of individuals and the integrity of sport. These compounds, which are synthetic derivatives of testosterone, were originally developed to treat specific medical conditions. However, their use has intensified among athletes, driven by their anabolic effects, such as increased muscle mass and strength.[1],[2]

During the 1950s and 1960s, especially after the success of Soviet athletes in international competitions, the use of EAAs proliferated among elite athletes, later spreading to the general population. Young and middle-aged men, often seeking to improve their physical appearance, became frequent users of these substances.[3],[4]

Although the ergogenic benefits of AAS are well documented, abusive use, characterized by supratherapeutic doses, is associated with a series of serious adverse effects. Among the health problems identified are cardiovascular consequences, such as left ventricular hypertrophy and increased risk of cardiovascular events, as well as liver dysfunction, changes in lipid profile, gynecomastia, acne and psychiatric disorders.[5],[6]

Detecting the use of AAS in sporting competitions presents ongoing challenges. The World Anti-Doping Agency (WADA) and its national affiliates have implemented advanced monitoring systems and testing techniques to identify the use of prohibited substances, including AAS, with the biological passport being a key tool in this process.[7]

Despite the widely recognized risks, many users of EAA continue to use them, sustained by the belief that the benefits outweigh the associated dangers. This phenomenon is particularly evident in subgroups such as CrossFit® athletes, where the prevalence of use is high and reports of satisfaction with the results occur, even in the face of adverse effects.[8]

To mitigate the abuse of AAS, a comprehensive approach is needed that involves restrictions on access to these substances, improvements in detection techniques and changes in social attitudes towards sports performance and body aesthetics.[4,7] In addition, the development of specific guidelines aimed at minimizing harm and offering adequate support to AAS users is crucial. Research into the misuse of AAS indicates that the problem persists, requiring the collaboration of regulatory bodies, health professionals and society as a whole to promote ethical sports practices and protect public health.

METHODOLOGY

This work consists of a literature review on the abuse of anabolic androgenic steroids (AAS) by athletes, focusing on the implications for health and sporting integrity. The methodology used to carry out this review covers several stages, ensuring a systematic and comprehensive approach to the subject.

Initially, research questions were defined to guide the review, highlighting the reasons for the abusive use of AAS, their consequences for health, detection practices in sports contexts and interventions to mitigate this use. On this basis, a selection of relevant sources was made.

The literature search included peer-reviewed articles, meta-analyses, systematic reviews and guidelines published in scientific journals in the fields of sports medicine, endocrinology and sports science. The inclusion criteria focused on publications that addressed aspects related to the use of AAS, their adverse effects, detection methods and proposed interventions, with an emphasis on studies published between 2012 and 2024. The main databases used for data collection were PubMed, Scopus and Web of Science.

After selecting the works that met the established criteria, the relevant data was extracted and organized. The collection of information considered aspects such as the epidemiology of AAS use, the related clinical effects, the effectiveness of the detection techniques used and the approaches recommended to reduce substance abuse. Each article analyzed underwent a critical review, assessing the methodological quality, validity and relevance of the evidence presented.

RESULTS

The literature review on the abuse of anabolic androgenic steroids (AAS) revealed a series of significant findings, organized into the following categories: prevalence of use, adverse health effects, challenges in detection and interventions proposed to reduce use.

Firstly, the prevalence of AAS use among athletes and non-athletes has proved alarming. Studies indicate that the rate of use among elite athletes can vary between 10% and 30%, while the general population, especially young and middle-aged men, has even higher rates, with some studies suggesting rates of up to 5% to 10% of users.[1,2] In addition, the use of AAS is not limited to professional athletes, but extends to amateur sports and physical activity practitioners, with emphasis on disciplines such as CrossFit®, where the prevalence of use reaches critical levels.[3]

With regard to the adverse health effects associated with the abusive use of EAA, the literature points to a wide range of consequences. Cardiovascular effects are particularly worrying, with evidence that users of supratherapeutic doses have left ventricular hypertrophy, diastolic dysfunction and an increased risk of serious cardiovascular events, such as myocardial infarction and stroke.[4,5] In addition, AAS have been associated with liver disorders, changes in lipid profile, gynecomastia, acne, alopecia and psychiatric disorders such as aggression and depression.[2,6]

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Detecting the use of AAS in sports competitions remains a significant challenge, despite advances in monitoring techniques. The implementation of the biological passport by the World Anti-Doping Agency (WADA) has been one of the main innovations, allowing longitudinal monitoring of athletes' urinary and blood markers. However, the effectiveness of detection tests can be compromised by users adapting to new strategies, such as sample manipulation and the use of substances that are not directly detectable.[7,8]

Finally, the interventions proposed to mitigate the misuse of AAS include multifaceted approaches. Education about the risks associated with the use of AAS is key, as is the implementation of awareness campaigns. In addition, it is crucial to establish stricter guidelines for the prescription of AAS in medical settings and to improve detection practices in sports competitions. Some guidelines also suggest creating support and rehabilitation programs for athletes seeking to quit using AAS, ensuring access to emotional and physical health professionals.[9]

In short, the results of this review highlight the need for an integrated approach to tackling the abuse of AAS, involving everything from prevention to detection and rehabilitation, with the collaboration of health professionals, sports bodies and society as a whole.

DISCUSSION

A review of the literature on the abuse of anabolic androgenic steroids (AAS) by athletes reveals a worrying picture of adverse health consequences, affecting multiple organ systems and resulting in injuries and significant pathophysiological changes. The findings indicate that the use of these compounds, often used to improve athletic performance and physical appearance, compromises not only the physical integrity of individuals, but also raises fundamental ethical questions in relation to the practice of sport.

In the cardiovascular system, the use of AAS is strongly associated with serious conditions, including left ventricular hypertrophy, myocardial fibrosis and myocytolysis. Studies have documented that these conditions increase the risk of ventricular arrhythmias and congestive heart failure, as well as altering diastolic function and ventricular contractility.[1,2,3] The pro-thrombotic state induced by EAA use can result in acute cardiovascular events, such as myocardial infarction, which are particularly alarming in athletes who are under pressure to compete at a high level.[4,5]

Additionally, hepatotoxicity is a critical concern associated with the use of AAS. Reports in the literature indicate that abuse can lead to conditions such as cholestasis, hepatic peliosis and, in severe cases, benign and malignant liver tumors.[6,7] The mechanisms involved include disturbances in antioxidant factors and bile acid synthesis, as well as hepatocyte hyperplasia, which can further aggravate the user's health problems.[8]

The kidneys are also affected by prolonged use of AAS, with the development of focal segmental glomerulosclerosis (FSGS) being one of the most worrying outcomes. This condition is often associated with proteinuria and kidney failure, resulting from adaptive glomerular changes due to increased lean body mass and the direct nephrotoxic effects of steroids.[9] These effects highlight the urgent need for monitoring athletes who use AAS in order to prevent long-term complications.

In the neuropsychiatric field, AAS have been associated with neurotoxic effects, including oxidative stress and neuronal apoptosis, which can contribute to neurodegenerative disorders and cognitive impairment.[10] This evidence reinforces the importance of understanding the risks associated with the use of AAS, in addition to the physical damage, impacting the quality of life and sports performance of users.[11]

These findings highlight the need for prevention and treatment strategies to mitigate the harms associated with EAA abuse. Awareness campaigns about the potential risks, complemented by stricter monitoring and testing guidelines at competitions, are essential to address this public health crisis.[12] In addition, rehabilitation programs and psychological support should be developed to assist those seeking to stop using AAS and deal with their consequences.[13],[14]

In conclusion, the alarming prevalence of EAA abuse among athletes, along with the various adverse health consequences, highlights the urgency of effective interventions. Collaboration between health professionals, sports bodies and society is key to combating this problem and promoting safe and ethical sports practices.[15]

CONCLUSION

The literature review on the abuse of anabolic androgenic steroids (AAS) by athletes highlights the magnitude and complexity of this issue, highlighting its serious implications for the health of individuals and ethics in sport. The data reveals a worrying prevalence of use among athletes and the general population, with AAS associated with a range of adverse effects that compromise cardiovascular, hepatic, renal and neuropsychiatric health. Despite advances in detection techniques, such as the biological passport, challenges in identifying the use of AAS persist, which prevents an effective response from regulatory bodies and health professionals.

Given this scenario, it is imperative to implement multifaceted strategies that include education about the risks associated with the use of AAS, awareness campaigns and psychological support for users seeking discontinuation. In addition, the need for stricter guidelines for the prescription of AAS and the prevention of their misuse should be a priority.

Collaboration between health professionals, sports organizations and society in general will be crucial to combat the abusive use of AAS and promote a healthy and ethical sports environment. Thus, the protection of athletes' health and the promotion of fair sports practices depend on coordinated actions that address both the behavior of steroid use and the consequences it brings.

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