Cross-sectional Study of Female Students Reporting Anabolic Steroid Use

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Objective: To determine the characteristics of female US high school students reporting anabolic steroid use.


Setting: Nationally representative sample of US high schools.

Participants: Female students in grades 9 through 12 (n=7544).

Main Outcome Measures: Participants' self-reported anabolic steroid use was compared with other health-related behaviors and with sports participation.

Results: Prior or ongoing anabolic steroid use was reported by 5.3% of female high school students. Those adolescent girls had a marked increase in other health-compromising behaviors, including past 30-day use of alcohol (odds ratio [OR], 8.83; 95% confidence interval [CI], 5.49-14.20), cigarettes (OR, 5.14; 95% CI, 3.14-8.42), marijuana (OR, 7.91; 95% CI, 5.20-12.04), cocaine (OR, 10.78; 95% CI, 6.18-18.81), and diet pills (OR, 4.86; 95% CI, 2.98-7.93). They were more likely to carry a weapon (OR, 7.54; 95% CI, 4.83-11.76), have had sexual intercourse before age 13 years (OR, 2.90; 95% CI, 1.58-5.33), and have had feelings of sadness or hopelessness almost every day for at least 2 consecutive weeks (OR, 4.13; 95% CI, 2.57-7.22). They were less likely to play school-sponsored team sports (OR, 0.52; 95% CI 0.34-0.80). Steroid users participating in sports shared the same problem behaviors as steroid users not participating in team athletics.

Conclusion: Self-reported anabolic steroid use is not confined to adolescent girls in competitive athletics and is an indicator of adolescent girls with a marked increase in a cluster of other health-harming behaviors.

Arch Pediatr Adolesc Med. 2007;161:572-577

During the 1990s, 3 different national surveys of US adolescents documented a 2-fold to 4-fold increase in the prevalence of anabolic steroid use among adolescent girls. Public awareness concerning escalating female anabolic steroid use further heightened in 2004 when the Centers for Disease Control and Prevention reported that more than 7% of ninth-grade girls indicated current or prior anabolic steroid use, a level exceeding that of some young male subgroups. National attention focused on steroid use in adolescent girls when it became a topic discussed during the 2005 congressional hearings on drug use in sports.

Previous associations with female anabolic steroid use have been limited to older women, and most reports of mature women taking anabolic steroids have related the use to competitive athletics and to bodybuilding. Using the nationally representative 2003 Youth Risk Behavior Surveillance System data set, we examined the characteristics of girls reporting anabolic steroid use. Because of the association between steroid use and sports participation among older women, we particularly explored that relationship among girls reporting prior or ongoing anabolic steroid use.

Methods

Instrument and Procedures

We analyzed data from the 2003 Youth Risk Behavior Survey. The Youth Risk Behavior Survey is a 93-item survey administered biannually to US high school students assessing demographic variables and priority health-risk behaviors relating to subsequent social problems, morbidity, disability, and mortality. It uses a 3-stage cluster design to draw a sample representative of US students in grades 9 through 12.
9 through 12, and details of its sampling strategy and methods have been reported.1-13

Trained data collectors administered the survey in classrooms during regular school hours. Local parental permission procedures were followed before survey administration, respondent anonymity was maintained, and the questionnaire and its administration was reviewed and approved by the institutional review board of the Centers for Disease Control and Prevention, Atlanta, Ga.

Anabolic steroid use was assessed by an item within a series of questions pertaining to controlled and illicit drug use, immediately following an item about the use of ecstasy (3,4-methylenedioxyamphetamine) and preceding a query concerning illegal injections. The question asked, “During your life, how many times have you taken steroid pills or shots without a doctor’s prescription?” Response options were 0 times, 1 to 2 times, 3 to 9 times, 10 to 19 times, 20 to 39 times, and 40 times or more. Individuals also were asked about sports participation in the question “During the past 12 months, on how many sports teams did you play?” Students could answer 0, 1, 2, or 3 teams or more.

In schools administering the survey, the overall student response rate was 83%. Among all female respondents (n=7544), 1.3% (n=97) were missing a response to the question concerning anabolic steroid use (n=61) or the covariates (n=36) and were excluded from the analysis examining the relationships between steroid use and covariates. The distribution of responses to the question about prior anabolic steroid use is shown in the Figure. The pattern suggests a potential bimodal distribution of female self-reported users. However, when those with less frequent use were compared with those reporting 20 or more times’ use (31.5% of all users), only 2 notable differences were observed. Those with less frequent use were less likely to report being threatened or injured on school property (odds ratio [OR], 0.12; 95% confidence interval [CI], 0.05-0.31) and were less likely to use diet pills (OR, 0.26; 95% CI, 0.11-0.61). Because no statistically significant differences were noted on all other dimensions, respondents were dichotomized into anabolic steroid users and nonusers.

**STATISTICAL ANALYSIS**

Analyses were performed on weighted data using SUDAAN software,14 which accounts for the complex sampling design of the Youth Risk Behavior Survey. For the comparisons with other health-related behaviors (drug use, violence, sexual behaviors, risky driving behaviors, weight loss practices, and mental health problems), we dichotomized variables into those engaged in and not engaged in those actions.

We conducted the analyses in 2 steps. In step 1, we examined the association between self-reported prior or ongoing anabolic steroid use and demographic variables and team sports participation as given in Table 1. Among demographic variables, geographic region and metropolitan status did not relate statistically significantly to steroid use. However, race/ethnicity, grade level, and team sports participation differed, and we included those variables as covariates in the subsequent logistic regression analyses investigating anabolic steroid use and various health-related variables. In those logistic models, anabolic steroid use and the covariates were the predictors, and the dichotomized health behavior was the outcome. Overall, among adolescent girls reporting prior or ongoing anabolic steroid use, 37.8% participated in team sports. In step 2, to determine whether female steroid users participating in sports differed from other self-reported users, the analysis was repeated using only those adolescent girls reporting anabolic steroid use. Rather than comparing steroid users and nonusers, team sports participation was the predictor for the health behavior outcomes for this subset, again using the demographic variables as covariates.

### RESULTS

Prior or ongoing anabolic steroid use was reported by 5.3% of female US high school students. Paradoxically, the prevalence of self-reported anabolic steroid use varied inversely with grade level (Table 1). Compared with stu-
The prevalence estimates, adjusted ORs, and 95% CIs comparing female anabolic steroid users with the nonuser reference group, controlling for race/ethnicity, grade level, and sports participation. Odds ratios greater than 1 indicate that the self-reported anabolic steroid users have a higher likelihood of that behavior, and the opposite holds when the ratio is less than 1. Adolescent girls reporting anabolic steroid use had significantly more other health-harming behaviors. They were much more likely to use other unhealthy substances, including past 30-day use of cigarettes (OR, 5.14; 95% CI, 3.14-8.42), alcohol (OR, 8.83; 95% CI, 5.49-
Adolescent female anabolic steroid users are characterized by polysubstance abuse and by a marked increase in other health-harming behaviors. Compared with non-users, odds are higher that they became sexually active at a younger age and have had more sexual partners; they are more likely to carry weapons and to have experience with violence. Along with greater controlled and illicit drug use, they are more likely to resort to harmful weight loss practices. These adolescent girls' mental health is more likely to be impaired, with more than two thirds having feelings of sadness or hopelessness for 2 consecutive weeks or more (OR, 4.13; 95% CI, 2.57-7.22) and were more likely to have attempted suicide (OR, 7.34; 95% CI, 5.22-10.31).

Overall, 51.6% of female students indicated participation on team sports. Team sports participants were less likely to be steroid users compared with team sports non-participants (OR, 0.52; 95% CI, 0.34-0.80). In addition, being in sports did not seem to identify a unique subgroup of steroid users. Self-reported anabolic steroid users in team sports differed in only 2 of the high-risk dimensions summarized in Table 2. Anabolic steroid users in team sports were more likely to use seatbelts (OR 3.11; 95% CI, 1.39-6.94) and condoms or birth control pills (OR, 5.24; 95% CI, 2.05-13.35), compared with anabolic steroid users who were not in team sports.

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girls at greater risk for depression. In other groups, anabolic steroid use has been associated with suicide among athletes, as have eating disorders and access to firearms.47

This evaluation has limitations. Data are cross-sectional, and causality and temporal sequences cannot be defined. In addition, associations were limited to items contained in the Youth Risk Behavior Survey instrument. We chose to use team participation as our measure of sports and exercise performance. Investigators have used other metrics, including shorter-term indexes of physical activity,35 and sport type and affiliation.48 However, the team questionnaire item has been used by others,49 and we were interested in examining its correlates because school sports teams may be an effective means to deter disordered eating and body-shaping drug use.40

Despite these limitations, our findings provide concern about adolescent girls with self-reported prior or ongoing anabolic steroid use. Across all grades, these seem to be troubled adolescent girls with co-occurring health-compromising activities in the domains of substance use, sexual behavior, violence, and mental health. Adolescent boys with multiple problems have been the focus of research.50 High-risk adolescent girls seem to have received less attention than adolescent boys, perhaps reflecting that their actions are less socially, albeit perhaps more personally, destructive. Anabolic steroid use is another marker for high-risk adolescent girls, and further study is needed to develop effective interventions for this population.

Accepted for Publication: December 20, 2006.
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Financial Disclosure: None reported.

Funding/Support: This study was funded in part by grant 5R01 DA07356 from the National Institute on Drug Abuse.

REFERENCES


**Announcement**

Submissions. The Editors welcome contributions to Picture of the Month. Submissions should describe common problems presenting uncommonly, rather than total zebras. Cases should be of interest to practicing pediatricians, highlighting problems that they are likely to at least occasionally encounter in the office or hospital setting. High-quality clinical images (in either 35-mm slide or electronic format) along with parent or patient permission to use these images must accompany the submission. The entire discussion should comprise no more than 750 words. Articles and photographs accepted for publication will bear the contributor’s name. There is no charge for reproduction and printing of color illustrations. For details regarding electronic submission, please see: http://archpedi.ama-assn.org.