

Asthma in United States Olympic athletes who participated in the 1996 Summer Games

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Background: Asthma prevalence appears to be increasing in the general population. We sought to determine whether asthma prevalence has also increased in highly competitive athletes. **Objective:** Our aim was to determine how many United States Olympic athletes who were chosen to participate in the 1996 Summer Olympic Games had a past history of asthma or symptoms that suggested asthma or took asthma medications. **Methods:** We analyzed responses to questions that asked about allergic and respiratory diseases on the United States Olympic Committee (USOC) Medical History Questionnaire that was completed by all athletes who were chosen to represent the US at the 1996 Summer Olympic Games in Atlanta. **Results:** Of the 699 athletes who completed the questionnaire, 107 (15.3%) had a previous diagnosis of asthma, and 97 (13.9%) recorded use of an asthma medication at some time in the past. One hundred seventeen (16.7%) reported use of an asthma medication, a diagnosis of asthma, or both (which was our basis for the diagnosis of asthma). Seventy-three (10.4%) of the athletes were currently taking an asthma medication at the time that they were processed in Atlanta or noted that they took asthma medications on a permanent or semipermanent basis and were considered to have active asthma. Athletes who participated in cycling and mountain biking had the highest prevalence of having been told that they had asthma or had taken an asthma medication in the past (50%). Frequency of active asthma varied from 45% of cyclists and mountain bikers to none of the divers and weight lifters. Only about 11% of the athletes who participated in the 1984 Summer Olympic Games were reported to have had exercise-induced asthma on the basis of other criteria that may have been less restrictive. On the basis of these less restrictive criteria, more than 20% of the athletes who participated in the 1996 Olympic Games might have been considered to have had asthma. **Conclusions:** Asthma appeared to have been more prevalent in athletes who participated in the 1996 Summer Games than in the general population or in those who participated in the 1984 Summer Games. This study also suggests that asthma may

influence the sport that an athlete chooses. (*J Allergy Clin Immunol* 1998;102:722-6.)

Key words: Asthma, exercise-induced asthma, sports medicine

More than 11% of the athletes who represented the US at the 1984 Los Angeles Summer Olympic Games were reported as having exercise-induced asthma.¹ Since those Games, other publications have also suggested that more than 1 of every 10 competitive athletes may have asthma.²⁻⁶ Published data indicate a very high prevalence of asthma in athletes in contrast to the suggestion by many authors that the prevalence of asthma in the general population is only about 4% to 7%.^{7,8} No study has been performed since 1984 to determine whether the number of Olympic athletes who participated in the Los Angeles Games and who met the criteria for exercise-induced asthma was abnormally high or was representative of athletes from other Summer Olympic Games.

We sought to determine the number of US athletes at the 1996 Atlanta Summer Olympic Games who recorded a history of asthma. Our goal was to compare the data obtained from athletes who participated in the 1984 Games with data from those who participated in the 1996 Games. A secondary goal was to determine whether the prevalence of asthma varied among sports and whether a history of asthma had any impact on performance (as measured by those who won medals) at this high level of competition.

METHODS

All athletes who represented the US at the 1996 Summer Olympic Games in Atlanta were required to complete a medical history questionnaire that was designed by the United States Olympic Committee (USOC) Sports Medicine Division. Questionnaires were given to the athletes by USOC medical staff at team processing in Atlanta, Ga, within 2 weeks before participation in the Games. All US athletes completed and signed the questionnaire. USOC medical staff then reviewed all of the questions on each form and conferred with each athlete to complete missing entries and to clarify concerns. There were 60 questions, most allowing for a *yes* or *no* response. When appropriate, the athletes were asked to list drugs that they were taking or to give dates or details about injuries and illnesses. Sixteen of the 60 questions asked were about allergic and respiratory disease (Table I) and were similar to questions asked of athletes who participated in the 1984 Summer Olympic Games¹ and to questions asked of those who participated in previous studies sponsored

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TABLE I. Questions asked on the USOC Medical History Questionnaire

Question	Yes/total responses
1. Are you allergic to any medicine (aspirin, penicillin, sulfa, etc)?*	79/698 (11.3%)
2. Are you allergic to any insect bites/stings or do you have any food allergies?	54/697 (7.7%)*
3. Do you take any medications (over the counter, herbs, supplements, vitamins)?	377/692 (53.5%)*
4. Do you take any prescribed medications on a permanent or semipermanent basis (steroids, birth control pills, anti-inflammatories, antibiotics, etc)?	262/693 (37.8%)*
5. Have you ever been told that you have (had) asthma or exercise-induced asthma?	107/699 (15.3%)
6. Do you ever have chest tightness?	59/699 (8.4%)
7. Do you ever have wheezing?	71/699 (10.2%)
8. Do you ever have itchy eyes?	123/699 (17.6%)
9. Do you ever have itching of the nose or throat or sneezing spells?	118/699 (16.9%)
10. Does running ever cause chest tightness or cough or wheezing or prolonged shortness of breath?	55/699 (7.9%)
11. Have you ever had chest tightness, cough, wheezing, asthma, or other chest (lung) problems that made it difficult for you to perform in sports?	71/697 (10.2%)
12. Have you ever missed school, work, or practice because of chest tightness or cough or wheezing or prolonged shortness of breath?	21/699 (3%)
13. If you have been told you have asthma, what medications have you taken?	84 (11.9%)†
14. Do you have trouble breathing or do you cough during or after activity?	46/699 (6.6%)
15. Do you have or have you ever had lung disease (pneumonia)?	34/699 (4.9%)
16. List current medications.	69 (9.9%)‡

*If athlete marked yes, he or she was given a line on which to list a response.

†Athlete was provided a space to fill in medication names.

‡Sixty-nine athletes listed an asthma medication.

Abbreviation used

USOC: United States Olympic Committee

by the American Academy of Allergy, Asthma and Immunology.⁹

At the completion of the 1996 Summer Olympic Games, all medical history questionnaires were sent to the US Olympic Training Center in Colorado Springs, Colo, where the information related to allergic and respiratory disease was transcribed onto SymptomScoreCardII diary cards (CompleWare Corporation, Iowa City, Iowa). These cards were returned to Iowa City, Iowa, where they were scanned into a database, transformed into a Microsoft Access data file, and analyzed.

Table II indicates the basis to determine that an athlete had asthma (a history of having been told that he or she had asthma, the indication that he or she had taken an asthma medication, or both). This project was approved by the University of Iowa Institutional Review Board.

RESULTS

Six hundred ninety-nine athletes completed a medical history questionnaire; 662 were on the US Olympic Team, and 37 were alternates. Responses to the 16 allergic and respiratory disease questions are tabulated in Table I. About 11% indicated an allergy to some medication (question 1), and almost 8% reported an allergy to insects or foods (question 2). More than 15% of the athletes had been told that they had asthma (question 5). A history of chest tightness, wheezing, itchy eyes, and itching (of nose or throat) or sneezing spells (questions 6 to 9) was present in about 8%, 10%, 18%, and 17% of the athletes, respectively. Running caused chest symptoms (question 10) in almost 8%. Only 3% responded

that chest symptoms had caused them to miss school, work, or practice (question 12). Athletes were more likely to give an affirmative response to question 11 (10.2%), which asked whether chest tightness, cough, wheezing, asthma, or other chest or lung problems impaired performance, than they did to question 14 (6.6%), which only asked about trouble breathing or cough during or after exercise.

More than half of the athletes indicated taking "any" medications, including over-the-counter medications (question 3), and about one third recorded that prescription medications were taken on a "permanent or semipermanent basis" (question 4). Eighty-four athletes listed having taken a medication specifically for asthma at some time (question 13). When we combined all questions on the questionnaire that asked athletes to list medications, we found that 97 (13.9%) had listed an asthma medication somewhere on the form or provided this information to USOC medical staff who recorded it on the questionnaire. Thus 13 did not list an asthma medication as a response to question 13 but did so elsewhere on the questionnaire.

Of the 699 athletes who completed medical history questionnaires (Table II), 107 (15.3%) answered yes to question 5 (Table I), the question that asked about a diagnosis of asthma, and 97 (13.9%) recorded having taken an asthma medication.

One hundred seventeen (16.7%) either had been told that they had asthma (question 5) or had taken an asthma medication. Of the 10 athletes who answered *no* to question 5 but recorded an asthma medication (or a response to question 13), 3 listed albuterol as a response to question 4, 2 listed albuterol as a response to question 13, 2

TABLE II. Response to question 5 and indication that athletes had taken an asthma medication on the USOC Medical History Questionnaire

Response to question 5	Recorded asthma medications	Number of athletes
Yes	Yes	87
Yes	No	20
No	Yes	10
	Total	117

reported having had asthma as a child for which they had taken medicine, 2 listed albuterol as a response to question 16, and 1 listed triamcinolone acetate, albuterol, and cromolyn in response to question 16. At the time of team processing, 69 of 699 (9.9%) of the athletes recorded that they were currently taking an asthma medication (Table I), and 4 additional athletes indicated taking an asthma medication on a permanent or semipermanent basis in response to question 4. Therefore 73 of 699 (10.4%) athletes were considered to have active asthma; Table III lists the medications they were taking.

We also evaluated the responses to questions that asked about asthma symptoms in athletes who had not been told that they had asthma and had not recorded asthma medications. These additional questions asked about a history of chest tightness (question 6); a history of wheezing (question 7); symptoms with running (question 10); performance impairment from respiratory symptoms (question 11); missed school, work, or practice because of respiratory symptoms (question 12); and respiratory symptoms after exercise (question 14). Responses of yes were recorded by 11, 6, 8, 8, 2, and 7 athletes, respectively, who had not been told that they had asthma and had not recorded taking any asthma medications. Twenty-four athletes answered yes to at least 1 of these questions but were not included in the 117 who we concluded had asthma. Unfortunately, we have no basis to determine whether these additional athletes did indeed have asthma, particularly exercise-induced asthma. Thus 141 athletes (20%) recorded that they had been told that they had asthma or had taken an asthma medication at some time or indicated symptoms suggestive of asthma. These criteria were similar to those used for the 1984 Summer Olympic Games,¹ suggesting that there may have been an increase in asthma in the 12 intervening years. Unfortunately, because the 2 studies were so different, we cannot say more about the comparability of asthma in these 2 populations of Olympic athletes.

We examined whether there were differences among sports in the numbers of athletes who recorded a history of asthma or listed asthma medications (Table IV). For this evaluation, we combined sports with similar characteristics for 2 reasons: (1) to provide as much confidentiality for the athletes as possible and (2) to provide sufficient numbers of athletes so that a difference in small numbers would tend to have less influence on the results. There were substantial differences among sports. In some sports no individuals had a history of asthma or had

TABLE III. Medications taken for asthma and allergy by athletes with active asthma

Medication category	Number of athletes
Short-acting β_2 agonist	68
Inhaled corticosteroids	31
Cromolyn/nedocromil	13
Antihistamines	11
Long-acting β_2 agonist	9
Theophylline	7
Prednisone	1
Ipratropium	1

taken an asthma medication, whereas in other sports almost half of the athletes either had a history of asthma or had taken an asthma medication in the past. For example, half of the cyclists and mountain bikers, more than a quarter of synchronized swimmers and swimmers (29.6%), and about a quarter of those who participated in canoe/kayak, rowing, and sailing/yachting (25.3%) recorded a history of asthma or had taken asthma medication. Athletes who participated in track and field and modern pentathlon (18.2%) and in boxing, wrestling, and judo (15.6%) comprised the next group. The remainder of the athletic groups had an asthma prevalence ranging from 7.5% to 13.5%. Active asthma, as defined here, was present in similar proportions among sports (Table IV); 45% of the cyclists and mountain bikers had active asthma.

Next we considered whether the sex of the athlete had any influence on whether the athlete reported asthma. We found that a significantly higher percentage of female athletes (60 of 301, 19.9%) met our criteria for asthma than did male participants (57 of 398, 14.3%) ($P < .05$, chi-square test). Similarly, 35 female (11.6%) and 38 male (9.5%) athletes had active asthma.

Finally, we determined whether those with asthma won a similar proportion of medals as compared with their nonasthmatic teammates. Of the 117 athletes having been told they had asthma or who had taken an asthma medication, 35 athletes (29.9%) won medals, including both individual and team medals. Of the 73 athletes with active asthma, 24 (32.9%) won 31 medals. In contrast, of the 582 who did not have asthma, 167 athletes (28.7%) won medals, again including both team and individuals awards.

DISCUSSION

We found that 117 (16.7%) of the 699 US athletes who participated in the Atlanta Summer Olympic Games had a history of asthma, took asthma medications, or both. Of these athletes, 107 (15.3%) answered yes to the question "Have you ever been told that you have (had) asthma or exercise-induced asthma?" on the medical history questionnaire, and 97 (13.9%) recorded taking asthma medications. We scored as positive for asthma any athlete who recorded having been told that he or she had asthma, listed an asthma medication, or both. These were easily determined objective criteria on which to make a presumptive diagnosis of asthma. Likewise, 10.4% of the athletes had active asthma on the basis of their need for

TABLE IV. Number of athletes who met criteria for asthma by sports

Events	Asthma/ total athletes*	Active asthma/ total athlete†
Cycling, mountain biking	10/20 (50%)	9/20 (45%)
Synchronized swimming, swimming	16/54 (29.6%)	14/54 (25.9%)
Canoe/kayak, rowing, sailing/yachting	22/87 (25.3%)	12/87 (13.8%)
Athletics (track and field) and modern pentathlon	29/159 (18.2%)	20/159 (12.6%)
Boxing, freestyle wrestling, Greco-Roman wrestling, judo	7/45 (15.6%)	5/45 (11.1%)
Archery, equestrian, shooting	7/52 (13.5%)	3/52 (5.8%)
Diving, weight lifting	2/18 (11.1%)	0/18 (0%)
Fencing, gymnastics, rhythmic gymnastics	4/36 (11.1%)	1/36 (2.8%)
Baseball, softball	4/40 (10%)	2/40 (5%)
Basketball, field hockey, soccer, team handball, water polo	12/135 (8.9%)	5/135 (3.7%)
Badminton, beach volleyball, table tennis, tennis, volleyball	4/53 (7.5%)	2/53 (3.8%)

*Athletes who indicated that they had been told that they had asthma or took an asthma medication at some time.

†Athletes who were taking an asthma medication at the time of team processing or indicated that they took an asthma medication on a permanent or semipermanent basis.

asthma medications at the time of completion of the questionnaire or the need for medication on a permanent or semipermanent basis.

Certain sports had a substantially greater number of athletes who met these criteria for asthma. For example, among cyclists, swimmers, and those who participated in canoe/kayak and sailing/yachting, 48 of 161 (29.8%) had a history of asthma or had taken an asthma medication in the past. In contrast, only 16 of 188 (8.5%) athletes who participated in basketball, field hockey, soccer, team handball, water polo, badminton, volleyball, table tennis, and tennis met these criteria. Frequency of active asthma varied from 45% of cyclists and mountain bikers to none of the divers and weight lifters.

The proportion of athletes who had a history of asthma or had taken an asthma medication was higher for female (19.9%) than for male (14.3%) athletes; active asthma was seen in 11.6% of female and 9.5% of male athletes. It did not appear that athletes who had been told that they had asthma or had taken asthma medications were less skilled; 29.9% won team and individual medals, whereas 28.7% of athletes who did not meet these criteria won team and individual medals. Clearly, the athletes with active asthma fared as well, with 32.9% winning medals.

Only limited data have previously been reported regarding the prevalence of asthma in comparable populations of highly competitive athletes. Fitch, in 1984,¹⁰ reported that 9.7% and 8.5% of Australian Olympic athletes who participated in the 1976 and 1980 Olympics had asthma, respectively. In 1986, Voy¹ reported experience with the 1984 US team at the Summer Olympic Games in Los Angeles. Five hundred ninety-seven athletes represented the US in those Games, of which 67 (11.2%) were described as having exercise-induced bronchospasm. Twenty-eight of the 67 (42%) were female. The diagnosis was made on the basis of a history of asthma (in 26 athletes), use of a bronchodilator (in 41 athletes), request to the International Olympic Committee for approval of

medications (in 13 athletes), and a history of chest tightness, wheezing, or cough related to strenuous exercise (in 42 athletes). About 90% of the 67 athletes diagnosed as having exercise-induced asthma were identified by their responses to an extensive questionnaire that was given to the athletes to be completed at the time of the Olympic Trials. A few of the athletes were also subjected to exercise challenges. The key questions from the 1984 questionnaire were also included in the 1996 USOC Medical History Questionnaire.

Of the 67 athletes identified in the Voy study, 41 won medals¹; 15 were awarded gold, 21 silver and 5 bronze medals. It is not clear how many nonasthmatic athletes won medals nor was it clear how many asthmatic athletes won more than 1 medal. We do know from this study that only 35 of the 67 athletes identified as having exercise-induced asthma were diagnosed before the Games as having asthma. Voy's study differed from ours in the following ways: (1) the major focus in his study was on exercise-induced asthma; (2) the criteria to make the diagnosis of exercise-induced asthma were less specific (a history of asthma, use of a bronchodilator, request to the International Olympic Committee for approval of medications, and history of chest tightness, wheezing, or cough related to strenuous exercise) than were the criteria to make the diagnosis in this study (a history of asthma or use of an asthma medication); (3) Voy's criteria depended on a self report of symptoms rather than a self report of a diagnosis as we required; and (4) although an extensive questionnaire was used in 1984, that instrument was not the official medical history questionnaire that athletes were required to complete as was the case in 1996. Therefore we cannot directly compare data from 1984 with data obtained by us in 1996. In our study athletes who recorded positive responses to questions 6, 7, 10, 11, 12, or 14 were not identified as having asthma unless they also listed an asthma medication or responded that they had been told that they had asthma. If we also included these questions and allowed a positive

response to make the diagnosis of asthma, then we might have been able to conclude that more than 20% of the athletes who participated in the 1996 Summer Olympic Games had asthma.

Past reports suggest that about 90% of patients with chronic asthma will be triggered to have an exacerbation of symptoms associated with exercise.⁹ An additional group, of perhaps 7% of an unselected population, would also be expected to have asthma associated with exercise but not chronic asthma.^{9,11} Taken together, these observations suggest that an even higher percentage of the athletes who participated in the 1996 Summer Olympic Games would have had exercise-induced asthma than we identified as having *asthma*.

With this report we now have data from US athletes who participated in 2 Summer Games in 1984 and 1996. These studies suggest that at least 1 of every 6 US Olympic athletes has a history of asthma, a history of taking asthma medications, or both, and about 1 in 10 has active disease. Some high-profile Olympic athletes who have asthma have received extensive publicity as a result of their achievements, including Amy Van Dyken, Tom Dolan, and Jackie Joyner-Kersey, who are 3 of the 117 asthmatic athletes who participated in the 1996 Summer Olympic Games.¹²

Studies should be undertaken to examine the prevalence of asthma in athletes who participate in future Olympiads, especially Winter Olympic Games. For now, it remains important for young asthmatic athletes to recognize that asthma need not prevent them from achieving success even at the highest levels of competition.

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