

Original article

Sensitization, asthma and allergic disease in young soccer players

Background: The aim of this study was to identify the prevalence of allergic disease in young soccer players compared to age-matched students and to evaluate if this prevalence changes as the intensity of training increases.

Methods: A modified ECRHS questionnaire was administered to 194 soccer players divided by age as *Beginners* (8–11 years), *Juniors* (12–16 years) and *Under 21* (17–20 years) to evaluate the prevalence of allergic diseases and symptoms as well as drug consumption. Subjects with a positive personal history of allergic diseases underwent skin prick and/or patch tests. Age-matched students ($n = 136$) were used as a control group.

Results: The prevalence of allergic diseases was 34.5% in soccer players and 31.6% in control subjects (n.s.). Skin sensitization to inhalant allergens was detected in 14.4% of symptomatic soccer players and in 19.2% of control students (n.s.). Patch tests were positive in 35.7% of soccer players and 23.0% of controls with allergic dermatitis (n.s.). The prevalence of allergic diseases did not significantly change in relation to the intensity of training. Although the relative prevalence of sensitization to perennial allergens and asthma was less frequent in soccer players than in controls, and the occurrence of exercise-induced bronchoconstriction was similar in the two groups, soccer players used twice as many anti-allergic and anti-asthmatic drugs as control students.

Conclusions: An increasingly intensive training programme is not associated with greater risk of allergic disease in soccer players. Therapy regimens of allergic athletes and exercisers should be monitored more closely to guarantee adequate treatment yet avoid inappropriate drug use and doping practices.

**M. T. Ventura¹, A. Cannone²,
D. Sinesi³, R. Buquicchio¹,
M. Carbonara⁴, E. Di Leo¹, M. Bonini⁵,
M. Dagnello¹, S. Bonini⁶**

¹Department of Internal Medicine, Immunology and Infectious Diseases (MIDIM); ²Department of Neurological Sciences, University of Bari Medical School, Policlinico, Bari; ³U.O. of Sport Medicine, Policlinico, Bari; ⁴Italian Statistical Institute, Regional Office of Bari, Bari; ⁵Sport Medicine Department, Università Cattolica del Sacro Cuore, Rome, Italy; ⁶INMM-Italian National Research Council and Second University of Naples, Naples, Italy; GA²LEN Unit Team Leader

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Prof. Sergio Bonini
Institute of Neurobiology and Molecular Medicine
Italian National Research Council
C/o Via Ugo de Carolis 59
00136 Rome
Italy

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It is widely accepted that an adequate amount of physical activity favours health and well-being. Moreover, a sedentary lifestyle and obesity are associated with a higher prevalence of allergic disease and asthma in both children and adults (1, 2).

Conversely, physical exercise may trigger symptoms, particularly bronchial obstruction, in allergic and non-allergic subjects (3), and increased prevalence rates of allergic diseases, asthma and contact dermatitis have been reported in athletes (4–7). The question has been raised whether allergic children and adolescents should practice sports or whether competitive training may favour the development or exacerbation of allergic diseases.

However, data on allergy and sports have mainly focused on groups of elite or Olympic athletes who are heterogeneous as regards age, sex, geographical origin and type of sport (5–7). These studies usually involve comparisons to the general population and not to an age-matched control groups. Furthermore, training programmes in elite athletes are quite extreme and hardly comparable to sport activities in nonprofessional young amateurs.

In this study, we evaluated the prevalence of allergic diseases and sensitization in a male population of different ages and levels of training in a second division Italian soccer team compared to an age-matched group of controls. Soccer was deliberately chosen as the sport discipline since it is a mixed-type of physical exercise (aerobic-anaerobic) and involves both outdoor (mainly) and indoor training. In Italy, soccer is also the most practiced activity, permitting us to enrol a well-matched control population. Furthermore, soccer has recently received special attention in view of the high incidence of amyotrophic lateral sclerosis, a disease often related to immunological abnormalities and doping practices (8, 9).

Materials and methods

The study population consisted of 194 males practicing soccer in the juvenile teams of A.S. Bari. All soccer players were included in the study with no restrictions of any kind. Subjects were subdivided into 3 classes according to age and level of training: *Beginners* (non-competitive level; 8–11 years), *Juniors*

(competitive level; 12–16 years) and *Under 21* (professional and semi-professional level; 17–20 years). As a control group, 136 male age-matched students were studied. Control students played sports, and in particular soccer, for recreation only. Students practicing any sport at a competitive level were not included in the control group. Allergic diseases and symptoms or disorders for which sports were contraindicated were not considered exclusion criteria in the recruitment of controls. All participants gave written informed consent. The study protocol was approved by the Ethics Committee of the Policlinic Hospital, University of Bari, Italy.

Clinical diagnosis

A slightly modified European Community Respiratory Health Survey (ECRHS) (10) questionnaire was used to collect in a structured and homogeneous way data about family history of atopy, history of allergic diseases and symptoms as well as use of medications. Diagnosis was made by combining questionnaire data with data of an accurate medical examination including pulmonary function tests and provocation tests when appropriate. Criteria set by international guidelines were used for diagnosis of asthma (<http://www.ginasthma.com>), rhinoconjunctivitis (<http://www.whiar.com>) and urticaria (11). Since no subject had allergic skin symptoms at the time of observation, the diagnosis of 'allergic dermatitis' was retrospective and based on answers to the questionnaire. This diagnostic approach did not allow to distinguish with certainty between atopic eczema and contact dermatitis. In the case of multiple allergic disorders, the prevalent symptom was considered.

Data about the prevalence of allergic disease in the population sample refer to cumulative life-prevalence rates, independently from the presence of symptoms at the time of observations or in a given period.

In order to reduce age effects, changes in prevalence in the three age groups of soccer players and controls were based on point-prevalence rates at the time of observation and during the preceding 12 months.

Skin prick tests

To detect sensitization to the most common aero-allergens, skin prick tests (SPT) were performed in all subjects reporting a disease or symptoms possibly related to inhalant allergy (rhinitis, conjunctivitis, asthma, exercise-induced bronchoconstriction). The standard panel of aqueous glycerinated extracts (and a positive – histamine 1 mg/ml and – negative extract diluted control) were used (Merck S.p.A., Milan, Italy): *Parietaria*, *Compositae*, *Grass*, *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, *Alternaria*, *Aspergillus*, *Dog* and *Cat*. The response was considered positive if the diameter of the wheal was 3 mm greater than the one provoked by the extract diluent. All SPTs were evaluated by the same physician.

Patch tests

In subjects with allergic dermatitis, the guidelines and panel recommended by the Italian Society of Environmental and Occupational Dermatology were used for patch tests (PTs) (12). The panel included 23 substances of the European Standard Series (Hermal., Reinbeck, Germany). Finn chambers were from Epitest Ltd OY, Tuusula, Finland. PTs were applied to the skin of the back and removed after 48 h. Readings were made 10 min

after removal. Additional readings were performed after 24 h in doubtful cases. All PTs were evaluated by the same physician.

Statistics

Data were analysed by the SPSS software 8.0. Comparisons between groups for the variables studied were made using the chi-square test. *P*-values lower than 0.05 were considered statistically significant.

Results

The two study groups (soccer players and control students) were statistically uniform regarding family history of atopy (9.3% vs 8.1%) and mean age (14.4 vs 13.9 years).

The cumulative life-prevalence of allergic diseases was 34.5% (67 of 194) in soccer players and 31.6% (43 of 136) in the control group (n.s.). There was no significant difference in the prevalence of any allergic disease in soccer players vs controls (Table 1). However, when only primary symptoms were considered the relative prevalence of rhinitis and conjunctivitis was higher in allergic soccer players than in allergic controls (35.8% and 23.9% vs 20.9% and 14.0%), while asthma was more frequent in allergic students than in allergic soccer players (18.6% vs 4.5%; *P* < 0.001).

Skin sensitization to inhalant allergens associated with clinical symptoms was detected in 14.4% (28 of 194) of soccer players and in 19.2% (26 of 136) of controls (n.s.). No significant difference was observed between the two groups with reference to the type of allergens responsible for sensitization. However, sensitization to pollens was relatively (*P* < 0.05) more frequent in soccer players than in controls (64.3% vs 20.0%) while sensitization to dust mites occurred relatively more often in the control group (50.0% vs 14.3%).

Table 1. Prevalence of allergic diseases and symptoms in young soccer players and control students

Disease	Soccer players (<i>n</i> = 194)	Control students (<i>n</i> = 136)	Statistical significance
Rhinitis	12.4%	6.6%	n.s.
Conjunctivitis	8.2%	4.4%	n.s.
Asthma	1.6%	5.9%	n.s.
Allergic dermatitis	2.6%	5.2%	n.s.
Urticaria	4.6%	3.7%	n.s.
EIB	5.1%	2.9%	n.s.
Anaphylaxis	0%	0.7%	–
Others (GI tract, symptoms possibly related to allergy)	0%	2.2%	–

Only primary symptoms were considered although several soccer players and controls had more than one allergic disease. EIB, exercise-induced bronchoconstriction; n.s., not statistically significant.

The prevalence of positive patch tests in subjects with allergic dermatitis was 35.7% in soccer players and 23.0% in control students (n.s.).

The prevalence of allergic diseases at the time of observation or during the last 12 months appeared to be higher in the 12–16 years age group in both soccer players and control students. Excluding this age effect, the prevalence of allergic disease did not significantly change with increasing training in soccer players. In fact, point prevalence rates changed in a similar way in soccer players and controls and were not different at any age group (Table 2).

The use of anti-allergic and anti-asthmatic drugs in subjects with allergic disease was higher in soccer players (75.0%) than in control students (42.3%). In particular, at the time of the study, soccer players were using β_2 agonists and inhaled corticosteroids in 7.1% and 10.7% of cases, while only 3.8% of control students were using these drugs.

Discussion

The prevalence of allergic disease in subjects practicing sports has been studied previously in highly competitive athletes whose data were then compared to those of the general population. In the present study, we selected subjects practicing soccer in different age groups and levels of training compared to age-matched students who only play soccer recreationally. The study design was aimed at evaluating whether an increasingly intensive training programme (from teaching courses to semi-professional and professional levels) was associated with significant changes in sensitization, asthma and allergic diseases, regardless of age.

The prevalence of sensitization, allergic diseases and symptoms in soccer players was generally high (one subject in every five or six showed sensitization and one in three had allergic disease). Nevertheless, this prevalence was not significantly different from that of control students, indicating that allergies did not prevent either the practice of sports, even at the professional level, nor

did more intensive training modify the prevalence of allergy and asthma.

The sample considered was too small to identify if the different distribution of allergy phenotypes in soccer players (more frequent sensitization to grass/more rhinoconjunctivitis) versus control students (more frequent sensitization to mites/more asthma and eczema) was a chance finding or might have been related specifically to soccer or to the more intensive level of training. It is more reasonable to speculate that subjects with more severe allergies refrained from practicing sports at a competitive level rather than the playing of soccer increased the risk of rhinitis and/or prevented the development of asthma. The lower prevalence of allergy in the *Under 21* groups might have been related to a selection bias and to the small number of subjects in the control group ($n = 23$).

The prevalence of asthma previously reported in elite athletes (up to 22.8%) (13) is definitely higher than that observed in our soccer players. The type of sport seems to influence the occurrence of asthma, which is more frequent in endurance sports such as long distance running (14), winter sports such as cross-country skiing and ice hockey (15, 16) and swimming (17). Moreover, the rigorous training carried out by elite athletes might also increase their susceptibility to upper respiratory tract infections and asthma (18). Finally, the inclusion in our population sample of subjects aged 8–11 years might have influenced prevalence rates recorded, because of the frequent appearance of asthma at a later stage of life.

In the present study, self-reported symptoms of exercise-induced bronchoconstriction (EIB) were frequently observed in both soccer players (5.1%) and control students (2.9%), independently of the presence of clinical asthma. These data are consistent with the previously reported occurrence of EIB in allergic subjects and in football players (19).

Although the occurrence of EIB might justify the frequent use of β_2 -adrenergic agents and inhaled corticosteroids by soccer players, higher than that we should expect when considering the prevalence of asthma in this group (7.1% and 10.7%, respectively vs 1.6% of asthmatics), our data indicate that soccer players used twice

Table 2. Prevalence of allergic disease (and sensitization) in soccer players and control students in different age groups and training programmes

Age class (training programme in soccer players)	Soccer players ($n = 194$)		Age-matched control students ($n = 136$)		Statistical significance*	
	Allergic diseases	SPT +ves	Allergic diseases	SPT +ves	Allergic diseases	SPT+
8–11 years (Beginners, n)	7.7%	(1.0%)	5.1%	(2.2%)	n.s.	n.s.
12–16 years (Juniors, n)	18.0%	(12.3%)	23.5%	(14.7%)	n.s.	n.s.
17–20 years (Under 21, n)	8.7%	(1.0%)	2.9%	(2.2%)	n.s.	n.s.

Percentages represent the prevalence rates at the time of observation or in the preceding 12 months. In brackets the prevalence of 'allergic diseases' associated with positive skin tests. n.s., not statistically significant.

*Soccer players vs controls for the different age classes.

as many anti-asthmatic drugs as control students, in whom asthma was more frequently observed and EIB occurred with a similar prevalence. Other medications such as antihistamines were also much more frequently used by allergic soccer players (42.9%) than control students (23.1%). Whether this was a sign of a better medical monitoring and disease management or a consequence of a more general tendency of even nonprofessional exercisers to counteract symptoms to achieve better performances is a matter of speculation. Certainly, the high percentage of athletes using β_2 -adrenergic drugs (20) is a matter of concern for the International Olympic Committee (<http://www.olympic.org>), the World Anti-doping Agency (21) and the scientific community in general (22).

In conclusion, the present study demonstrates that, unlike what has been previously reported in elite athletes,

young soccer players who participate in long-term training programmes are not at increased risk for sensitization and allergic disease. Therapy regimens of allergic athletes and exercisers should be monitored more closely to guarantee adequate treatment yet avoid excessive drug use and inappropriate doping practices for the prevention of asthma.

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