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Anabolic Steroid Exposure of Athletes of Qom, Iran, Through Performance Enhancing Drugs Use

Mansour Ebrahimi
Green Research Center, University of Qom, Iran

Abstract: The aim of study was to determine the extent of Anabolic Steroids (AS) exposure of athletes of Qom, Iran in sport clubs. AS are a group of synthetic steroid hormones which have the potential to alter the normal functioning of the endocrine system in wildlives and humans and sharp increase of some diseases have been shown to have direct relation with increase to their exposure. Many athletes use Performance-Enhancing Drugs (PEDs) in training and even competitions. It has been shown that some PEDs have capacity to disturb normal endocrine system and increases of some disorders in athletes have been related to continuous exposure to AS. Here, the amounts of athletes' exposure to AS in Qom sport clubs have been studied. The results showed that nearly in all sport clubs different types of supplementary diets, were used up to 750 days and it were more common in athletes of fitness and aerobic fields which mainly recommended by couches. More than 15.6% of 62 PEDs used in Qom sport clubs had been confirmed and registered as AS, mainly they were steroid hormones derivatives such as testosterone, prohormones, anabolic steroids, vinsterol, sevestanol, oxymetolone, nanderlone, anadrol (oxybolone) and oxandelone and they were common between athletes of aerobic and fitness fields. Significant differences ($p<0.05$) were found between the numbers, types and duration of PEDs usage, field of sport activity and PEDs advisors while highly significant ($p<0.001$) difference found between male and female sexes. By considering the finding of this study and the extent of AS usage by athletes, it would be possible to see a sharp surge in hormone dependent disease in Qom so urgent action should be taken.

Key words: Endocrine disrupting chemicals, sport clubs, hormone dependent diseases

INTRODUCTION

In recent years, there have been many reports on chemical substances which may disturb human or animal endocrine systems (Singleton and Khan, 2003). The endocrine system is a communication system that maintains normal physiological balance across multiple organ systems. It accomplishes this by modulating or regulating the activity of almost every body system in reaction to variations in body temperature, activity level, stress and circulating levels of nutrients and hormones required for growth, reproduction and metabolism (Witorsch, 2002a). The exogenous compounds have been called by many names such as endocrine disrupting chemicals, environmental hormones and majority of them fall into Anabolic Steroids (AS) group (Tsai, 2006). It has been shown that they can bind to hormone receptors (mainly sex steroid hormones), either mimic or block normal hormone functions and increase in incidences of hormone dependent disease have been related to increase in exposure to AS (Allen and Gottlieb, 1997). Decline in sperm quality and quantity (Peknicova *et al*., 2002), increase in prostate, testicular and breast cancer and some other reproductive anomalies have been blamed to AS exposure (Imaida and Shirai, 2000). Due to lipophilic character of AS, they bioaccumulate gradually in adipose tissue and when their concentration reaches to a critical point, they release into blood stream and bind to hormone receptors (Rasmussen *et al*., 2002). It is apparent that exposure to these

chemicals present in the environment can cause sublethal, but still deleterious, effects to wildlife. In many cases reproduction has been adversely affected and in at least some of these cases this disruption has been shown to be a consequence of disruption of the endocrine control of reproduction (Markey *et al*., 2002).

Since the dawn of recorded time, some athletes have looked to external sources for a competitive edge to wield against their opponents (Fraser, 2004). The ancient Greek Olympians are said to have eaten magic mushrooms to win, whereas Aztec athletes favoured the human heart (Climstein *et al*., 2003). Many of today's athletes resort to the use of PEDs and nutritional supplements to augment or enhance training routines or performance. In 1968 the International Olympic Committee (IOC) banned the use of PED substances to promote fair play in competition (Kazlauskas and Trout, 2000). At that time the banned substances were primarily anabolic steroids and amphetamines. Other athletic associations and sport governing bodies soon followed suit by adopting similar bans, including nearly all national sport federations which adopted a drug-testing program to promote fair and equitable competition and to safeguard the health and safety of athletes. Since, then the specified number of banned substances has risen dramatically as athletes are driven to finding new ways to obtain a competitive edge and/or to avoid detection. Despite these regulations, the incidence of PEDs use among athletes has not decreased and in some instances, has increased (Fraser, 2004). In general, the decision to not use drugs is felt to be related more to the fear of reprisal than to health issues and users continue to look for ways to avoid detection rather than decide not to use these banned substances (Kalinski, 2003).

The primary toxic effects of PEDs may be divided as reproductive, hepatic and cardiovascular, and psychological effects, but it has been shown that many of PEDs fall into AS pollutants category and it would not be surprising to see the same side effects of AS in athletes using PEDs (Smurawa and Congeni, 2007). Among men, heightened levels of testosterone lead to decreased levels of Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH), both of which are required for spermatogenesis. The results are a decreased sperm count, irreversible atrophied testicles and impotence (Yesalis, 2001; Van-Breda *et al*., 2003). Increases in testicular and prostate cancers have been noticed due to exposure to AS (Atwood and Bowen, 2007). Female users of steroids often experience the virilizing effects of the drugs. Hirsutism, deepening of voice, clitoral hypertrophy and male pattern baldness can result from chronic abuse of PEDs and ordinarily are irreversible. Acne, increased libido and menstrual irregularities also may be observed (Scott and Scott, 1992). There also has been speculation that prolonged use of PEDs can lead to hormone dependent cancers such as breast and uterine cancers and even non hormone dependent cancers such as hepatic tumours (Shahidi, 2001). In both sexes other side effects such as hepatic and cardiovascular abnormalities and even psychological effects such as roid rages, periods of heightened aggressiveness and irritability have been reported. Other potential psychological side effects include anxiety, tremors, paranoia, mania, hypomania, major depression and occasionally psychosis (Maravelias *et al*., 2005).

Regarding the extent of recent researches and finding on the effects of AS on human health regarding the voluntary usage of PEDs, with AS activity, the purpose of this study was to examine the extent of AS exposure via PEDs usage in athletes of all sport clubs in Qom, Iran.

MATERIALS AND METHODS

Through a cross sectional study design during 2006-2007, all sport clubs in Qom were inspected and studied monthly. Data gathered through monthly referral and different variables such as number of personals and number of coaches in each club, duration of activity, types of sport activities, taking, percentage, duration and advisor of supplementary diets usage, taking, percentage, duration and advisor of PEDs usage were measured through questionnaires. The percentage of PEDs with AS activity were

defined by using Environmental Protection Agency (EPA) databases, only those active substances confirmed as AS component if they had been registered there as AS pollutants. As a part of study, we intended to gather data of athletes who had encountered endocrine related abnormalities due to PEDs intake, but many of them were reluctant to cooperate so data were incomplete. SPSS 16 for Windows software was used for the statistical analysis of significant differences between variables by using multivariate ANOVA (95% significancy level).

RESULTS

During the course of this study, 121 private and governmental owned sport clubs had been registered in National Sport Management Office (NSMO) and only 8 swimming pools were excluded from the study because we did not see any signs of PEDs usage there, while 9 more sport clubs did not participate in the study and 21 were either closed or in the process of closure, so 81 remaining sport clubs were questioned monthly. From 316 personals, 233 of them were serving as coaches, 1.77 coaches per sport club in average with a maximum of 11 and minimum of 1 coach in each sport club. Most of the private sport clubs in Qom were small in size (average of 65 m^2, maximum 1000 and minimum of 30 m^2) and most of them had been established in the last 10 years.

Nearly in all sport clubs (80 out of 81) athletes were using at least one type of supplementary diets, with 100% usage in 6 sport clubs and minimum of 5% of athletes in 1 sport club and up to 750 days of diet taking. The results revealed that athletes of fitness (in 52 sport clubs) had the most tendencies to use supplementary diets followed by aerobic parishioners (in 7 sport clubs). Although in just 2% cases the athletes started their diets under physician supervision, more than 93% of them started and continued their supplementary diets with their coaches advices.

In 66 sport clubs (81%), athletes were using PEDs during the course of this study with a maximum and minimum of 90 and 5% of athletes, respectively, but the average of PEDs usage was 13.8%. They consumed them for a few and up to 180 days. Fitness, aerobics, martial art, wrestling and boxing athletes were the users of PEDs, respectively. Again, coaches were the main advisors to athletes to use PEDs (in more than 70% of sport clubs) followed by physician (23%) (Table 1). Total numbers of 65 PEDs compositions were taken by the athletes of Qom such as steroid hormones (testosterone, prohormones, anabolic steroids, vinestrol, sevestanol, oxymetholone, anadrol and oxandelone), amino acid derivatives and vitamins. By comparing PEDs used in Qom sport clubs with EPA databases it showed from 65 PEDs, 15.6% of them had been confirmed and registered as AS but their usage were more common in Qom sport clubs than other compounds, natural and safe compounds (17 substances, 37.8%) and AS suspected compounds (21 substances, 46.7%) (Fig. 1).

Statically analysis revealed significant differences ($p<0.05$) in duration of supplementary diets, field of sport activities and supplementary diet advisor, while PEDs usage in sport clubs, duration of PEDs usage in athletes, field of sport activities and PEDs advisors showed highly significant

Table 1: Different advisors to athletes of Qom sport clubs to use Diets or PEDs

Advisor	No.	Percent
Diet		
Coach	76	93.80
Physician	2	2.50
Unknown	3	3.70
Athletes	0	0.00
PEDs		
Coach	57	70.37
Physician	19	23.46
Unknown	3	3.70
Athletes	2	2.47

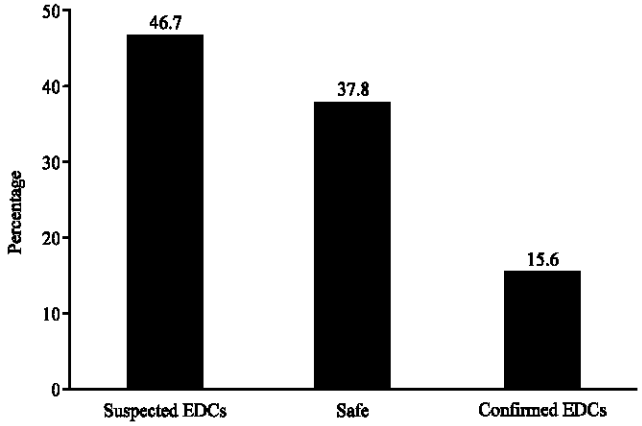

Fig. 1: Percentage of different categories of PEDs used by athletes of Qom's sport clubs, Iran

differences ($p<0.001$). Also the numbers and types of PEDs used in sport clubs showed significant difference ($p<0.05$) with hormone derivatives were the most were being consumed. The sex of athletes highly significant ($p<0.001$) contributed to PEDs rate of consumption with lower usage in female athletes, only 5% of them had tried at least one PEDs compound and all of them were practicing in martial arts.

DISCUSSION

The history of PEDs use strictly follow the history of scientific development that took place at the time of the ancient and the modern Olympic Games; although the drugs used by athletes competing in the first ancient Olympic Games approximately were the same of those used 1 millennium later by their colleagues or by Roman gladiators, the illicit pharmacologic support to sport performance proceeded at a much faster pace in the twentieth century, with a further dramatic increase from the early 1960s to the present (Prendergast *et al.*, 2003). The first official antidoping tests performed on the occasion of a multi sport, international event took place at the Olympic Games of Mexico City in 1968 (Fraser, 2004). At that time, the only prohibited substances were those capable of producing a significant effect on sport performance only if administered, in sufficient amounts, right before or during the competition (Fraser, 2004). Although short (compared with its current equivalent), that first list continuously was updated to include any new form of doping substance or method of administration. The periodic upgrades of the list were performed by the IOC Medical Commission until the constitution of the World Anti-Doping Agency (WADA) in 1999 (Seifulla *et al.*, 2006). In the past 45 years, the prohibited list has expanded progressively. The possible health risks of PED substances and methods have been the subject of several review articles, monographs and conference proceedings. Mostly, these studies have been based on and supported by review of the scientific and medical literature, which have considered the results obtained in controlled, randomized clinical trials and the direct evidence obtained from clinical practice. It is evident that the risks/benefits ratio is always unbalanced toward the risks and many diseases in doppinged athletes have been related to PEDs use (Laos and Metzl, 2006).

Within the last two decades the terms endocrine disrupter, endocrine modulator and hormone mimics have entered the lay and scientific jargon as terms to describe exogenous chemicals that alter the function(s) of the endocrine system and consequently cause adverse health effects in an organism, its progeny or subpopulations (Singleton and Khan, 2003). Any exogenous chemical such as PEDs, no matter how innocuous, may disrupt the physiological balance of the body either by direct

interaction with hormone receptors or indirectly through changes induced in other organ systems and adversely alter endocrine homeostasis (Cheshenko *et al*., 2008). They have potential for impairing development and reproduction or increasing the risk of hormone dependent cancers such as breast, uterine, prostate and testicular cancers (Birrell *et al*., 2007). Some studies have shown that the sperm count in the ejaculate has fallen up to 50% in Western Europe (Bretveld *et al*., 2007) and the incidence of prostate cancer in men and breast cancer in women have increased sharply (Witorsch, 2002b). Some PEDs act exactly by mimicking endocrine system pathway to increase body strength and energy and so they have been classified as endocrine disruptor modulators and would not be odd to see the same side effects in healthy athletes due to continuous use of PEDs (Ciocca, 2005). This study looked at the endocrine modulators contamination in performance enhancing diets used by the athletes of Qom sport clubs.

Considering the findings of this study, there was no responsible body to inspect and manage illegal use of banned PEDs in Qom's sport clubs and by athletes, advised mainly by coaches or even by athletes themselves, so they felt free to consume any substances as performance enhancers. Some strange and even unbelievable scenes were observed during monthly visit to some sport clubs which athletes injecting PEDs before starting their daily exercises and some coaches had setupped a small illegal shop inside the clubs to sell PEDs without any medical prescription. No PED free sport club found in Qom, but we encountered some athletes who have been using PEDs for more than 2 years and did not know anything about the side effects of PEDs. Although use of those substances were common in fitness athletes, others athletes in aerobics, martial arts and wrestling fields also used them.

From 62 different substances were being used by athletes of Qom sport clubs, 15.6% of them were in AS group, but they have being used in nearly in all clubs, therefore it is expected in near future to see a surge in hormone related diseases in athletes here (Ciocca, 2005). We asked athletes whether they have had any disease or problem during last few months, although some refused to answer and we had to ignore this question in final analysis, some of others spoke about their problems ranging from nausea, restlessness, tremor and even in one case infertility due to sperm stickiness and immobility. In summary the extent usage of PEDs with endocrine disrupting ability in athletes of sport clubs of Qom, idiotism of PEDs' side effects and non-responsible behaviour of authorities have provided a very dark future for athletes here and if a quick action not to be taken the situation will get worse and worse.

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