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Asthma Medication in Finnish Olympic Athletes: No Signs of Inhaled β_2 -Agonist Overuse

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ABSTRACT

ALARANTA, A., H. ALARANTA, P. PALMU, P. ALHA, K. PIETILÄ, M. HELIÖVAARA, and I. HELENIOUS. Asthma Medication in Finnish Olympic Athletes: No Signs of Inhaled β_2 -Agonist Overuse. *Med. Sci. Sports Exerc.*, Vol. 36, No. 6, pp. 919–924, 2004.

Introduction: Occurrence of asthma has been reported to be frequent in endurance athletes and especially high in winter sport athletes. Recently, the International Olympic Committee has restricted the use of inhaled β_2 -agonists and requires documentation for their use. However, epidemiologic data comparing the use of antiasthmatic medication in different sport events are mostly missing. **Methods:** A cross-sectional questionnaire survey was carried out in 2002. All the athletes ($N = 494$) financially supported by National Olympic Committee comprised the study group. Of them, 446 (90.3%) filled in a structured questionnaire concerning asthma and allergies, use of medication, characteristics of sport activities, and smoking habits. A representative sample of Finnish young adults ($N = 1\,504$) served as controls. **Results:** Physician-diagnosed asthma was more common in athletes as compared with controls (13.9% vs 8.4%). Use of any asthma medication was reported by 9.6% of the athletes and by 4.2% of the controls. No difference was observed in the frequency of asthma medication used by winter or summer sport athletes (10.0% vs 9.4%). Inhaled β_2 -agonists were used by 7.4% and 3.0% of the athletes and controls, respectively. After adjusting for age, sex, and smoking, odds ratio with 95% confidence interval for use of any asthma medication was 0.69 (0.17–2.92) for motor skills demanding events, 1.87 (0.85–4.11) for speed and power sports, 3.00 (1.68–5.37) for team sports, and 4.16 (2.22–7.78) for endurance events as compared with controls. None of the athletes used antiasthmatic medication without physician diagnosis. **Conclusions:** The frequency of antiasthmatic medication is clearly lower than the occurrence of physician-diagnosed asthma in Finnish Olympic athletes. No evidence of overuse of inhaled β_2 -agonists is found. **Key Words:** ELITE ATHLETE, SYMPATHOMIMETIC DRUGS, ANTI-ASTHMATIC MEDICINES, TYPE OF SPORT, SPORTS MEDICINE, DOPING

In the summer Olympic Games, 4–15% of participating athletes have reported physician-diagnosed asthma (3,22,23). Twenty-two percent of the U.S. Olympic athletes who participated in 1998 Winter Olympic Games reported physician-diagnosed asthma (25). Use of antiasthmatic medication was reported by 7–18% of these athletes (3,22,23,25).

Asthma is most common among those competing in endurance events, such as cycling, swimming, cross-country skiing, and long-distance running (8,9,12,14,21,24). Occurrence of asthma has been somewhat higher in winter than in summer sports athletes (3,8,9,12,14,21–25). Use of antiasthmatic medication has been reported by 15–38% of these athletes (8,9,14,21). The most commonly used antiasthmatic medication has been inhaled β_2 -agonists followed by inhaled corticosteroids.

Recently, the International Olympic Committee (IOC) has restricted the use of inhaled β_2 -agonists and requires documentation for their use (17). Most published evidence suggests that no ergogenic effects of these drugs on athletic performance can be observed (2,13,16). Regular long-term use of inhaled β_2 -agonists without anti-inflammatory treatment increases airway responsiveness to nonallergic stimuli and enhances allergen-induced late bronchoconstriction, as

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TABLE 1. Participating athletes by type of sport.

Winter Events	<i>N</i> = 180	Response Rate	Summer Events	<i>N</i> = 266	Response Rate
Speed and power	Freestyle Speed skating Alpine events	93.1% (27/29)	Speed and power	Track and field (sprinters, hurdlers, jumpers, throwers, decathletes) Weight lifting Karate Boxing Wrestling Taekwondo	87.8% (86/98)
Endurance	Cross-country skiing Nordic combined Biathlon Orienteering on skis	96.0% (48/50)	Endurance	Judo Swimming Track and field (800 m+) Squash Cycling Badminton Aerobic Orienteering Rowing Canoeing	87.0% (60/69)
Motor skills demanding	Figure skating Ski jumping Snow boarding Curling	79.3% (23/29)	Motor skills demanding	Bowling Diving Shooting Archery Sailing Gymnastics Horse riding Dancing	87.0% (50/60)
Team sports	Ice hockey (women) Ice hockey (women U-22) Ice hockey (men U-20)	97.6% (82/84)	Team sports	Basketball (women) Soccer (women) Soccer (Olympic team) Volleyball (men) Handball	93.3% (70/75)

well as airway inflammation (1). As athletes are repeatedly and strongly exposed to various airborne allergens, the regular use of these agents without anti-inflammatory treatment may be extremely harmful (6).

A few studies of elite athletes have included reports of used antiasthmatic medication (3,5,8,23,25). However, these studies have included only winter or summer sport athletes and do not include representative control samples. No study has been specifically designed to compare occurrence of antiasthmatic medication between different sport events.

In a recent study, Nystad and coworkers (18) reported the prevalence of asthma in a large sample of Norwegian national-level athletes (*N* = 1082) compared with the general population (*N* = 1038). However, the questions concerning asthma were only part of a more extensive questionnaire, and the authors do not specify used medications. The actual response rate in this asthma study was only 67%, and results were not compared between winter and summer sport events. No study has reported the prevalence of asthma and use of asthma medication among elite athletes after the IOC restricted the use of inhaled β_2 -agonists in 2002.

To investigate frequency of antiasthmatic medication use and factors associated with it, we examined a large sample of Finnish elite athletes using a structured questionnaire. Their results were compared with a representative sample of young adults.

METHODS

Study design for athletes. A cross-sectional questionnaire survey was carried out during May–October in 2002. In Finland, the National Olympic Committee provides

financial support for: 1) athletes with Olympic Medal possibilities (*N* = 54), 2) athletes who probably will participate in the next Olympic Games (*N* = 109), and 3) young athletes who probably will participate in the Olympic Games in the future (*N* = 132). The National Olympic Committee supports financially also Olympic team sport events and some non-Olympic events such as orienteering and ski-orienteering (*N* = 199). All these athletes (*N* = 494) comprised the source population for this study. They were asked to complete the questionnaire on their national team camps during the study period. Of them, 446 (90.3%) filled in a structured questionnaire (8,10) and signed written informed consent. The athletes were divided into four groups according to their type of sport. The four groups were speed and power sport athletes, endurance athletes, athletes in motor skills demanding events, and team sport athletes (Table 1). The characteristics of the four study groups are given in the Table 2.

Control subjects. The reference group consisted of persons aged 18–29 yr (*N* = 1 894) in the sample of the Finnish national health survey Health 2000, coordinated by the National Public Health Institute and implemented in collaboration with the Ministry of Social Affairs and Health, the 80 health center regions included in the sample, and several Finnish organizations (the Central Pension Institute, the Social Insurance Institution, the Municipal Pension Institute, Statistics Finland, The National Research and Development Centre for Welfare and Health, the Institute of Occupational Health, and the UKK-Institute for Health Promotion).

The target population of Health 2000 comprised all persons aged 18 and over and living in Finland. A nationally representative two-stage cluster sample was drawn, which

TABLE 2. Characteristics of the study groups.

	All Athletes (<i>N</i> = 446/494)	Speed and Power Events (<i>N</i> = 113)	Endurance Events (<i>N</i> = 108)	Motor Skills Demanding Events (<i>N</i> = 73)	Team Sport Events (<i>N</i> = 152)	Controls (<i>N</i> = 1504/1876)
Sex (men/women)	261/185	82/31	62/46	45/28	72/80	766/738
Mean (SD) age (yr)	23.0 (4.5)	23.8 (4.1)	23.6 (4.0)	23.6 (6.5)	21.6 (3.6)	23.4
Mean (SD) duration of active sport career (yr)	11.7 (4.3)	12.2 (3.7)	12.4 (4.6)	11.9 (5.0)	10.8 (4.1)	—
Mean (SD) training amount (h·wk ⁻¹)	15.4 (6.1)	15.5 (4.6)	17.3 (5.9)	15.1 (7.4)	14.1 (6.3)	—
Smoking status						
Never smoker	77.6 (346)	80.5 (91)	91.7 (99)	74.0 (54)	67.1 (102)	44.1 (663)
Ex-smoker	11.0 (49)	12.4 (14)	5.6 (6)	6.8 (5)	15.8 (24)	17.6 (265)
Current smoker	11.4 (51)	7.1 (8)	2.8 (3)	19.2 (14)	17.1 (26)	38.3 (576)
Response rate (%)	90.3	89.0	90.8	82.0	95.6	80.2

comprised 10,000 persons and 80 regions (municipalities or groups of municipalities with joint primary care). All 15 bigger cities and towns were included in the sample. Persons age 30 or over were interviewed and invited to a health examination; the substudy of younger adults aged 18–29 consisted of a computer-aided health interview carried out during spring–summer 2001 by professional interviewers of Statistics Finland. The final size of the sample of those aged 18–29 was 1876 of which 1504 (80.2%) participated in the health interview.

Questionnaire. Both athletes and control participants answered to similar structured questions (8,10). Athletes had the possibility of consulting with the author (A.A.) when filling out the questionnaire. In case the athlete was injured and did not participate in training camp, the questionnaire was sent to the athlete by mail. All the questionnaires were filled in anonymously, and were confidentially analyzed and reported.

Questions concerned asthma, exercise-induced bronchial symptoms, use of asthma and allergy medication, characteristics of sport activities, educational level, and smoking habits. Subjects were asked the following questions: 1) “Do you have asthma diagnosed by a physician?” If the subject answered positively, he was considered to have asthma. All the subjects were asked 2) “Do you currently use any asthma medication for it?” Subjects were also asked to name all the physician-prescribed preparations they had used during the previous 12 months.

All the subjects were asked about their smoking habits: 3) “Have you smoked more than 100 cigars or cigarettes in your life?” 4) “What is your current smoking status: (a) daily smoker, (b) occasional smoker, (c) nonsmoker?” 5) “When was the last time you smoked (a) today or yesterday, (b) 2 d to 1 month ago, (c) over 1–6 months ago, (d) over 6 months to 1 yr ago, (e) 1–5 yr ago, (f) over 5–10 yr ago, or (g) over 10 yr ago?” If the subject had smoked fewer than 100 cigars/cigarettes during his lifetime, he was considered to be a never smoker. If the subject had smoked over 100 cigars/cigarettes and had smoked for the last time more than 1 month ago, he was considered to be an ex-smoker. If the subject answered positively to question number 3 and answered daily or occasional smoker to question number 4, he was considered to be a current smoker.

Athletes were also asked: 6) “How often do you have cough, shortness of breath, or wheezing in connection to exercise (each symptom asked separately): (a) daily, (b)

weekly, (c) monthly, (d) in connection to respiratory infections, or (e) never?”

Antiasthmatic and allergy medication were classified as inhaled β_2 -agonists, inhaled corticosteroids, cromones (sodium cromoglycate and nedocromil), leukotriene antagonists, and oral antihistamines. Inhaled β_2 -agonists were further classified as short-acting (salbutamol and terbutaline) and long-acting (salmeterol and formoterol) β_2 -agonists.

Statistical methods. The sample-size requirement was calculated using a study power of 80%, a Type I error α of 0.05, and an estimated occurrence of 10% and 5% for use of antiasthmatic medication in the athlete and control group, respectively. A total of 434 study subjects in both groups was required to identify a 5% difference in medication rates between these groups.

Odds ratios (OR) for the presence of antiasthmatic medication and their 95% confidence intervals (95% CI) for different athlete groups compared with controls were analyzed using a logistic regression model (SPSS 10.0 software). Age, sex, smoking status, and type of sport were included as independent covariates in the analysis. Significance of the covariate terms was tested with likelihood ratio statistics and expressed as exact *P* values.

RESULTS

Physician-diagnosed asthma was reported by 13.9% (62/446) of the athletes and by 8.4% (126/1504) of the controls (Table 3). After adjusting for age, sex, and smoking, OR (95% CI) for physician-diagnosed asthma was significantly higher among endurance and team sport athletes as compared with controls (Table 4). After adjusting for age, sex, and smoking, the prevalence of asthma did not differ significantly between winter and summer athletes (OR, 1.60; 95% CI, 0.89–2.85). Of the asthma-like symptoms, the occurrence of wheezing varied significantly (*P* = 0.004) by type of sport and was most often reported by endurance athletes.

Athletes reported use of any antiasthmatic medication significantly more often than the controls (9.6% vs 4.2%) (Table 3). After adjusting for age, sex, and smoking, OR for any asthma medication use was significantly higher among endurance and team sport athletes as compared with controls (Table 4). No statistical difference was found in the absolute frequency (10.0% vs 9.4%) or in age-, sex-, and smoking-adjusted OR between winter and summer athletes (OR, 1.26; 95% CI, 0.64–2.48). Of the athletes with asthma

TABLE 3. Prevalence (%) of physician diagnosed asthma and use of antiasthmatic medication in athletes and controls.

	Physician-Diagnosed Asthma	Asthma Medication	Inhaled β_2 -Agonist	Inhaled Corticosteroid	Cromone	Leukotriene Antagonist	Oral Antihistamine
All athletes	13.9 (62/446)	9.6 (43/446)	7.4 (33/446)	6.3 (28/446)	1.6 (7/446)	0.7 (3/446)	13.7 (61/446)
Women	15.7 (29/185)	13.0 (24/185)	10.3 (19/185)	9.2 (17/185)	2.2 (4/446)	1.1 (2/185)	17.3 (32/185)
Men	12.6 (33/266)	7.3 (19/261)	5.4 (14/261)	4.2 (11/261)	1.1 (3/261)	0.4 (1/261)	11.1 (29/261)
Speed and power athletes	8.8 (10/113)	7.1 (8/113)	5.3 (6/113)	4.4 (5/113)	0	0	11.5 (13/113)
Endurance athletes	22.2 (24/108)	14.8 (16/108)	10.2 (11/108)	10.2 (11/108)	3.7 (4/108)	1.9 (2/108)	24.1 (26/108)
Motor skills demanding events	8.2 (6/73)	2.7 (2/73)	1.4 (1/73)	1.4 (1/73)	0	0	8.2 (6/73)
Team sport athletes	14.5 (22/152)	11.2 (17/152)	9.9 (15/152)	7.2 (11/152)	2.0 (3/152)	0.7 (1/152)	10.5 (16/152)
Controls	8.4 (126/1504)	4.2 (63/1504)	3.0 (45/1504)	1.9 (28/1504)	0.2 (3/1504)	0	10.8 (163/1504)
Women	8.1 (60/738)	4.5 (33/738)	2.4 (18/738)	2.6 (19/738)	0	0	11.7 (86/738)
Men	8.6 (66/766)	3.9 (30/766)	3.5 (27/766)	1.2 (9/766)	0.4 (3/766)	0	10.1 (77/766)

medication, 77% used medication on a regular basis. Female athletes used asthma medication significantly more often than their male counterparts (13.0% vs 6.9%, $P = 0.02$).

Inhaled β_2 -agonists were the most commonly used antiasthmatic drugs in all athlete groups. Inhaled β_2 -agonist use was reported by 7.4% (33/446) of the athletes and 3.0% (45/1504) of the control subjects (Table 3). Long-acting β_2 -agonists (salmeterol, formoterol) were reported by 2.7% and 0.3% and short-acting β_2 -agonists (salbutamol, terbutaline) by 6.3% and 2.9% of the athletes and control subjects, respectively. Of the athletes, 4.0% (18/446) reported using inhaled β_2 -agonists on a regular basis and 3.4% occasionally or when needed. A total of three athletes reported regular use of inhaled β_2 -agonists without inhaled corticosteroid medication. Similarly, inhaled corticosteroids were reported by 6.3% (28/446) and 1.9% (28/1504), cromones by 1.6% (7/446) and 0.2% (3/1504), and leukotriene antagonists by 0.7% (3/446) and 0% of the athletes and control subjects, respectively. Of the athletes, 5.4% used inhaled corticosteroids on a regular basis and 0.9% when needed. None of the athletes used antiasthmatic medication without having reported physician-diagnosed asthma. Age, sex, and smoking adjusted OR (95% CI) for use of inhaled β_2 -agonists and inhaled corticosteroids are represented in Table 4.

Nineteen (30%) of those athletes having physician-diagnosed asthma reported not using asthma medication at all. Of the control subjects having physician-diagnosed asthma

63 (50%) reported not using asthma medication at all. As adjusted for age, sex, and smoking, the difference was not statistically significant ($P = 0.09$).

A significant difference was observed in the frequency of oral antihistamine use between different sport events. After adjusting for age, sex, and smoking, OR (95% CI) for use of oral antihistamines was significantly higher among endurance athletes as compared with controls (Table 4).

DISCUSSION

As expected, the prevalence of asthma was nearly two times more common among elite athletes as compared with control subjects of the same age. Similarly, the use of asthma medication was over two times more frequent among athletes than controls. However, the frequency of reported asthma medication use was clearly lower than the number of physician-diagnosed asthma cases in athletes. Based on this data and as compared with earlier reports of asthma prevalence in Olympic athletes (23,25), there are no signs of inhaled β_2 -agonists overuse in Finnish Olympic athletes.

Validity of the data. The response rate of the study was excellent exceeding 90% for the athletes and was over 80% for the control subjects representing Finnish people of the same age. The studied outcome variable, use of antiasthmatic medication, was based on previously used questions

TABLE 4. Logistic regression model on physician diagnosed asthma and asthma medication.

Characteristic	Asthma		Any Asthma Medication		Inhaled β_2 -Agonists		Inhaled Corticosteroids		Oral Antihistamines	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (yr)										
Under 21	1		1		1		1		1	
21–24	1.02	0.69–1.52	1.05	0.62–1.79	0.86	0.47–1.60	0.94	0.45–1.98	1.27	0.87–1.84
Over 24	1.17	0.80–1.73	1.36	0.82–2.26	1.33	0.75–2.35	1.51	0.76–3.01	1.33	0.92–1.92
Sex										
Women	1		1		1		1		1	
Men	0.97	0.71–1.32	0.75	0.50–1.12	1.00	0.63–1.59	0.47	0.27–0.83	0.78	0.59–1.04
Smoking status										
Never smoker	1		1		1		1		1	
Ex-smoker	1.15	0.73–1.82	1.26	0.73–2.17	1.13	0.60–2.14	1.79	0.90–3.56	1.05	0.70–1.56
Smoker	1.43	1.00–2.06	0.95	0.57–1.58	0.84	0.46–1.52	0.83	0.38–1.78	0.84	0.59–1.18
Type of sports										
None (controls)	1		1		1		1		1	
Speed and power athletes	1.22	0.61–2.43	1.87	0.85–4.11	1.78	0.72–4.38	2.98	1.09–8.18	1.07	0.58–1.97
Endurance athletes	3.70	2.18–6.18	4.16	2.22–7.78	3.57	1.72–7.42	6.81	3.09–15.01	2.52	1.54–4.12
Motor skills demanding events	1.08	0.46–2.56	0.69	0.17–2.92	0.45	0.06–3.30	0.88	0.12–6.63	0.76	0.32–1.79
Team sport athletes	2.06	1.25–3.41	3.00	1.68–5.37	3.61	1.92–6.8	4.29	2.04–9.02	0.92	0.57–1.71

by the National Public Health Institute. The current study of athletes was based on a self-administered questionnaire, whereas corresponding data on control subjects were obtained through face-to-face interview. Interview data on specific medication for bronchial asthma cannot be accurate if the patient misunderstands or forgets either the indication or the nature of the treatment or is unwilling to report it. As the diagnosis of asthma is conceptually clear, however, its diagnosis is easily communicated by the doctor to the patient. This has been shown to be accurately verified by an interview (10). The Mini-Finland Health Survey (10), from which our questions regarding asthma were adapted, showed good agreement in asthma between a clinical examination by physician, a home interview by public health nurse, and the same questions of a self-administered questionnaire as used in the current study (data not shown). No considerable doubt remains that this also concerns survey data on antiasthmatic medication.

The principal aim of this study was to evaluate use of antiasthmatic medication in Finnish elite athletes as compared with people at large. Use of pulmonary function tests for all athletes and controls would have increased obtained information. However, introducing the new IOC regulations (including eucapnic hyperventilation test, histamine/methacholine challenge test, exercise challenge test, and bronchodilatation test) would have required nearly 8000 pulmonary function tests in the present study, which obviously is not possible. Previously, Lumme et al. (15) and Helenius et al. (9) have shown that highly trained athletes with physician-diagnosed asthma nearly always show also increased bronchial responsiveness and eosinophilic airway inflammation. In fact, occurrence of asthma based on pulmonary function testing has been much higher in these studies than occurrence of physician-diagnosed asthma as reported by the athletes.

A total of 4.2% of the control subjects reported use of asthma medication, which is a similar prevalence rate as recently reported among the Finnish general population (4). In all athlete groups, participants were dedicated athletes as indicated by their training amount. The athletes represented the highest level of sports in Finland. Distribution of men and women as well as the number of daily smokers and nonsmoker were not exactly the same between athlete and control groups. However, these confounding factors were adjusted using logistic regression models. Sample-size requirement for athletes was calculated using established study power (80%) and Type I α error of 0.05. This gave 434 athletes, which we managed to recruit.

Comparison with earlier data. Occurrence of asthma has been higher in winter than in summer sports athletes (3,8,9,14,21–25). Larsson et al. (14) observed that asthma as defined by a positive methacholine challenge test and at least two exercise-related symptoms affected 33% of cross-country skiers and 3% of the control subjects. If a previously diagnosed asthma was included in the analysis, this occurrence increased up to 55%. Of these athletes, 36% used antiasthmatic medication, which included most often inhaled β_2 -agonists, followed by inhaled corticosteroids, and

cromoglycate. Sue-Chu et al. (21) investigated 118 cross-country skiers from Norway and 53 from Sweden. Using similar definitions, asthma was found in 12% of the Norwegian and in 42% of the Swedish skiers. Of them, 16% and 38%, respectively, reported use of inhaled β_2 -agonist, and 4% and 23% use of inhaled corticosteroids.

Helenius and Haahtela (6) studied 253 Finnish summer sport athletes using a similar questionnaire than in the present study. Use of antiasthmatic medication was reported by 10% of the speed and power athletes, by 22% of the long-distance runners, and by 21% of the swimmers studied. The most commonly used medication was inhaled β_2 -agonists. These figures are significantly higher than those reported in the present study, in which 9% of all athletes reported use of any antiasthmatic medication. The figures for use of inhaled β_2 -agonists and inhaled corticosteroid were even lower. In accordance with the study of Helenius and Haahtela (6), use of antiasthmatic medication was most frequent in endurance athletes. However, the present study included all the athlete groups financially supported by the National Olympic Committee. The occurrence of asthma medication use was significantly lower among athletes in motor-skills demanding events as compared with other sport groups (2.7% vs 14.8% among endurance athletes), and this lowers somewhat the occurrence of asthma medication use in the whole athlete group. It can also be argued that self-selection may have happened so that asthmatic athletes could not achieve the highest athletic level, which then would lower the occurrences for asthma and antiasthmatic in these groups. However, Potts (19) studied 735 swimmers using respiratory-symptom questionnaire, and observed that occurrence of asthma was most common in the international-level swimmers group as compared with junior or national-level swimmers.

In contrast with previous findings (3,8,9,12,14,21–25), no significant difference was observed in the frequency of antiasthmatic medication between winter and summer athletes. Females used significantly more often medication than did males. Occurrence of asthma has been higher in females than in males in swimmers and also in other athlete groups (9,19,20).

Between 1994 and 2000, the use of asthma medication increased by 42% in Finnish general population (4). However, during recent years, use of asthma medication seems to have lowered in the Finnish athlete population (8). In general population, the use of preventive medicines (inhaled corticosteroids) has grown more rapidly than symptom relieving, short-acting β_2 -agonists. Since 1994, the ratio of defined daily doses of preventers to those of relievers has exceeded 1.0 (4). In contrast, inhaled β_2 -agonists are still most commonly used antiasthmatic medication, although eosinophilic and neutrophilic airway inflammation affects every fifth athlete (7,11,15).

The IOC has recently restricted use of inhaled β_2 -agonists and requires documentation for their use in the Olympic Games (17). In the present study, no overuse of inhaled β_2 -agonists or antiasthmatic medication was found in Finnish Olympic athletes. The low occurrence of asthma in the

present as compared with previous studies (8,9,12,14,21–23,25) suggests that underdiagnosis may still exist in this athlete population. Because only two-thirds of the asthmatics in this study used antiasthmatic medication, undertreatment may also occur. Similarly, of the asthmatic controls 50% used antiasthmatic medication. However, their requirements for respiratory system during exercise performance are much less.

In conclusion, the frequency of reported antiasthmatic medication was clearly lower than the reported occurrence of physician-diagnosed asthma in a large sample of Finnish

Olympic athletes. Use of asthma medication was most frequent in endurance athletes, but no difference was observed between winter and summer sport athletes. Female athletes used antiasthmatic medication more often than males. No evidence of overuse of inhaled β_2 -agonists was found. Treatment of airway inflammation seemed unsatisfactory.

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