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Complexities in Assessing Health Risks of Anabolic Steroid Abuse

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Letter to the Editor

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ABSTRACT

The misuse of anabolic androgenic steroids (AAS) has been linked to a broad spectrum of adverse effects, ranging from mild symptoms like acne and gynecomastia to severe health risks, including cardiovascular complications. However, establishing causality for these outcomes is hindered by significant methodological limitations in many studies, which often rely on case reports, uncontrolled cohorts, or retrospective analyses. Additionally, numerous confounding factors complicate the interpretation of results, such as the use of counterfeit or adulterated drugs, excessive dosing, prolonged use, polypharmacy, and the absence of medical oversight.

This letter raises critical considerations for analyzing the health effects of AAS misuse, emphasizing the need to account for pre-existing health conditions, drug quality, dosing regimens, and concurrent substance use. Factors such as the duration of supraphysiological dosing, lifetime exposure, and whether users were monitored by healthcare professionals are crucial in evaluating risks. The chaotic and uncontrolled context of AAS abuse, often marked by high doses and the simultaneous use of legal and illegal substances, presents significant challenges to identifying specific causal relationships.

While the dangers of prolonged, unsupervised AAS misuse are well-documented, attributing precise causality to AAS in adverse health events remains complex. This discussion underscores

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the importance of robust methodologies and critical evaluation in future research to better understand the health risks associated with AAS and to mitigate potential harm.

Keywords: Testosterone; anabolic steroids; androgens; doping agents; drug abuse.

DEAR EDITOR,

The misuse of AAS is well-documented to cause a wide range of adverse effects, varying from mild to severe, as demonstrated in the work of Parkinson AB and Evans NA. Their survey of 500 users revealed that only 0.8% reported no side effects (Parkinson & Evans, 2006). Commonly reported issues include acne and increased skin oiliness, gynecomastia, mood and behavioral disturbances, sexual dysfunction, testicular atrophy, fluid retention, insomnia, localized pain at injection sites, skin striae, increased body hair, hair loss, voice deepening, clitoral hypertrophy, hypertension, and disruptions in cholesterol profiles and liver enzyme levels (Parkinson & Evans, 2006; Goldman & Basaria, 2018).

However, Goldman A. and Basaria S. (Goldman & Basaria, 2018) have argued that the more serious outcomes, particularly cardiovascular events, are primarily derived from studies with significant methodological limitations. These include reliance on case reports, case series, retrospective case-control analyses, cross-sectional research, and uncontrolled cohort studies. Fanaroff AC et al., (2020) further emphasize that without robust randomization, such evidence is insufficient to accurately evaluate the true risks and benefits of AAS use, undermining any proof-of-concept validity (Fanaroff et al., 2020).

In addition, many confounding factors complicate the interpretation of findings in this field and should be critically addressed in academic discussions. These include the use of counterfeit or adulterated drugs sourced from underground markets (rates of adulteration can exceed 50% in some seized and chemically analyzed samples) (Câmara, 2023), as well as the administration of excessive doses (up to 30 times the therapeutic range), long-term use spanning years, and polypharmacy involving either AAS or ancillary drugs (Parkinson & Evans, 2006). Such combinations often heighten risks when substances like, diuretics, beta-agonists, insulin, or stimulants are involved (Parkinson & Evans, 2006; Goldman & Basaria, 2018). Further complexities arise from variations in drug combinations, underlying mood or behavioral disorders, incomplete evaluations of clinical or laboratory histories, disregard for familial or personal health risks, and the absence of medical supervision to guide safer practices or discontinuation, which could reduce preventable health complications (Parkinson & Evans, 2006; Goldman & Basaria, 2018; Evans, 2004; Hoffman & Ratamess, 2006; Pope & Katz, 1994; Sagoe et al., 2014).

Maybe some key questions can assist professionals and researchers in obtaining a clearer understanding of adverse health outcomes, particularly when analyzing non-randomized or uncontrolled studies. For example, in case reports, case series, case-control studies, surveys, cross-sectional analyses, or cohort studies, it is crucial to consider the patient's personal and family medical history prior to anabolic androgenic steroid (AAS) abuse (Sagoe et al., 2014). Additionally, identifying the source of the substances used becomes paramount, as the quality and origin of these drugs (underdosed, overdosed, with biological contaminants, presence of heavy metals, substitution or addition of other substances) can significantly influence outcomes (Câmara, 2023).

Another essential factor is determining whether the doses were moderate, slightly supraphysiological, or excessively abusive. It is also necessary to evaluate whether AAS or testosterone were used in isolation or combined with other legal substances, such as alcohol and tobacco, or illegal drugs, including cocaine, marijuana, methamphetamines, LSD, and ecstasy (Sagoe et al., 2014; Sagoe et al., 2015). The duration of use, particularly the total lifetime exposure and the length of continuous supraphysiological dosing, further compounds the issue. Lastly, assessing whether health monitoring or professional supervision was in place to mitigate potential harms is vital for a more accurate evaluation of risks (Hoffman & Ratamess, 2006; Sagoe et al., 2014).

Based on logical reasoning, it is evident that prolonged, high-dose, and uninterrupted AAS abuse, often accompanied by polypharmacy involving legal and illegal substances, poses significant health risks (Parkinson & Evans,

2006; Goldman & Basaria, 2018). Such behaviors, in the absence of medical supervision or monitoring, have been associated with severe outcomes, including fatalities (Parkinson & Evans, 2006; Goldman & Basaria, 2018). However, while the dangers of this scenario are clear, pinpointing the specific contribution of AAS to these adverse events remains challenging. The chaotic and uncontrolled nature of such circumstances, marked by numerous confounding factors, complicates efforts to establish definitive and adequate causal relationships (Parkinson & Evans, 2006; Goldman & Basaria, 2018; Fanaroff et al., 2020; Câmara, 2023; Sagoe et al., 2014; Sagoe et al., 2015).

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The author declare that generative AI was used only at the final stage of manuscript preparation (after writing) and exclusively for linguistic refinement in English Language (Name: ChatGPT; Version: GPT-4; Model: OpenAI's Large Language Model; Source: OpenAI - https://openai.com). No original text was generated or substantively edited by the AI.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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