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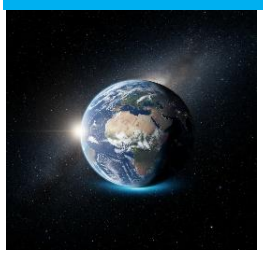

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When should you suspect if your patient is an Anabolic-Androgenic Steroid User? Evidence-Based literature review of usage patterns changes and clinical implications for medical practice (2005-2025)

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ABSTRACT

Background: Anabolic-androgenic steroid (AAS) use has evolved into a significant public health concern affecting diverse populations beyond elite athletics.

Objective: To examine evidence-based changes in AAS usage patterns including demographics, motivations, and health consequences from 2005-2025 using systematic reviews and peer-reviewed research.

Methods: Literature review of peer-reviewed studies and systematic reviews from PubMed and National Health Institute Library focusing on AAS epidemiology, demographic changes, and health consequences published between 2005-2025.
Results: Global lifetime prevalence of AAS use is estimated at 6-29%. Female participation is estimated to be constantly growing. Evidence indicates expansion beyond traditional athletic populations with significant cardiovascular, psychiatric, and reproductive health consequences.
Conclusions: AAS use represents a widespread public health concern requiring enhanced clinical awareness and evidence-based management approaches among medical practitioners.
Keywords: anabolic steroids, adverse effects, clinical practice

1. Introduction

Anabolic-androgenic steroids (AAS) are synthetic derivatives of testosterone designed to substitute their properties. Androgens stimulate and precipitate the development of male sex characteristics, including the most common purpose of increased growth in muscle mass, however their use is also extended to medical services. Al Shareef et al. lists medical prescriptions for anabolic steroids and androgens (oral or injectable) to treat conditions like: hormonal imbalance for hypogonadism, impotence in men, delayed puberty in adolescent boys, breast cancer treatment, endometriosis, osteoporosis, and muscle loss in patients with cancer or HIV.

For years, they have been mostly correlated to professional bodybuilders rather than regular gym visitors or others. However, due to changes in view on physical attraction, growing certain social standards of looks and peer pressure, AAS have been increasingly abused outside professional society and without specialists supervision, posing significant health risks due to their severe effects [2]. While athletes misuse or abuse AAS mostly to enhance performance and prolong endurance, non-athletes misuse anabolic steroids to increase their body weight and lean muscle mass without increasing the body's fat mass to adjust to certain beauty standards [1].

Due to their abuse potential, the Anabolic Steroid Control Act of 2004 amended the Controlled Substances Act, redefining anabolic steroids to "any drug or hormonal substance, chemically and pharmacologically related to testosterone (other than estrogens, progestins, corticosteroids, and dehydroepiandrosterone), including tetrahydrogestrinone (THG), androstenedione, and specified related chemicals".

AAS use has become a significant public health concern due to the transition from strictly sports and treatment use to a much wider spectrum of the population with low education about

consequences of uncontrolled and unsupervised usage [1]. Understanding contemporary patterns and associated health risks is essential for healthcare providers to effectively recognize and manage AAS-related complications.

2. Global Epidemiology and Prevalence

2.1 Overall Prevalence Rates

A comprehensive meta-analysis and meta-regression analysis examining global epidemiology found that nonmedical AAS use is a serious widespread public health problem [3]. The lifetime prevalence worldwide changed rapidly over a decade. In the literature from 2014 it was estimated to be 1% to 5%, while 2025 data shows rates ranging 6.4-29.3% globally among gym participants, depending on the population and setting [8].

2.2 Geographic and Population Variations

The estimated prevalence rates among AAS users vary geographically. Data show that AAS abuse is more prevalent in Brazil, Western countries, and the Middle East, and is less prevalent in Asia and Africa. 2.9-4 million of young American males are estimated to abuse these substances.

In the study conducted in Saudi Arabia, the prevalence rate suggests that every 5th to even every 3rd male gym member is an AAS user [7].

Among athletes, the highest use is widespread in Saudi Arabia (29.3 %) followed by Norway (24.2 %). This was followed by athletes from Sweden, Iran and Lebanon that showed prevalence rates of 19.6 %, 16.6 % and 10.7 % respectively [8].

Stigma about AAS users between athletes and non-athletes may impede clear results in completing such information. Presumably it could be expected for countries with higher popularity of bodybuilding and increased rates of social media consumers (due to certain body standards and body dysmorphophobia) among population to have higher numbers of AAS users, however there is lack of evidence supporting that thesis with most certainty.

3. Gender-Specific Usage Patterns

3.1 Female AAS Use

Evidence suggests there has been an increase in anabolic-androgenic steroid (AAS) use among women, driven by the evolving landscape of women's participation in sport. Historically, AAS research has focused on men, therefore there is lack of historical data on patterns and usage among females, but recent evidence necessitates a shift in focus because of differential physiological responses to these substances [4].

Piatkowski et al. [4] summarized 18 studies with identification of three subgroups of AAS-using women: general population/non-athlete, athletes/recreational gym users and bodybuilders. The pooled prevalence from all studies was 4% (95% CI = 2%–9%), with substantial heterogeneity between studies partly explained by the three subgroups. Notably, when pooled by subgroup, prevalence rates were higher among athletes and recreational gym users and bodybuilder subgroups compared to the other subgroup, with bodybuilders showing the highest prevalence at 16.8%. Earlier studies primarily concentrated on women bodybuilders, however there has been a shift toward a more nuanced portrayal of women who use AAS with the perspective of different goals, desires and motivation.

A post-COVID-19 pandemic study found that among 3603 surveyed resistance training practitioners in various geographical locations, 53.05% of men and 41.99% of women reported using anabolic and androgenic steroids. Differences between gender were noted in the type of used substance (29.47% men used Testosterone, 31.20% of women used Winstrol) and way of administration (50.30% of men used steroids via injection, while 49.05% of women used them orally) [5].

4. Age Demographics and Educational Status changes

Data gathered by Hoseini at el. [5] provides the insight about average age and educational status about the surveyed group.

It was concluded that based on his study, a significant proportion of men and women resistance training practitioners who used AS were particularly young adults with limited training experience: 46% out of 3603 people were aged between 18 and 29 years old (46.15% men and 45.08% women), 34.08% were aged between 30 and 44 years old (34.17% men and 33.98% women), 14.13% were aged between 45 and 59 years old (14.33% men and 13.90% women), and 6.16% were aged over 60 years old (5.34% men and 7.04% women).

Results of educational status were: 0.72% of the participants were illiterate (0.81% men and 0.63% women), 19.18% had a bachelor's degree (18.01% men and 20.42% women). The majority of the participants, 80.10%, were university-educated (18.18% men and 78.95% women). Regarding employment status, 44.93% of the participants were employed (68.46% men and 19.97% women), 30.01% were enrolled as students (27.01% men and 33.18% women), and 25.06% were unemployed (4.53% men and 46.85% women).

Albaker et al. [7] evaluated the prevalence of gym members in Eastern Province, Saudi Arabia, using AAS. Out of 541 participants who were included in the study, 67% were in the age range between 21-25 years old. Similar profiles have been reported in other local studies in Saudi

Arabia, with the majority being the age group of 25 to 29 years. 72.3% of the studied gym members were currently employed and received higher education, i.e., bachelor's degree or higher (67.1%).

Based on another research, performed by Cohen [6] in 2007 the typical AAS user was a Caucasian, highly-educated, gainfully employed professional approximately 30 years of age, who was earning an above-average income.

Comparison of the studies cited above suggest that contemporary average AAS users in male group might be 5-10 years younger than they were 18 years ago with comparable or lower educational status. There is a lack of comparable data providing information on average changes in age and educational status among female AAS users along the years.

5. Motivations and Purpose of Use

5.1 Performance Enhancement, Aesthetic Goal or more?

AAS use is primarily driven by the desire to enhance physical appearance, muscle mass, and athletic performance: while bodybuilders aimed to increase muscle mass and strength as the main reason, non-athletes were motivated by societal pressures to conform to idealized body images [8].

Other relevant but less highly-rated factors included increased confidence, decreased fat, improved mood and attraction of sexual partners. Injury prevention, recreational weightlifting, increased endurance, amateur bodybuilding, amateur/recreational sports and power lifting were rarely endorsed motives. The majority of all users in this sample (98.8%) denied injecting AAS in order to get "high" [6].

As the motivations among AAS users differ based on their desired achievement, whether it is performance improvement in athletes or physical appearance in non-athletes, it's crucial for medical specialists to identify the problem correctly for suitable solutions.

5.2 Body Image and Dysmorphic Concerns

Due to increased participation of non-athletes among AAS users, motivated primarily by aesthetic purposes, the subject of body dysmorphophobia should be emphasized and directly associated with uncontrolled AAS usage.

The studies about dysmorphic disorders correlated with anabolic steroids began to appear just in 2007 with limited amounts. Research conducted that year by McReary et al. [9] discusses the complexity of a problem, including not only the specific image the suffering patient has about himself, but also other conditions driving the vicious circle, especially the eating disorders and polypharmacy.

Dieting to increase muscularity or weight has been observed in various studies to range from approximately 21% to 47% of adult and adolescent males (Cafri et al., 2005). The desire to increase muscle mass and lose body fat simultaneously tend to result in bulimia, restrictive eating habits and deepening of body dysmorphia due to constant anabolic-catabolic diet cycles, often resulting in gaining undesired body fat. The majority of those problems were observed among professional athletes, rather than recreational gym members. Researchers also identified that the problem occurs more often in the group of homosexual males.

Contemporary research data extracts a more detailed disease entity - bigorexia nervosa (BN), being considered either a feeding/eating disorder (FED) or a subtype of body dysmorphic disorder (BDD). Bigorexia nervosa, or simultaneously muscle dysmorphia/reverse anorexia, was initially reported in male bodybuilders constantly ruminating about their body mass and being larger or more muscular. Symptoms are i.e. feeling of having inadequate, almost never ideal body shape, compulsions refer to overexercising in the gym, overbuying sports supplements, dysfunctional eating behavior, or substance use disorders. The results showed that bodybuilders, weightlifters, and other populations involved in athletic activities are the most vulnerable to the onset of this disorder.

Patients with BN should also be screened for physical and psychiatric comorbidities and complications, such as anabolic steroid use disorder, physical exercise addiction, and depressive or anxiety disorders. The main differential diagnoses for BN are schizophrenia spectrum disorders, depressive disorders, anxiety disorders, bodily distress disorder, and obsessive–compulsive disorders [10].

The importance of body image increased rapidly along with the growth of social media over the years. Although the problem was already known and described in studies from 2008, when comparison to celebrities in magazines and music videos were more common, daily exposure to (often unachievable) wide amounts of beauty standards negatively impacts self-esteem and deepens the feeling of outstandingness in society.

An important phenomenon of social media usage is considering the certain, highly muscular, toned and lean body image as the expected norm to adjust to, even though the posted image might be highly edited or achieved by methods of high risk in health consequences. In example, perception of Arnold Schwarzenegger's peak physique as Mr. Olympia champion as "too small" in the terms of muscle mass, or referring to the current Mr. Olympia champion Chris Bumstead's unposed physique as "the dad body", meaning the appearance of muscular, yet not leaned body with softer features, being in the mid-section between training and non-training person. The rising unrealistic expectations toward one's body image coming from social media

might significantly influence the popularity of AAS usage, considering them the new "normality".

6. Health Consequences and Clinical Implications

According to the literature, only ⅓ of users were aware of possible side effects and consequences of usage.

6.1 Cardiovascular Effects

6.1.1 Systematic Evidence of Cardiovascular Toxicity

The cardiovascular system is one of the most affected by the side effects of AAS use, as it enhances vascular resistance and increases blood pressure, pro-inflammatory biomarker profile, sympathetic tone, alters serum lipoproteins, and produces direct myocardial toxicity [13].

6.1.2 Cardiovascular Disease Epidemiology

AAS use is associated with a substantially increased risk of cardiovascular disease in a large cohort with a long follow-up period [14, 15].

During an average of 11 years of follow-up performed by Windfeld-Mathiasen et al. [14], AAS users (n=1189) demonstrated a significantly higher incidence of several cardiovascular events compared with controls (n=59 450). Correspondingly, AASs were associated with an increased risk of acute myocardial infarction, percutaneous coronary intervention or coronary artery bypass graft, venous thromboembolism, arrhythmias, cardiomyopathy, and heart failure. Ischemic stroke and cardiac arrest cases among AAS users were not reportable due to the low amount of these types of incidents.

The epidemiology of cardiovascular disease in AAS users remains relatively unexplored and requires attention to the possible symptoms and outcomes in the medical practice, especially among the group of young adult males, suspicioned about AAS use.

6.1.3 Specific Cardiovascular Manifestations

Transthoracic echocardiography in 140 experienced male weightlifters, AAS users, demonstrated relatively reduced LV systolic function and diastolic dysfunction compared with nonusers [11]. These findings correlate with the results of study performed by Hassan et al. [12], whose results of echocardiography showed that bodybuilders who use steroids have smaller left ventricular dimension with thicker walls, impaired diastolic function, as well as higher peak systolic strain rate in steroid-using bodybuilders compared to the not using anabolic steroids constituted group, and five nonathletic males constituted negative control group.

Additionally, AAS users demonstrated higher coronary artery plaque volume than nonusers. Lifetime AAS dose was strongly associated with coronary atherosclerotic burden in rank of plaque volume for each 10-year increase in cumulative duration of AAS use [11].

The evidence needs confirmation and a relatively more reliable negative control group with an increased number of participants to compare the results to.

6.1.4 Cardiomyopathy Risk

AAS use has been shown to change physiological cardiac remodeling of athletes to pathophysiological cardiac hypertrophy, which is directly related to an increased risk of life-threatening arrhythmias, fibrosis, and necrosis, especially when combined with exercise.

The most reported macroscopic heart changes reported were cardiomegaly and hypertrophy, and the main histological changes were necrosis of myocardial tissue and foci of fibrosis [13, 15, 16].

The literature agrees on AAS users being at high risk of developing the cardiomyopathy, however as spoken above, the epidemiology remains unexplored and due to changes in the AAS user profile it might require more attention in the future as arising in numbers of incidents of public health care issue.

6.2 Psychiatric and Mental Health Effects

6.2.1 Depression, Suicide Risk and Personality Disorder

The data about the link between AAS usage and negative psychiatric outcomes, like depression, from the years 2005-2011 is limited. Furthermore, we can find the literature about anti-depressant effects in testosterone replacement therapy (TT), especially among those with hypogonadism or HIV/AIDS and elderly subpopulations [17].

Contemporary, the new evidence supports that AAS are independently associated with either the new-onset of severe mental health disorders or promotes the outcome of ones in patients with previous psychiatric history.

AAS use appears to be a risk factor for major depressive disorder (MDD), body dysmorphic disorder (BDD - raised above), and/or suicide attempt/intentional self-harm. Future studies are necessary to elucidate whether a dose-response association exists, withdrawal from AAS plays a role, and if patient selection or preventative measures can mitigate the risk. [18].

In the survey conducted on 10,259 participants the results showed that users declared more anger issues, anxiety, depression, and - what stands in opposition to one of the purposes of starting AAS usage - their self-esteem was lower than among non-anabolic androgen steroid

users. A larger proportion, 30%, had attempted suicide compared to 10% of non-users. Proportionally, anabolic androgen steroid users were more likely to take medicine for mental health problems and misuse substances than non-users [19].

More specific findings indicate that individuals with AAS use were reported with more aggressive behaviors, suicidal thoughts/suicidal attempts, and criminality, when personality disorders were already diagnosed than those without a personality disorder. It seems that it is the combination of AAS, narcotics, and family/medical backgrounds, including a diagnosis of PD that may trigger the aggressive feelings/behaviors and suicidal ideation, rather than AAS usage by itself [20].

The researchers suggest that men with suicide attempt, BDD, or MDD should be investigated for a history of AAS use by medical professionals. The field is in need of detailed studies on how previous history of any psychiatric medical disorders and poly-pharmacy combined with AAS impacts the outcome of severe conditions, and whether the AAS usage stimulates the new-onset of psychiatric disorders or reveals the problems diagnosed/undiagnosed before.

6.2.2 Addiction to Anabolic Steroids

Data from the Anabolic 500 survey, published in 2012, showed that almost one quarter of AAS users were dependent on them. These AAS-dependent users had a higher rate of heroin use as well as anxiety and major depressive disorders compared with AAS-nondependent users [21]. This data is worth comparing to the fact that in a different, already mentioned study analyzing the motivation to start the usage, the least declared purpose was to narcotize themselves.

Analysis of a total of 50 studies published between 1985 and 2014 shown, that AAS users often used other licit and illicit substances. The main ancillary/supplementary substances used were alcohol, and cannabis/cannabinoids followed by cocaine, growth hormone, and human chorionic gonadotropin (hCG), amphetamine/meth, clenbuterol, ephedra/ephedrine, insulin, and thyroxine. Other popular substance classes were analgesics/opioids, dietary/nutritional supplements, and diuretics. These non-AAS substances were said to be used mainly to enhance the effects of AAS, combat the side effects of AAS, recreational or relaxation purposes and sexual enhancement [22].

According to a 2016 study, the prevalence of AAS dependence among AAS users has been estimated to be approximately 30%, and polysubstance use, of both pharmaceutical drugs and narcotics, within this group is common. The present review primarily discusses AAS in the context of addiction and dependence, and further addresses the issue of using multiple substances, i.e. stimulants and opiates in combination with AAS [23].

In 2024 an interesting study was performed by the Finnish researchers, where it was aimed to characterize the differences in perimortem polypharmacy, antemortem cerebro-nervous system (CNS) drug use and utilization of health care services of AAS positive, AAS negative and randomly selected Finnish forensic autopsy cases. While perimortem polysubstance use was common in all groups, AAS positive individuals exhibited higher use of prescription CNS drugs beginning several years antemortem. Also, utilization of health care services increased as death approached, possibly offering room for preventive measurements in the health care system. These findings highlight the need for individual treatment planning and polypharmacy control among patients with AAS use [24].

Studies cited above suggest that the addiction problem is not only correlated to the AAS themselves, but also other substances used simultaneously, often to reduce the side effects of AAS, making the medical approach in addiction treatment more complex.

Furthermore, the issue raises a question on a group of AAS users more prone for polypharmacy and poly-substances addiction, due to a combination of drugs with already existing psychiatric problems, aggression and family history, rather than the AAS being the main addiction trigger.

6.2.3 Comprehensive Psychiatric Morbidity

Beside the discussed conditions, abuse of AAS has been associated with various psychiatric manifestations: sleep disorders, anxiety, labile mood, mania, irritability, aggression, violence, psychosis, confusion and delirium. Long-term abuse may lead to the development of persistent psychiatric disorders. Kanayama et al. [25] explained, that “High concentrations of AAS, comparable to those likely sustained by many AAS abusers, produce apoptotic effects on various cell types, including neuronal cells - raising the specter of possibly irreversible neuropsychiatric toxicity”.

6.2.4 Psychiatric Complications Overview

Future research should concentrate on the measures that could increase physician-guided medical treatment adherence in the AAS users patient group.

It is crucial to alert the healthcare professionals about symptoms that might suggest the possible use or abuse of the steroid substances, especially if potential self-harm is suspicioned. What needs to be emphasized is that patients at high-risk of developing severe psychiatric outcomes require special approach in communication - due to the majorly illicit, unsupervised character of AAS and other substance usage, patients lack trust in getting help without legal consequences. Besides educating health care professionals, increased guidance on the dangers of mixed substance abuse should be provided directly to the AAS using population [24].

6.3 Reproductive System Effects

Mulawkar et al. studied 32 manuscripts to complete the systematic review with the total population comprising 9371 individuals, of which 2671 were AAS users (past, current or prospective). Most of the subject group used many compounds of testosterone and its esters with various combinations and sequences. Some of them also used additional substances, i.e. growth hormones, antiestrogens, fertility agents, erectile dysfunction drugs and weight loss drugs. The doses used were significantly higher than the therapeutic doses of the compounds.

In the results AAS users had significantly reduced levels of FSH and LH than the non-users population. These levels remained low for 3-6 months after stopping AAS. One year after stopping AAS, the users and non-users population had insignificant differences in FSH and LH values.

The total testosterone (TT) levels were both higher or lower in the AAS users group compared to non-users population depending on the performed study, however the overall effect was not reported to be significantly different. Furthermore, those levels were comparable in users and non-users populations at baseline (day 0 of stopping AAS usage). 3 months and 6 months after stopping AAS usage the TT values were comparable to the baseline, however a 1 year after discontinuation TT values were lower in AAS users.

Sperm concentration in AAS users and non-users was similar, but sperm motility was lower in AAS users. The testicular size was lower in AAS users. The erectile function improved with AAS use, but on withdrawal, there was decreased libido and erectile dysfunction. Most AAS users need additional medications to mitigate detrimental effects on fertility.

In the literature, there are also case reports of irreversible infertility among men using AAS.

The increasing prevalence of anabolic-androgenic steroids among women raises significant health concerns, particularly due to the limited knowledge regarding their effects on the female organism [27]. Prolonged use and/or high doses of AAS are linked to various harmful side effects, including mood changes, psychiatric disorders, voice deepening, aggression, inflammation and many more.

Among female reproductive system most common side effects are clitoromegaly and menstrual irregularities, with amenorrhea in severe cases due to disrupted ovarian function [28]. Additionally, maternal administration of androgens during pregnancy can adversely affect offspring's reproductive, neuronal, and metabolic health, resulting in long-term impairments.

The complexity of the mechanisms underlying AAS effects, and their potential genotoxicity remains poorly understood [27].

6.4 First impression at the medical profession office

Anabolic–androgenic steroid use is associated with specific interview details, medical history, personality traits, physical aspects that might appear along with usage and help to suspect them at the medical office. Not every user will experience them, however they might alert the suspicion.

The medical interview would be the first thing to pay attention to. It is important to correctly identify the patient's purpose of visit, but also keep in mind that the underlying issue might be hidden - in example, the only spoken problem might be gynecomastia with omitting anything else. The questions asked about the symptoms should be complex, contain information like the character of the symptoms, how long they last and set to look for possible triggers of them. Asking about eventual signs from different areas might be helpful in gathering a full clinical view.

Medical and pharmacological history could differentiate possible causes for symptoms similar to AAS usage, including therapeutic purposes of usage itself. If still there is a suspicion of unsupervised/illicit AAS usage, the medical professional can pay attention to other declared used drugs, that patient might be more eager to admit to. Obviously the direct question about AAS might arise frustration, aggression even - increased defensive mechanisms should be suspected for fear of discovering the usage, however it is important to emphasize that cooperation with patients who might feel judged, in danger of legal consequences or offended would be at least not effective, so it is crucial to remain understanding while looking for other possible symptoms and ensure your patient about clear intentions of helping them.

Psychiatric interview could expand the patient’s profile of eventual personality, mood, food disorders or traits, depressive behaviors or even suicidal risks. If the patient is at risk of harmful actions towards himself immediate psychiatric care should be recommended!

The first thing to pay attention to in a physical examination is the skin of a patient. Acne vulgaris, stretch marks and body hair are common despite the gender. Acne usually appears on more than one body area, including face, arms, chest, back and glutes area, with increased exacerbation. Stretch marks tend to appear in the body parts, where the muscle growth was the fastest and it may depend on one’s preferences about their body proportion, intensity and consistency on training certain body areas, where the stretch marks would appear. Body hair among male tends to be intensely grown on the chest, arms and back, while a common side effect is simultaneous hair loss from the head. Among females, hair appears on the areas that aren't gender specific: face, back, arms, stomach, etc. with possible increased head hair loss [29].

Gynecomastia is a breast tissue growth in male. It might appear in several diseases (i.e. breast cancer, testicular cancer, hormonal imbalance) or medications, including AAS and might be detected during physical examination.

Decrease in size of testicles in males and increase in size of clitoris in females are other examples of possible changes that the medical profession may possibly detect and correlate with the rest of the clinical view.

Blood pressure might be higher than usual and the measurement should be not only repeated at the visit, but also recommended to be done daily by the patient at home and noted for further analysis.

Laboratory tests of sex hormones (including beta-HCG for both exclude pregnancy in females and eventual cancer suspicion in male), lipidogram, liver function tests, creatinine with GFR and general urine tests would deliver more information for your diagnosis.

The most important factor of correct diagnosis and therapeutic success, not only in the matter of AAS usage, will always be your patient's trust in you. Just like everyone, they need to feel understood to share the fragile details of medical history that might cause their clinical condition. Judgement, prejudice and blame could lead to avoidance in visits, not seeking further help and finally causing worse outcomes.

If your patient denies the usage, make the additional tests. Implementing diagnosis without consideration of different conditions could be found even as malpractice. It is important to suspect many causes of a patient's complaints - collect the information without presumptions.

If there is strong evidence on AAS usage and also other possibilities responsible for similar symptoms were excluded, try to speak with your patient and explain your statement: what leads you to think about it, what are the symptoms, what do they need to be aware of and what could be done with it. If they decided to visit your office, something made them concerned enough.

7. Clinical Recognition and Management Implications

7.1 Systematic Review of Adverse Effects

Many mechanisms of AAS impact on the human body are clinically well proved, yet still there are many in need of immediate research.

Due to increased popularity of gym sports, bodybuilding and usage among younger non-athletes generations and females compared to past studies, these groups require attention in the future, better understanding the consequences of usage and acknowledgement of potential adverse effects. Older generations that started their journey with AAS 10 years ago and more, should

now be examined as a follow-up group of how long-term usage influenced their health.

Psychiatric and cardiac effects are presumably at the biggest risk of being fatal and have a significant potential of being quite common states among emergency care. Personality disorders should be studied for their impact on outcomes of more severe adverse effects of AAS, as well as AAS impact on new-onset conditions.

7.2 Healthcare Provider Considerations

A study by Hashimi et al. [30] revealed an increasing trend of AAS abuse, deleterious effects of AAS use on reproductive health, and lack of consensus among the treating physicians regarding the management of related adverse effects. This statement is considered to be a call to the scientific bodies to have more studies, establish guidelines for management, and to have better awareness of this serious public health concern.

Not only users will be met in healthcare more often due to higher popularity of usage and AAS effects themselves, but also because of the quality of the substance. Medical professionals should be aware of uncertain sources of AAS in the majority of cases due to an easier pathway of obtaining them and simultaneously unclear composition, which might lead to many more adverse effects, including higher risk of addiction.

AAS use is also significantly associated with an increased risk of disability pension award, meaning that these individuals are deemed to have lost their working ability permanently [31].

8. Limitations

Most studies focus on specific populations or cross-sectional data rather than longitudinal demographic trends. Female population data is limited. Researches about dosage changes among 20 years, sources of supply and information for users are difficult to obtain due to the nature of stigma, judgement and fear of legal consequences.

9. Conclusions

Based on available peer-reviewed evidence from 2005-2025:

1. **Prevalence**: Global lifetime AAS use prevalence is estimated at 6.4-29.3% and goes significantly beyond the professional athletes community. Depending on the population, literature states it could be even up to every 3rd member of the gym. Statistical age of users decreased, with comparable or lower educational status.
2. **Gender Trends**: Evidence suggests increasing female participation in AAS usage as well, as constantly increasing prevalence among males.

3. **Motivations:** Elevated meaning of appearance and fitting in modern, often highly unrealistic beauty standards of a visibly toned, muscular and lean body is the main goal among non-athletes, whereas professionals in bodybuilding and other sport categories tend to choose performance enhancement as the main reason for usage.
4. **Cardiovascular Risk**: AASs were associated with an increased risk of acute myocardial infarction, coronary intervention or coronary artery bypass graft, venous thromboembolism, arrhythmias, cardiomyopathy, and heart failure. More severe cases and much younger patients might be appearing in public healthcare and emergency units with increased frequency due to uncontrolled usage and source of substances.
5. **Psychiatric Complications**: AAS have strong associations with depression and high risk of suicide attempt, reaching even 30% of examined group of users. Common correlating problems are personality disorders that tend to either be deepened by AAS or appear as the new-onset, based on the source. Bigorexia nervosa is a type of body dysmorphia specific for the training population, in which the patient affected feels like his muscularity is never enough and there is an unstoppable need for constant improvement. Addiction of AAS along with other substances used simultaneously might be a growing problem due to increased popularity of AAS, internet as the main source of information about usage and unawareness of risks.
6. **Clinical Implications**: Healthcare providers need enhanced awareness given widespread use and serious health consequences. Communication skills and a suited approach might be crucial for gaining patients' trust and gathering accurate, detailed medical interviews. The need for additional research about lacking data and guidelines for medical specialists should be emphasized.

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