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The Prevalence of Anabolic Androgenic Steroid Misuse and its Associated Factors among Bodybuilders in Shiraz, Iran

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ABSTRACT

Background: Anabolic androgenic steroids (AAS) are synthetic forms of testosterone that can be misused by bodybuilders to increase their athletic performance. This study was conducted to determine the prevalence and characteristics of AAS use among male bodybuilders in Shiraz, Iran.

Methods: This cross-sectional study was conducted on 246 men attending bodybuilding clubs in Shiraz, southern Iran using multistage cluster sampling method. To collect the data, self-administered questionnaire, containing demographic questions, type of AAS used, purpose of consumption, and the recommender of AAS use were completed. Participant's anthropometric indices were assessed using standard methods, and body composition values were measured using bioelectric impedance analysis.

Results: The mean age of participants was 29.09 ± 7.76 years, and the prevalence of AAS use was 39%. Significant difference was observed in distributions of participants by bodybuilding history between AAS users and non-users. A significant higher weight, body mass index, fat free mass, total body water and lower fat mass were observed among AAS users compared with non-users. The main reason for using AAS was muscle mass increase (75.1%), and half of the participants started AAS with their trainers' recommendation (54.1%).

Conclusion: AAS misuse was prevalent amongst male bodybuilders and its consumption seems to be associated with some desirable body composition changes (higher fat free mass and lower fat mass).

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Introduction

Anabolic androgenic steroids (AAS) are synthetic derivatives of male sex hormones that imitate the biological roles of these hormones and reproduce their effects on body, which ultimately promote growth of skeletal muscle and development of male

sexual characteristics (1-3). Indication for the use of AAS is primary male hypogonadism treatment, but since the 1950s, athletes began to misuse AAS as an enhancing performance substances (4). AAS use has shown an increasing trend around the world and its prevalence is estimated ranging from 20%

to 50% among bodybuilders (BB) (5, 6).

Surprisingly, majority of AAS users are not amongst the professional BB, and its usage is higher between unprofessional BB with the intention to lose fat mass (FM) or gaining more fat free mass (FFM). Some previous studies reported that AAS administration increases body weight, FFM, muscle size, and strength, while decreasing FM in men (7, 8). However, other studies reported some or none of these anthropometrical changes, and rejected any obvious conclusion about the effect of AAS usage on body composition indices (9, 10). The inappropriate use of AAS leads to disruption in the production and secretion of hormones, causing number of both reversible and irreversible health problems, such as cardiovascular, hepatobiliary, neuroendocrine, psychiatric, and reproductive system disorders (1, 11-14).

Numerous researches have focused on identifying the predisposing risk factors that place BB at risk for AAS misuse, in order to develop an effective strategy against AAS abuse. Some of the known risk factors include being male, participating in a strength-related sport at a commercial gym, and knowing an AAS user (15, 16). Previous studies showed a surge in the prevalence of AAS consumption amongst Iranian young adults, and numerous studies have described frequency and pattern of AAS usage among athletes, but there is a scarcity of studies regarding AAS usage among BB in our region (9, 17, 18). Therefore, in an effort to obtain more insight on AAS usage, the present study was carried out to estimate the prevalence of AAS use, and to study some characteristics of BB using AAS in Shiraz, Iran.

Materials and Methods

This cross-sectional study was conducted among male BB attending gyms' in Shiraz, Iran. Shiraz is the capital of Fars Province, in the southwestern part of Iran, with semi-mountainous climate, and according to the last official census in 2011 has a total population of 1,700,665 (19). According to the sample size formula and previous study results published by Nakhaee et al. (20) (assuming: $P=0.20$, $d=0.05$ and 95% significant level), the sample size was calculated at 246 participants. Two hundred and forty-six BB were selected as samples, using multistage cluster sampling method.

Information was collected from the physical education organization about the number of active gyms (200 gyms) and divided them into four districts based on socio-economic state. In the next step, participants were randomly selected from the gyms across the quadruple city regions according to the ratio of calculated sample size to each area's

population size. Before inviting the athletes to complete the questionnaire, the study objectives were explained to them briefly, and informed consent was obtained. The participants were asked to complete a self-administered questionnaires comprising of 2 sections: first, demographic information (such as age, marital status, education level, and exercise history); second, anabolic steroid related information (history of steroids usage, person recommending the steroids, and reasons for the use of steroids).

Weight was measured to the nearest of 0.1 kg on a Seca electronic scale with participants wearing light clothes, and height was measured to the nearest of 0.5 cm with no shoes and in an upright position. Body mass index (BMI) was calculated as weight in kg divided by the height in meters squared (kg/m^2). Bioelectric impedance analysis (BIA) was used as standard and non-invasive method using resistance values obtained from weak electrical currents to estimate body composition. In the present study, BIA was used in the post absorptive state, by injecting 800 microampere and 50 kHz alternating sinusoidal current with a standard tetra polar technique (Bodystat QuadScan 4000 device, England) to determine body composition (such as fat mass (FM), fat free mass (FFM), and Total Body Water (TBW)).

BIA was performed according to standard conditions, which was mentioned earlier in the study published by Eftekhari et al. (21). Statistical analysis was conducted by SPSS software (version 16, Chicago, IL, USA). To compare normally distributed variables between AAs users and non-users, the independent t-test was used and the information is given as mean and standard deviation. Descriptive information was reported as number or percentage. Given the qualitative nature of the variables of education level, marital status, and BB history record, Chi-square test was used to compare between AAs users and non-users. P-values less than 0.05 were considered to be statistically significant.

Results

Totally, 246 male BB were studied. The mean age of participants was 29.09 ± 7.76 (ranging between 15 and 59) years. In total, 8.1% of them were under 20 years of age, 53.7% were 20-30, and 38.2% were over 30 years old. The mean BMI of participants was $26.21 \pm 3.68 \text{ kg}/\text{m}^2$, which 39% of them were under $24.9 \text{ kg}/\text{m}^2$, 45.5% were between 25 and 29.9, and 15.4% were above $30 \text{ kg}/\text{m}^2$. Overall, 39% of the BB reported using AAS ($n=96$) within median age of 29 years. Significant higher weight, BMI, FFM, TBW and lower FM were observed among AAS users compared to non-users. Table 1 shows

Table 1: Participant's characteristics and body composition parameter using body composition analyzer.

Variable	Total (n=246)	History of AAS usage		P value**
		Positive (n=96)	Negative (n=150)	
Age (years)	29.09±7.76*	29.68±6.66	28.71±8.39	0.33
Weight (kg)	82.70±13.17	86.72±13.84	80.13±13.17	<0.001
Height (cm)	1.77±6.21	1.77±6.87	1.77±6.21	0.89
BMI (kg/m ²)	26.21±3.68	27.50±4.14	25.39±3.68	<0.001
Fat mass (%)	14.74±8.15	14.74±7.86	17.15±8.15	0.02
Fat free mass (%)	82.84±8.15	85.25±7.86	82.84±8.15	0.02
TBW (%)	48.17±6.10	53.80±8.02	48.17±6.10	<0.001

*Mean±SD, **Independent t-test, AAS: Anabolic androgenic steroids; BMI: Body mass index; TBW: Total body water.

the individual characteristics, anthropometrical and body compositions variables of the participants.

Participant's distribution by level of education showed that only 6.1% did not have high school diploma (n=15), while 93.9% had high school diploma or higher degree (n=231). The majority of participants (71.5%) were single and 28.5% of them were married. Nearly, half of the participants (49.2%) had fewer than 2 years of BB history, and significant difference was observed in distributions of participants by BB history between AAS users and non-users (P<0.001). Table 2 summarizes other participant's demographic characteristics including educational level, marital status, and history of BB.

Figure 1 shows the recommender of AAS usage among participants, which most reported source of recommendation was their trainers at the gym (54.1%), friends (20.8%), internet web sites (16.6%), television programs and advertisements (4.1%), magazines (2.1%), doctors (1%), and parents (1%) were the source of recommendations. According to the participants' response, increase in muscle mass was one of the main reasons for using AAS among BB (75.7%). Table 3 shows different reasons for using AAS by BB.

Table 3: Reasons for AAS use.

Reason for use (n=96)	Of Reason (%)
Muscle mass increase	75.7
Weight gain	3.2
Muscle power increase	19.2
Muscle endurance increase	1.9

Discussion

To the best of our knowledge, this is the first study to investigate the prevalence and characteristics of AAS users among BB in Shiraz, Iran. Understanding the pattern and prevalence of AAS usage in different groups of athletes can guide policymakers toward developing preventive strategies. Present study revealed that a significant proportion of BB athletes have used AAS during their lifetime (39%). It was also found that AAS use is particularly common amongst 20-30 years old age group. Additionally, some body composition indices were significantly different between AAS users and non-users.

Many studies have found that people who do strenuous exercise have tendency to use performance enhancer substances to boost their energy level and shorten their path into their sportive career goals (22). Results from studies on AAS misuse among BB athletes describe a wide range of prevalence

Table 2: Educational level, marital status, and bodybuilding history of participants.

Variable		Total (n=246)	History of AAS usage		P value**
			Positive (n=96)	Negative (n=150)	
Education Level	Under Diploma	15 (6.1)*	6 (6.2)	9 (6.0)	0.21
	Diploma	105 (42.7)	45 (46.9)	60 (40.0)	
	BSc or BA	99 (40.2)	40 (41.7)	59 (39.3)	
	MSc or MA	25 (10.2)	5 (5.2)	20 (13.3)	
	PhD	2 (0.8)	-	2 (1.3)	
Marital Status	Single	176 (71.5)	65 (67.7)	111 (74.0)	0.28
	Married	70 (28.5)	31 (32.3)	39 (26.0)	
Years of bodybuilding	1-2	121 (49.2)	20 (20.8)	101 (67.3)	<0.001
	2-4	49 (19.9)	22 (22.9)	27 (18.0)	
	>4	76 (30.9)	54 (56.2)	22 (14.7)	

*Number (percentage), ** Chi-squared test, AAS: Anabolic androgenic steroids.

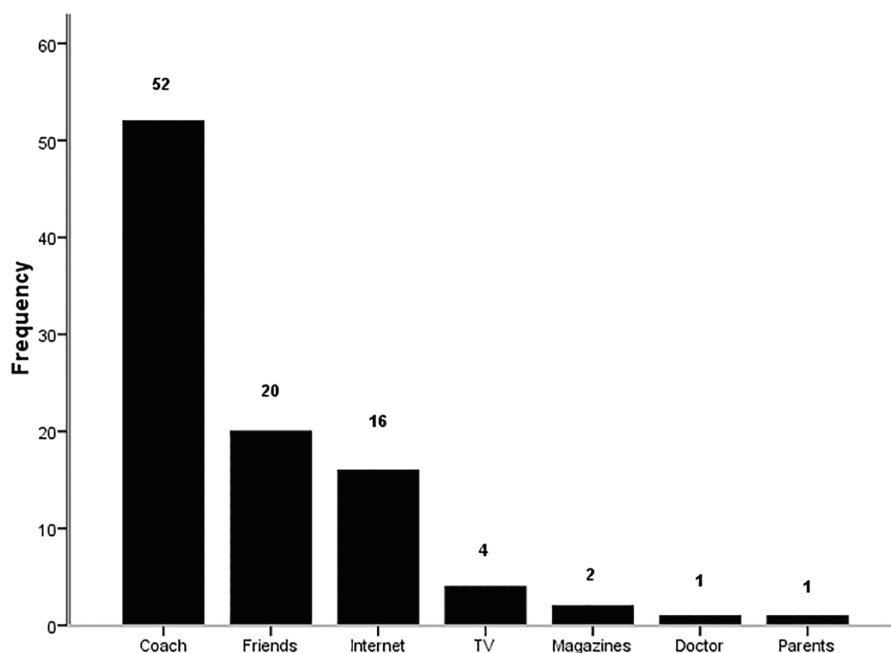


Figure 1: Recommender of AAS usage (n).

in Iran. In consistent with the present findings, the prevalence of AAS use among male BB athletes in Bandar Abbas was reported at almost 44% (23). Studies conducted on the same topic, reported that 40.1% of BB in Qazvin, and 40% of BB in Kerman had reported AAS use at least once during their sportive life (20, 24). In this study, more than half of AAS abusers were under 30 years of age, similar data were obtained in other studies. Razavi et al. reported that 54% of AAS users were 25 years or younger in the city of Hamadan (18).

According to the results of present study, increased percent of FFM, TBW and decreased FM seems to be associated with AAS use in BB athletes. In line with the present findings, de Souza et al. reported similar findings among BB using AAS during the pre-contest period (25). A common and expected finding after AAS use is changes in body composition, following increased FFM and decreased FM. Several pathways of action are recognized for AAS. In human, after conversion of AAS to active form of testosterone (dihydrotestosterone) by 5- α -reductase enzyme, dihydrotestosterone binds directly to androgen receptors, located in cell nucleus, and induce increment of muscle tissue, attributable to hypertrophy and the formation of new muscle fibers. Athlete's expectations from AAS use are formed along the lines of AAS hypertrophic effects. As presented in the results, most frequent reason for AAS use was muscle mass increase (75.7%), which was consistent with previous studies findings (15, 26). Although in the present study, educational level showed no significant difference between AAS users and non-users, many previous studies suggested that

AAS use in athletes under diploma educational level was significantly higher than athletes with diploma or higher educational level, probably due to less complications awareness of AAS usage in persons with lower education levels (26).

In present study, among different socio-demographic parameters only years of BB history was significantly different between AAS users and non-users; more experienced BB reported AAS use more than the others in the present study. The present finding could be justified by the fact that more experienced BB had a longer exposure to the risk of AAS misuse; hence the prevalence of AAS use was higher. On the other hand, more experienced BB prepared themselves for different matches and championships, which increased their desire to consume such substances, in which case it reflected the dangerous trend of senior athletes who relied on AAS for performance increase more than the juniors do (27, 28).

There were various sources of recommenders of AAS use in present study. Findings of this study were similar to the results of other studies; club trainers ranked first amongst recommenders (54.1%). Consistent with our study, study by Ekramzadeh et al. (29) reported clubs coaches were the main source of recommendation for ergogenic usage. This finding suggests clubs trainers for increased customer attraction and higher income by prescribing such agents. This hypothesis is further confirmed by Nakhostin-Roohi et al. study that showed almost a quarter of the participants have got their ergogenic supplement from the club coaches illegally (30).

Finally, significant prevalence of AAs use among

male BB athletes in Shiraz can be an important finding for further preventive plans. One of the limitations in the present study was lack of knowledge assessment regarding AAs complications, which makes the data interpretation about observed differences in participant's characteristic more difficult.

Conclusion

The findings of this study showed that prevalence of ASS use was high amongst BB athletes. Some body compositions and socio-demographic factors were observed to be associated with AAS misuse among BB athletes. In present study, AAS use was mainly suggested by club coaches, and the main reason of AAS misuse seems to increase muscle mass. Considering the increasing prevalence of AAS misuse, it seems that there is a need for more longitudinal studies on the benefits, possible side effects, and the impact of AAS misuse on athletes' health.

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Conflict of Interest

None declared.

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