Assessing the prevalence and knowledge of anabolic steroid use in male athletes in Al Madina Al Munawara, Saudi Arabia

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ABSTRACT

الأهداف: تقييم مدى انتشار استخدام الستيرويدات الابتنائية ومستوى المعرفة حول المنشطات بين الرياضيين الذكور في المدينة المنورة، المملكة العربية السعودية.

المنهجية: أجريت الدراسة على الرياضيين الذكور حيث تم اختيارهم عشوائيا من المراكز الرياضية الخاصة في المدينة المنورة على مدى 5 أشهر. تم جمع البيانات من جميع المشاركين باستخدام استبانة مكونة من 33 سؤالاً. الاستبانة غطت الخصائص الاجتماعية والديموغرافية للمشاركين ومعارفهم ومواقفهم واستخدامهم للستيرويدات الابتنائية.

النتائج: من بين 150 رياضيًا شملهم الاستطلاع، أكمل 121 الاستبيان (معدل الاستجابة: 80.6%). أكثر من النصف تتراوح أعمارهم بين 18 و23 عامًا (56.2%) وكانوا عازبين (79.3%). أفاد 32% أنهم يستخدمون الستيرويدات الابتنائية، بشكل أساسي لزيادة كتلة العضلات، وذلك بناءً على نصيحة المدربين (46.1%). وشملت المصادر الرئيسية الإنترنت (30.7%)، والمدربين (30%)، والأصدقاء (27.9%)، والمهنيين غير العاملين في مجال الرعاية الصحية. كانت أهم الدوافع هي السعر ونصيحة المدرب/الطبيب والتوافر. وشملت الفوائد المتصورة زيادة كتلة العضلات والقوة والقدرة على التحمل، في حين شملت الآثار الضارة المتصورة تلف الكلى / الكبد والمشاكل الجنسية.

الخلاصة: استخدم ثلث الرياضيين الذكور الذين شملهم الاستطلاع المنشطات، متأثرين سهولة الوصول اليها وإمكانية الاتصال الاجتماعي، بدلاً من توجيهات الرعاية الصحية. وهذا يسلط الضوء على الحاجة إلى وعي أكبر بالمخاطر الصحية طويلة المدى، وذلك من خلال التعليم الذي يقدمه متخصصون في الطب الرياضي.

Objectives: To assess the prevalence of anabolic steroid use and the level of knowledge on anabolic steroids among the male athletes in Al Madina Al Munawara, Saudi Arabia.

Methods: A cross-sectional study was conducted on male athletes randomly selected from the private athletic centers in Al Madina Al Munawara over 5 months. Data were collected from all participants using a self-administered anonymous questionnaire with 33 questions. The questionnaire covered the socio-demographic characteristics of the participants, and their knowledge, attitudes, and use of anabolic steroids.

Results: Of the 150 male athletes surveyed, 121 completed the questionnaire (response rate: 80.6%). Over half were aged between 18 and 23 years (56.2%) and were single (79.3%). Thirty-two percent reported using anabolic steroids, mainly to increase muscle mass, following coaches' advice (46.1%). Key sources included the internet (30.7%), coaches (30%), and friends (27.9%), and non-healthcare professionals. The top motivations were price, coach's/physician's advice, and availability. The perceived benefits included increased muscle mass, strength, and endurance, while the perceived adverse effects included kidney/liver damage and sexual problems.

Conclusion: One-third of the male athletes surveyed used anabolic steroids, influenced by accessibility and social contact, rather than healthcare guidance. This highlights the need for greater awareness of the long-term health risks, ideally through education provided by sports medicine specialists.

Keywords: anabolic steroids, androgens, anabolic androgenic steroids, testosterone, misuse.

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Anabolic-androgenic steroids (AAS) or anabolic steroids, such as testosterone, have been used in hormone replacement therapy, including the treatment of hypogonadotropic hypogonadism, testosterone deficiency syndrome, impotence, and delayed puberty.[1] When prescribed and monitored appropriately, testosterone can safely alleviate these deficiencies and improve health outcomes. Testosterone plays a critical role in spermatogenesis by binding to androgen-binding protein in Sertoli cells, thereby maintaining high local testosterone concentrations and supporting sperm development. Factors, such as nutritional status and body temperature (optimal at around 35°C), also influence spermatogenesis. Androgens exert various physiological effects on muscles, reproductive tissues, bone, skin, liver, and kidneys, as well as on the immune and central nervous systems.[2]

In addition, AAS exhibits anabolic effects, promoting protein synthesis and the burning of body fat. They facilitate muscle growth and tissue repair while stimulating the production of new red blood cells. Additionally, they can counteract the catabolic effects of hormones, such as glucocorticoids, which break down muscle proteins during and after exercise. The first synthetic androgen, methyltestosterone, was introduced to clinical medicine in 1939 by Foss and is widely used in medical practice because of its androgenic and anabolic properties.[3] Other synthetic hormones, such as nandrolone and stanozolol, which are chemically related to androgens, aid in tissue building and are prescribed for conditions involving protein catabolism and deficiencies, as well as for burns, anemia, renal failure, and growth retardation.[4,5]

Athletes discovered that high doses of anabolic steroids could enhance strength and aggressiveness, leading to improved performance in competition. However, because of their dangerous and permanent side effects, the use of anabolic steroids in bodybuilding and other sports has been prohibited by most sports organizations, such as the International Olympic Committee. Chronic use of anabolic steroids can lead to serious and irreversible adverse effects, including sterility, impotence, and reduced sperm production in men, as well as the development of male characteristics, such as facial hair and deepening of the voice in women.[6,7] They can also cause hepatotoxicity, cardiotoxicity, polycythemia, dyslipidemia, hypertension, and depression.[8] Anabolic-androgenic steroids rank among the most widely abused drugs, with approximately one million Americans using them.[9]

Moreover, exogenous supplements of anabolic steroids cause a negative feedback effect on the hypothalamus and pituitary gland, leading to reduced production of gonadotropin-releasing, luteinizing, and follicle-stimulating hormones. In men, this can result in decreased testicular function, including reduced sperm production (oligospermia) and a permanent decline in natural testosterone levels.[10,11] The misuse of anabolic steroids elevates the risk of cardiovascular disorders such as dyslipidemia, arrhythmia, and hypertension, which can increase the likelihood of heart attacks and strokes.[12] Liver problems, including hepatotoxicity, blood-filled cysts, and benign and malignant tumors can also result from anabolic steroid use.[13] Oxandrolone and oxymetholone carry warnings about hepatocellular carcinoma that have been observed with their use.[14,15] Other side effects associated with anabolic steroids include mood swings, fatigue, restlessness, appetite loss, insomnia, and steroid craving. Long-term exposure to high doses of testosterone, as often seen in athletes, has been linked to aggressive behavior known as "roid rage," as well as tumors and sterility.[16]

In the past decade, there has been a growing awareness among Saudi individuals regarding the importance of exercise in maintaining good health. This has led to the overspread of gymnasiums and sports centers throughout Saudi Arabia, encouraging people to engage in their favorite physical activities. In Al Madina Al Munawara, youths frequently visit gymnasiums to increase their muscle mass and achieve a fit appearance. However, the prevalence of the unapproved use of anabolic steroids in Al Madina Al Munawara has not been thoroughly investigated. In addition, there is a need to clarify the harmful effects of these supplements. Therefore, our study aims to assess the prevalence of anabolic steroid use and the level of knowledge regarding anabolic steroids among male athletes of Al Madina Al Munawara.

Methods. This cross-sectional study was conducted between September 2023 and January 2024 among male athletes randomly selected from private athletic centers in Al Madina Al Munawara, Saudi Arabia. All men who were athletes, bodybuilders, or had been exercising in Al Madina Al Munawara and fell under the age group of 18 to over 40 years (y) from any private athletic centers in Al Madina Al Munawara were eligible to participate in this study. The survey data was collected through

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an electronic questionnaire using Google Forms. One hundred and fifty participants consented to take part in the survey, out of which one hundred and twenty-one completed it (86.6% response rate). For this study, there are no inclusion and exclusion.

Male athletes were recruited using convenience sampling. Seven trained research assistants collected data to minimize investigator bias. The research assistants received training on standardized data collection protocols and survey administration procedures before study initiation. To ensure consistency, all research assistants followed the same data collection protocols and survey administration techniques. A pretest-structured interviewer-administered questionnaire, designed after reviewing several surveys from similar published studies, was formulated as a data collection tool.[17] The questionnaire was translated into Arabic for the convenience of the Arabic native speakers and back-translated to English to ensure its validity. The questionnaire consisted of 33 questions divided into 2 main parts. The first part included the socio-demographic characteristics of the participants, and the second part was structured to measure athletes' use, knowledge, attitudes, and practices regarding anabolic steroids. It included 6 questions to measure athletes' use of anabolic steroids: medical use, accessibility, reasons for use, and sources of anabolic steroids. Six questions assessed knowledge and attitudes toward anabolic steroids, looking for safety and their possible side effects.

Four researchers, 2 physicians, and 2 clinical pharmacists, reviewed the study tools used to research prostate cancer. Each item was rated on a scale of 1 to 5, with 1 being irrelevant and 5 being highly relevant. Items rated as irrelevant by all the researchers were excluded, whereas those rated as appropriate or highly relevant were included. Items with mixed ratings were discussed and resolved by consensus.

Four researchers reviewed the questionnaire and rated each item on a Likert scale from 1 to 5. Two academic pharmacists and 2 clinical pharmacists with experience in sports sciences research provided the ratings. Items deemed irrelevant by all 4 researchers were excluded, whereas those considered relevant or highly relevant were retained. Questions that were questionable were resolved through discussion and consensus.

Subsequently, 25 participants were selected for pilot tests to ensure readability and comprehension. The test-retest method was used to assess the stability of the scores over a short period. The participants were asked to answer the items twice, with a short interval of thirty minutes to one hour between the 2 rounds. The scores obtained by the same participants in both rounds were correlated, and Pearson's correlation coefficient (r) was used to indicate test-retest reliability. The scores displayed excellent stability, with a Pearson's correlation coefficient of 93.2% (95%CI=88.2–95.7%) and a *p*-value of <0.001. The internal consistency of the items used in the test was excellent, as indicated by Cronbach's alpha of 81.7%. Cronbach's α was used to determine the internal consistency. Internally consistent tools should have $0.70 \leq \alpha \leq 0.95$.

The study was reviewed and approved by the Research Ethics Committee of the College of Pharmacy at Taibah University, with reference number COPTU-REC-57-20230312, in March 2023. We obtained written permission from the gymnasium administrators to conduct the study in their facilities. Before enrolment, all participants were given a thorough explanation of the study objectives and provided written informed consent. This manuscript was written in accordance with the STROBE guidelines for reporting observational studies.

Statistical analysis. All statistical analyses were conducted using the Statistical Package for the Social Sciences, version 27.0 (IBM Corp., Armonk, N.Y., USA). Descriptive analyses were used to describe all sections of the survey questionnaire. Means and standard deviations were calculated for continuous variables, and frequencies and percentages were used for categorical variables. To evaluate the knowledge section of male athletes, a score of one was assigned for each correct response (indicated by "yes"), and a score of zero was given for incorrect responses (indicated by "no" and "I do not know"). Bloom's 1986 cut-off point was used to categorize male athletes' overall knowledge score, with a score of 5.6 to 7 considered good, 4.2 to 5.5 moderate, and less than 4.2 poor.[18] Pearson Chi-squared or Fisher's exact tests were used to determine whether there was a difference in the distribution of categorical variables when using anabolic steroids. Statistical significance was set at $p<0.05$.

Results. A total of 121 out of 150 male respondents (response rate: 80.6%) participated in this study. The age distribution was heavily skewed toward younger adults, with 68 (56.2%) aged between 18 and 23 years old. A high proportion of 73 (60.3%) had a bachelor's degree, and 67 (55.4%) were students. Additional details show that 96 (79.3%) were single, 111 (91.7%) lived in urban areas, 35 (28.9%) were employed, and 55.4% had monthly incomes below 1000 Saudi riyal (SR). Regarding health behavior, 68 (55.3%) were nonsmokers, 51 (42.1%) had normal body mass index (BMI), and exercise habits varied, with 79 (65.5%) exercised 3 to 5 times weekly, but duration ranged

from less than one hour (42, 34.7%) to over 2 hours (9, 7.4%). Dietary practices also differed, with the most significant percentage (45, 37.2%) reporting that they sometimes followed special diets or consumed supplements. Table 1 summarizes the sociodemographic characteristics of the participants.

A total of 32% of individuals who attended private athletic centers in Al Madina Al Munawara admitted to using anabolic steroids. Meanwhile, 68% of male athletes reported that they had never used anabolic steroids. A total of 46.1% of the male athletes reported using anabolic steroids to increase muscle mass based on their

Table 1 - The association between sociodemographic characteristics and anabolic steroid use.

Characteristics	Total (N=121) n (%)	Use of anabolic steroid		*P*-value
		Yes n (%)	No n (%)	
Age				
18 – 23 y	68 (56.2)	23 (59.0)	45 (58.5)	
24 – 29 y	26 (21.5)	9 (23.0)	17 (20.7)	
30 – 35 y	11 9.1)	3 (7.7)	8 (9.7)	0.91
36 – 39 y	10 (8.3)	2 (5.1)	8 (9.7)	
≥ 40 y	6 (5.0)	2 (5.1)	4 (4.9)	
Level of education				
School	39 (32.2)	11 (28.2)	28 (34.1)	
Bachelor	73 (60.3)	25 (64.1)	48 (58.5)	0.80
Postgraduate	9 (7.4)	3 (7.7)	6 (7.3)	
Marital Status				
Single	96 (79.3)	34 (87.1)	62 (75.6)	
Married	23 (19.0)	3 (7.7)	20 (24.3)	0.014
Divorced/Widower	2 (1.7)	2 (5.1)	0 (0.0)	
Location of current residence				
Urban	111 (91.7)	35 (89.7)	76 (92.7)	0.72
Rural	10 (8.3)	4 (10.2)	6 (7.3)	
Employment status				
Student	67 (55.4)	21 (53.8)	46 (56.1)	
Employed	35 (28.9)	8 (20.5)	27 (32.9)	0.16
Unemployed	13 (10.7)	7 (17.9)	6 (7.3)	
Self-employed	6 (5.0)	3 (7.7)	3 (3.6)	
Personal monthly income				
<1000 SR	67 (55.4)	25 (64.1)	42 (51.2)	
1000 – 5999 SR	29 (24.0)	1 (2.5)	20 (24.4)	
6000 – 9999 SR	10 (8.3)	1 (2.5)	9 (10.9)	0.30
10000 – 15000 SR	7 (5.8)	3 (7.7)	4 (4.9)	
>15000 SR	78 (6.6)	1 (2.5)	7 (8.5)	
Smoking status				
Current Smoker	40 (33.1)	14 (35.9)	26 (31.7)	
Non-smoker	68 (55.3)	19 (48.7)	49 (59.7)	0.39
Previous smoker	13 (10.7)	6 (15.3)	7 (8.5)	
Body mass index (BMI)				
Underweight (< 18)	11 (9.1)	2 (5.1)	9 (10.9)	
Normal weight (18-24.99)	51 (42.1)	20 (51.3)	31 (37.8)	0.70
Overweight (25-29.99)	43 (35.5)	12 (30.7)	31 (37.8)	
Obese (30-34.99)	16 (13.2)	5 (12.8)	11 (13.4)	
Total period of exercise				
< 1 month	43 (35.5)	16 (41.0)	27 (32.9)	
1 – 6 months	24 (19.8)	5 (12.8)	19 (23.1)	0.42
7 – 12 months	13 (10.7)	3 (7.7)	10 (12.2)	
> 1 y	41 (33.9)	15 (38.4)	26 (31.7)	
Frequency of exercise per week				
<3 times	42 (34.7)	16 (41.0)	26 (31.7)	0.41
3 – 5 times	79 (65.5)	23 (58.9)	56 (68.3)	

coach's advice. Smaller portions indicated using them for treatment (25.6%), disease prevention (15.4%), or other reasons (12.8%). Various factors influenced participants' selection of anabolic steroids, with similar percentages reporting they chose products based on price (25.5%), advice from coaches (25.5%), and advice from physicians (22.2%). Smaller proportions cited availability (19.3%), social media influence (6.4%), or recommendations from pharmacists (2.9%).

Figure 1 shows the participants who received anabolic steroids. The most frequently reported sources were the internet (30.7%), coaches (30%), and friends (27.9%), followed by much lower percentages obtaining substances from pharmacies (6.3%) or hospitals (5%).

Self-reported benefits of anabolic steroid use. Figure 2 displays the perceived benefits of anabolic steroid use as self-reported by participants. The most frequently cited benefits were increased muscle mass (24.2%), increased muscle strength (17.1%), stimulated growth (15.9%), and increased endurance (15.3%). A smaller percentage of athletes reported benefits of burning body fat (10%), decreasing muscle pain (7.7%), overcoming anemia (7.1%), and decreasing protein catabolism (2.7%).

Table 1 - The association between sociodemographic characteristics and anabolic steroid use (Continuation).

Characteristics	Total (N=121) n (%)	Use of anabolic steroid		*P*-value
		Yes n (%)	No n (%)	
Time of daily exercise				
<1 hour	42 (34.7)	15 (38.4)	27 (32.9)	0.82
1 – 2 hours	70 (57.9)	21 (53.8)	49 (59.7)	
>2 hours	9 (7.4)	3 (7.7)	5 (6.1)	
Following special diet				
Never	33 (27.3)	9 (23.0)	24 (29.2)	0.568
Rarely	19 (15.7)	5 (12.8)	14 (17.0)	
Sometime	45 (37.2)	18 (46.1)	27 (32.9)	
Always	24 (19.8)	7 (17.9)	17 (20.7)	
Using dietary supplements				
Never	58 (47.9)	18 (46.1)	40 (48.8)	0.51
Rarely	18 (14.9)	7 (17.9)	11 (13.4)	
Sometime	22 (18.2)	9 (23.0)	13 (15.8)	
Always	23 (19.0)	5 (12.8)	18 (21.9)	

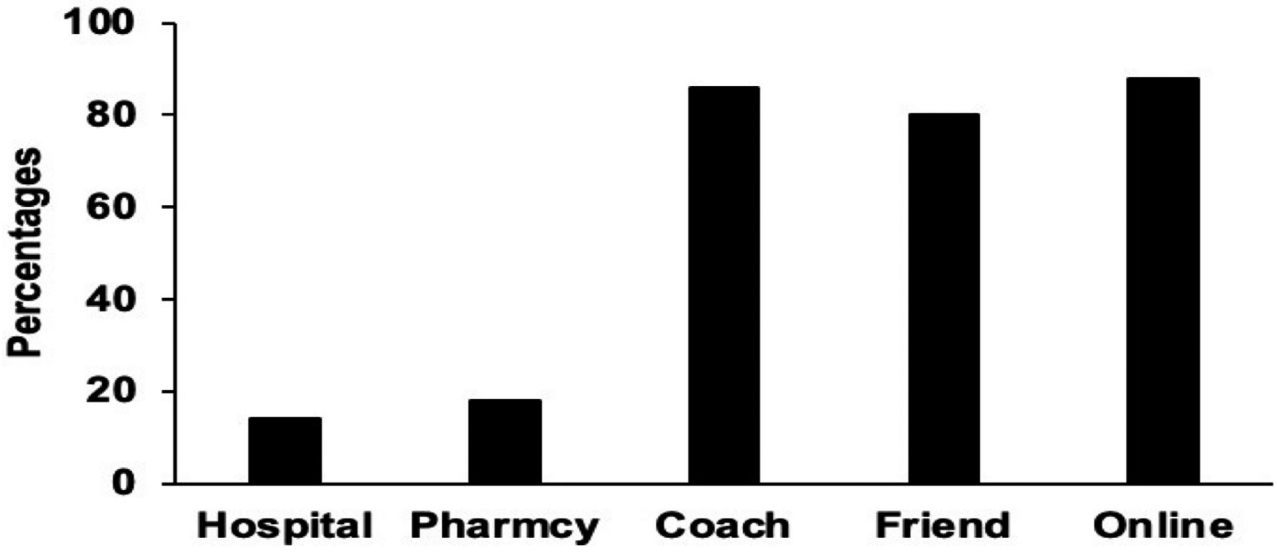

Figure 1 - Sources of anabolic steroids acquisition.

Self-reported adverse effects of anabolic steroids. Figure 3 illustrates the perceived side effects of anabolic steroid use, as reported subjectively by the participants. The most frequently cited adverse effects were kidney damage (18.4%), liver disorders (14%), sexual dysfunction (13%), and cardiovascular disorders (8.4%). Additional self-reported adverse effects at lower frequencies included prostate enlargement (7.9%), voice deepening (7.5%), increased body hair (7.3%), premature baldness (6.9%), increased aggression (6.1%), gynecomastia (5.9%), acne (1.5%), and others (3.1%).

Participants' anabolic steroid knowledge channels. Figure 4 shows that 23.8% of male athletes get their information about anabolic steroids from social media, 20.6% from physician consultations, 20.6% from friends, 12.1% from the internet, 10.3% from books, 10.3% from coaches, 1.9% from commercial advertisements, and 0.5% from pharmacists' consultations.

Knowledge of anabolic steroid use. The male athletes' knowledge of anabolic steroid use was assessed using 7 questions with scores ranging from zero to 7 points. Athletes with scores between 4.2 and 7 were considered to have sufficient knowledge. The mean knowledge score was 4.14 ± 2.47, whereas the median knowledge score was 5 (range = 0 to 7). The percentage of correct answers to the 7 questions on the questionnaire was

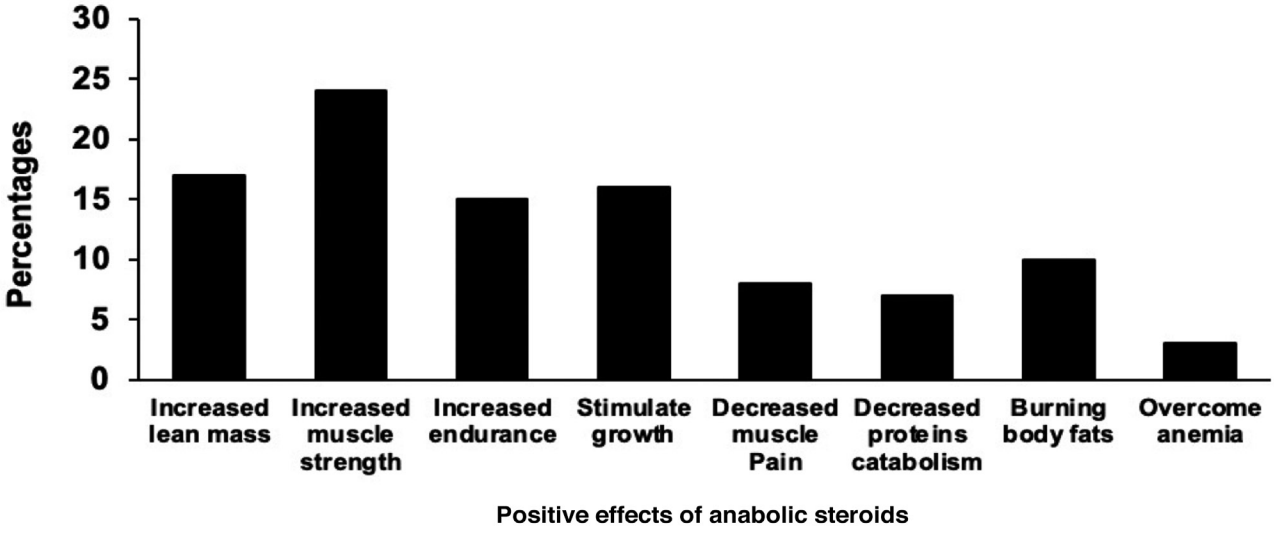

Figure 2 - Self-reported benefits of anabolic steroid use.

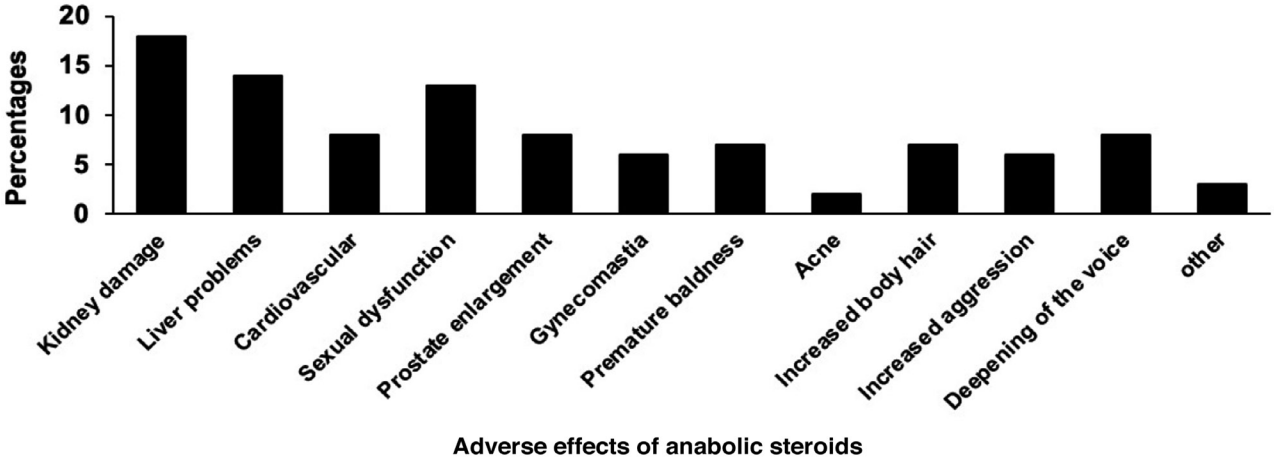

Figure 3 - Self-reported adverse effects of anabolic steroids.

59.14% (4.14/7*100), which indicated insufficient knowledge (Table 2). Fifteen male athletes earned the lowest total knowledge score (0), whereas 28 received the highest score (7). The most correct responses (71.9%) were in response to the K5 question. The lowest percentage of correct responses (47.9%) were observed in the K4 question. In addition, more than 80% of the male athletes supplied the correct answer to only 2 of the 7 questions in the knowledge section. Table 2 shows the responses to the questions related to male athletes' knowledge of anabolic steroids.

Association between sociodemographic factors and anabolic steroid use. Table 1 shows the association between anabolic steroid use and socio-demographic variables. Chi-squared analysis revealed a statistically significant association between marital status and anabolic steroids use (p=0.014). However, other sociodemographic variables examined, including

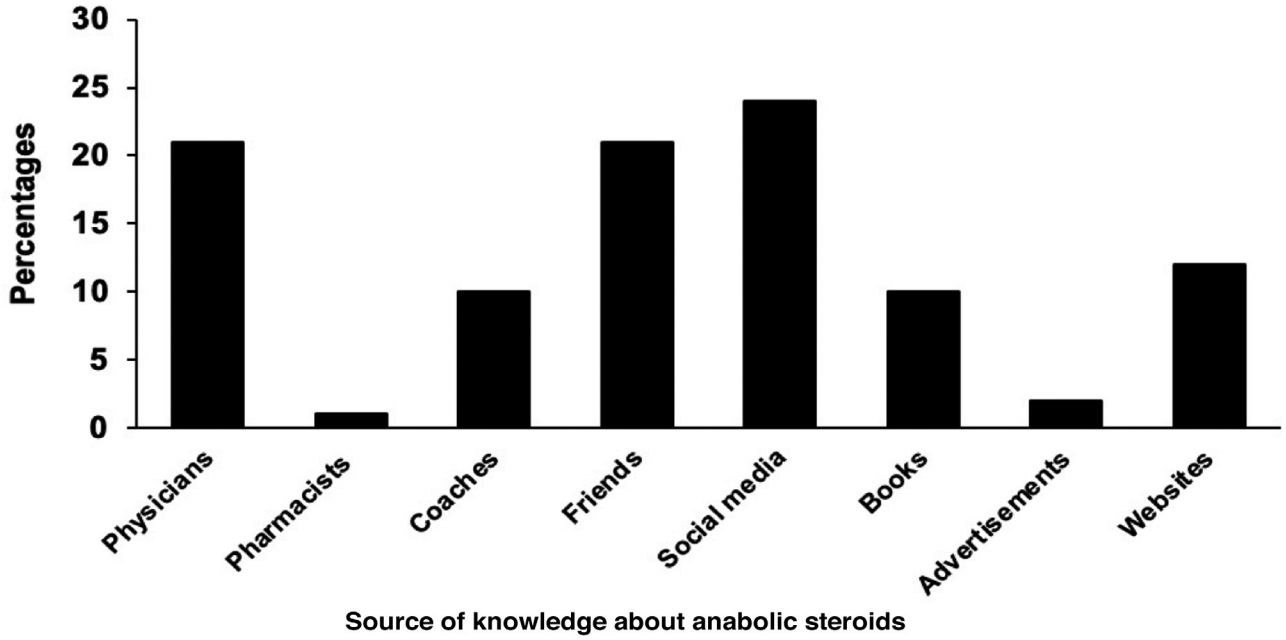

Figure 4 - Self-reported adverse effects of anabolic steroids.

Table 2 - Participants knowledge about anabolic steroids.

Questions	Correct answer	Correct (%)	Incorrect (%)	I do not know (%)
K_1 Using anabolic steroids requires medical assessments	Correct	77 (63.6)	17 (14)	27 (22.3)
K_2 Anabolic steroids must be prescribed by a physician	Correct	71 (58.7)	19 (15.7)	31 (25.6)
K_3 Treating a disease with anabolic steroids needs an accurate dose	Correct	80 (66.1)	11 (9.1)	30 (24.8)
K_4 Anabolic steroids are not safe	Correct	58 (47.9)	21 (17.4)	42 (34.7)
K_5 Misuse of anabolic steroids can cause long-term side effects	Correct	87 (71.9)	10 (8.3)	24 (19.8)
K_6 Anabolic steroids can cause infertility	Correct	68 (56.2)	16 (13.2)	37 (30.6)
K_7 Anabolic steroids can cause hepatotoxicity	Correct	60 (49.6)	22 (18.2)	39 (32.2)

age and educational level, showed non-significant associations with anabolic steroid use.

Discussion. The frequency of AAS use was 32% in this study, which was consistent with the study carried out in Riyadh.[19] These results are higher than those for other Arabic states and Muslim countries. In Kuwait and the United Arab of Emirates, the AAS users were reported to be 22.7% and 22%, respectively.[20,21] Nevertheless, the frequency of AAS use was lower when compared with that of Western countries, such as the United Kingdom (69.9%) and the United States (79.6%).[22,23] This study highlights a wide age range among athletes abusing AAS, with a notable majority within the age group of 18-23 years. A significant proportion (59%) of the users were found in this age group. However, there were also users in older age groups, with 23% between 24 and 29 years and only 5.1% belonging to the age group of 36-40 years. The observed variations in the distribution of AAS abuse across different age groups could be attributed to the validity of the self-reporting methods used in this study. It has been suggested that individuals who abuse these drugs may be hesitant to disclose their behavior because of the stigma associated with AAS abuse. This reluctance to report could skew the data, particularly among older athletes, who may be more aware of the social disapproval of AAS use. The discrepancies in the age distribution of AAS abuse among athletes likely stem from underreporting, influenced by the perceived social stigma associated with drug abuse.[24]

According to our study, the foremost reason cited for escalating AAS abuse was guidance from coaches, accounting for 25.5% of responses. Notably, social media influence emerged as the least influential factor, constituting only 6.4% of reported reasons. In contrast to prior research, which indicated the media portrayal of celebrities with desirable physiques were the primary driver for increased AAS abuse, our findings suggest a different trend.[19] Furthermore, within the scope of this study, the primary rationale for the use of AAS was to augment muscle mass. A smaller subset of participants reported using these substances for therapeutic purposes (25.6%), disease prevention (15.4%), or enhancing performance (12.8%). Additionally, advice from physicians (22.2%) emerged as a notable factor influencing AAS consumption. Conversely, a smaller contingent cited recommendations from pharmacists (2.9%) as a contributing factor in their decision to use AAS. These findings provide insight into the diverse motivations underlying AAS use, highlighting the influence of healthcare professionals in guiding individuals' decisions regarding these substances.

According to our study's results, the most common sources of AAS purchases with percentage of 30.7% through the internet, 30% coaches, and 27.9% friends, followed by much lower percentages of substances from pharmacies (6.3%) and hospitals (5%). In comparison with similar studies, the most common source of purchases in the Eastern Province was coaches, with 55.1%.[25]

The primary motivation for using AAS is to enhance muscle development, a consistent finding evident in both our investigation and prior studies among adult gymnasium attendees in Jeddah (24.2%), and the Eastern Province (47.1% and 68.54%).[25,26] This trend aligns with the findings of Nakhaee et al,[27] who carried out a study on the prevalence of anabolic steroid use among bodybuilders in Iran in 2013, and affirming that the predominant reason for AAS use was to enhance muscle size. In the current study, one of the most proven positive effects of AAS was increased muscle mass, which was reported by 24.2%, followed by increased muscle strength stated by 17.1%, stimulated growth by 15.9%, and increased endurance by 15.3% of AAS users in this study.

In this study, the predominant adverse effects reported by AAS users were kidney damage (18.4%) and liver complications (14%). Interestingly, these findings contrasted with those of a previous investigation conducted in Benha and Shebin Al-Kom cities in 2022, where acne emerged as the most frequently reported side effect among AAS users, constituting 36.1% (28). Moreover, our study revealed sexual dysfunction as an adverse effect in 13% of cases. This finding is consistent with the research of Horwitz et al,[29] who observed that erectile dysfunction affected more than 10% of AAS users.

Study limitations. This study had several limitations, primarily related to its prevalence and accuracy, which relied heavily on the honesty and openness of the participants. It is widely recognized that underreporting may have led to an underestimation of the actual number of AAS users, suggesting that the true prevalence could be higher than that which was previously reported. Additionally, the use of a self-administered questionnaire may have introduced self-reporting bias. The survey instrument did not include questions on any ailments, disorders, injuries, or other factors that may have led to anabolic steroid use. Future studies should gather more details on participants' health status and clinical indications that may influence the use of supplements. This study does not clearly distinguish between the

prescribed therapeutic use of AAS and the illicit use without medical direction. The analysis only considered non-prescribed use, but future studies would benefit from clearly differentiating and reporting prescribed use versus unregulated use separately. Furthermore, the study was conducted exclusively in one city, Al Madina Al Munawara, which is characterized by unique social and economic demographics, and included only male gymnasium members. Consequently, these findings may not be applicable to other regions or to women. Moreover, serum AAS levels were not measured to confirm usage, and the study did not explore whether AAS use varied across different gymnasiums or among specific sociodemographic groups within these gymnasiums.

In conclusion, this cross-sectional study provides important insights into the prevalence of anabolic steroid use and knowledge regarding potential adverse effects among target demographics. Quantifying anabolic steroid use and assessing familiarity with the health risks associated with the unauthorized use of these anabolic steroids makes a valuable contribution. The data revealed that younger adults primarily frequent gymnasiums and athletic centers in Al Madina Al Munawara. Additionally, many individuals obtain information about anabolic steroids from unreliable sources rather than from accredited medical professionals. However, further studies might explore the effectiveness of educational initiatives to improve athletes' understanding of the risks and side effects associated with anabolic steroid use. Research might be extended to compare the findings in Al Madina Al Munawara with other regions or countries to understand the broader context and differences in steroid use patterns and knowledge levels. This would enhance our knowledge and enable more rapid and effective management strategies for anabolic steroids use among the male athletes. s

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