

Research Article / Araştırma Makalesi

## Examination of knowledge, attitudes and behaviors of coaches towards Female Athlete Triad

### *Antrenörlerin Kadın Sporcu Üçlemesi'ne yönelik bilgi, tutum ve davranışlarının incelenmesi*

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#### ABSTRACT

**Objective:** The incidence of the female athlete triad, which is characterized by low energy availability, menstrual dysfunction and decreased bone mineral density, has increased with the increased participation of women in sports. In this study, the knowledge, attitudes and behaviors of the coaches, who have a significant impact on early detection and prevention of female athlete triad were examined.

**Material and Methods:** Coaches over the age of 18 were included in the study. The questionnaire was carried out during a face-to-face interview or digitally via 'Google forms'. The questionnaire was consisted of their practice with female athletes, knowledge about the female athlete triad, their method to detect eating disorders, menstrual dysfunction, and bone stress injuries in their athletes, and of interventions they take upon detection of any component of the triad.

**Results:** 134 coaches, 49 (36.6%) female and 85 (63.4%) males were included in the study. 63.4% of coaches were actively working with female athletes, whereas only 32.8% declared that they had heard of the female athlete triad and 48.5% of coaches have noticed eating disorders in their athletes. Referral of suspected athletes to physicians having any components of female athlete triad were significantly higher by female coaches compared to male coaches ( $p<0.001$ ).

**Conclusion:** The knowledge of the coaches about the female athlete triad was found to be low. Educational interventions will provide significant advances in detection, prevention and treatment of Female Athlete Triad.

**Keywords:** Female athlete, menstrual dysfunction, eating behaviors, coach awareness

#### ÖZ

**Amaç:** Düşük enerji kullanılabilirliği, menstrual disfonksiyon ve düşük kemik mineral yoğunluğu ile tanımlanan kadın sporcu üçlemesi görülme sıklığı kadınların spora katılımlarının artması ile birlikte artmaktadır. Bu çalışmada kadın sporcu üçlemesinin erken dönemde fark edilmesi ve önlenmesinde etkin bir yere sahip olan antrenörlerin bu hastalık hakkındaki bilgi, tutum ve davranışları incelenmiştir.

**Gereç ve Yöntem:** Araştırmaya 18 yaş üstü antrenörler dahil edildi. Anket, yüz yüze görüşme sırasında veya dijital olarak 'Google formları' aracılığıyla gerçekleştirildi. Anket formu antrenörlerin kadın sporcularla çalışması, kadın sporcu üçlemesi hakkındaki bilgileri, sporcularındaki yeme bozuklukları, menstruasyon bozuklukları ve kemik stresi yaralanmalarını saptama ve üçlemenin herhangi bir bileşenini saptadıklarında kullandıkları müdahale yönteminin sorgulanmasını içermektedir.

**Bulgular:** Araştırmaya 49'u (%36,6) kadın, 85'i (%63,4) erkek olmak üzere 134 antrenör dahil edildi. Antrenörlerin %63,4'ü aktif olarak kadın sporcularla çalışırken, sadece %32,8'i kadın sporcu üçlemesini duyduğunu, %48,5'i ise sporcularında yeme bozuklukları fark ettiğini ifade etti. Kadın antrenörlerin kadın sporcu üçlemesinin herhangi bir bileşenine sahip olan şüpheli sporcuları hekime yönlendirmeleri, erkek antrenörlere göre anlamlı olarak daha yüksekti ( $p<0.001$ ).

**Sonuç:** Antrenörlerin kadın sporcu üçlemesine ilişkin bilgilerinin düşük olduğu görülmüştür. Eğitimsel müdahaleler Kadın Sporcu Üçlemesi'nin saptanması, önlenmesi ve tedavisinde önemli ilerlemeler sağlayacaktır.

**Anahtar Sözcükler:** Kadın sporcu, menstrual disfonksiyon, yeme davranışı, antrenörlerin farkındalığı

## INTRODUCTION

The female athlete triad was first described in 1992 as a condition composed of disordered eating, amenorrhea, and osteoporosis (1). This definition was revised by the American College of Sports Medicine (ACSM) in 2007, and the female athlete triad was characterized by a spectrum of inter-related conditions and complications consisting of low energy availability with or without disordered eating beha-

viour, menstrual dysfunction and low bone mineral density (2).

The female athlete triad is a health problem that the severity of its effects are understood better day by day, and it is important to detect the condition early and prevent/treat it before it causes irreversible health problems (3). The primary underlying disorder that constitutes the pathophysio-

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ology of the triad is low energy availability (4). With or without an eating disorder, negative energy balance causes altered Gonadotropin-releasing hormone (GnRH) pulsatility in the athlete, leading to a hypoestrogenic state. The resulting hypoestrogenic state causes menstrual irregularities and a decrease in bone mineral density (5). Amenorrhea observed in female athletes may sometimes be related to this mechanism and is called functional hypothalamic amenorrhea. The ACSM recommends screening for triad or potential underlying medical problems in the presence of amenorrhea or oligomenorrhea lasting more than 6 months (2). The osteoblastic and osteoclastic activity process mediated by estrogen contributes to the improvement of bone health (6). In hypoestrogenic conditions where the process is interrupted, bones weaken due to decreased bone mineral density; injury, stress fractures and pathological fractures increase (6). The increase in female participation in sports has also brought about an increase in competition among female athletes, as well. The athletes' desire to be successful, the pressure to maintain a lean figure, the stress factors brought by the external demands from the athletes by the coaches and parents to be successful may lead them to the irregular eating behavior, intentional or unintentional restrictions in dietary intake and excessive training in order to reach the desired body weight and athletic performance (7).

Although the exact prevalence of the female athlete triad is unknown, studies show that it is observed at a rate of 1-4% (4). The prevalence of the triad is suggested to be higher than reported due to unidentified and underestimated symptoms, and underreporting of symptoms by athletes (8). It is important to identify specific strategies in the recognition, prevention and treatment of the female athlete triad. Apart from the health professionals, the parents and coaches also have important duties. Coaches have the ability to positively influence athletes by training and encouraging them to adopt healthy behavioral patterns (7). In addition, coaches have the chance to observe the changes in the athlete in the early period. We have limited information about the coach awareness about the female athlete triad, and the attitudes and behaviors when the triad is detected (7). In this study, it was aimed to examine the knowledge, attitudes and behaviors of the coaches, who play a critical role in the prevention and treatment of the syndrome. Our hypothesis was that there would be a lack of knowledge of coaches about the triad, treatment strategies and referring the athletes to physicians.

## MATERIAL and METHODS

Power analysis performed with the G\*power program revealed that the sample size should be 98 people since the

confidence interval was accepted as 95% and the effect size as 0.5 (10). Coaches over the age of 18 were included in the study on a voluntary basis. The questionnaire that was created after a literature review was filled in face-to-face meetings or digitally via 'Google Forms'.

The questionnaire was created by the researchers through a review of literature (4,8-12). The questionnaire included questions on the knowledge of the coaches about the female athlete triad, identifying any component of the triad, steps they take upon the identification of any of the components and their demands for obtaining information about the triad. The survey form consists of 39 questions. One of the survey questions includes a 4-point Likert-type scale regarding the evaluation of eating behavior. Yes/no/I don't know options were used in the knowledge and awareness questions to prevent guessing (4). 23.8% of the coaches were working in football, 9.7% in taekwondo, 8.9% in athletics, 8.2% in swimming, and 7.4% in badminton.

## Statistical Analysis

The data obtained in the research were evaluated with SPSS v.23 package program. The mean  $\pm$  standard deviation, frequency (n) and percentage (%) of the data were determined. Differences between groups was analyzed by chi-square test. p value was considered significant at 0.05 level.

## RESULTS

134 coaches participated in the study. The mean age of the participants was  $36.2 \pm 12.8$  years, mean training experience was  $10.8 \pm 9.3$  years. 37% (n=49) of them were women. Coaches who have been actively working with female athletes were 63.4% (n=85), while those who had worked with female athletes in the past were 24.6% (n=33). The average working time of these coaches with female athletes was  $7.5 \pm 7.3$  years. Coaching for female athletes was significantly higher in female coaches (p=0.02).

33% (n=44) of the coaches declared that they had heard of the 'female athlete triad'. 28.4% (n=38) of the coaches answered the question about the components of female athlete triad. 53% (n=20) of those answered all three components correctly.

The rate of coaches who stated that they noticed an eating disorder of the female athletes was 48.5% (n=65). The rate of those who said that they always felt comfortable talking about eating behavior with female athletes was 35.8% (n=48). The rate of those who stated that they always asked questions about eating behaviors in order to find out eating disorders in female athletes was 24.6% (n=33). In this context, it was reported that the most frequently asked question by the coaches was related to the decrease in athletic

performance with 64.9% (n=87). Those who always kept track of the weight and body fat percentages of female athletes were 24.6% (n=33). It was observed that female coaches monitored the weight and body fat percentages of female athletes more closely (p=0.001). The answers given to the

questions about eating behaviors of the athletes were presented in Table I. Upon detection of an eating disorder, the most common action the coaches took was to talk to the athletes 73,1% (n=98)

**Table 1.** The answers related to the eating behaviors of the athletes

	Not serious (%)	Could be serious (%)	Serious (%)	Very serious (%)
Eating too much	4.5	34.3	35.8	25.4
Skipping 1 meal a day	4.0	33.6	22.4	6.0
Restricted calorie intake (less than needed)	11.2	43.3	33.6	11.9
Skipping 2 meals a day	2.2	21.6	38.1	38.1
Not eating anything for a full day	1.5	11.2	21.6	65.7
Self-induced vomiting after meals	2.2	11.2	14.2	72.4
Use of laxatives	3.0	12.7	17.9	66.4
Abuse of diuretics	2.2	11.9	21.6	64.2
Weighing themselves many times a day	17.2	36.6	27.6	18.7
Doing excessive exercise (more than the requirement of the sport)	3.7	31.3	35.8	29.1
Eating fast food occasionally (several times a week)	38.8	41.0	14.2	6.0
Eating fast food frequently (every day)	3.0	18.7	34.3	44.0
Having a carbohydrate-restricted diet	6.7	41.0	38.1	14.2
Having a fat-restricted diet	11.9	40.3	31.3	16.4

Those who always monitored the menstrual cycles of female athletes were 12.7% (n=17), and those who always noticed lack of menstrual period for 3 consecutive months were 13.4% (n=18). It was observed that female coaches monitored the menstrual cycles of female athletes more closely (p=0.001). The rate of the coaches who always asked the female athletes about the duration of menstruation, its regularity, the intensity of bleeding and whether the menstrual period was painful or not was 10.4% (n=14). Those who reported that they always felt comfortable talking about the menstrual cycles were 28.4% (n=38). 16% (n=21 coaches; 2.6±3.2 athletes) declared that they worked with a female athlete whose menstrual period was irregular or who did not have a menstrual period for at least 3 months, 23,9% stated that they referred an athlete to a doctor for menstrual irregularity previously (n=32 coaches; 2.1±2.7 athletes). The awareness and initiatives of female coaches on this

were significantly better when compared to male coaches (p < 0.001).

13% of the coaches (n=17) thought that menstrual irregularity or lack of menstruation was normal response to training for female athletes (Table II). The most common approach of the coaches was referring the athlete to the physician with a rate of 25,8% (n=74).

23,9% (n=32) of coaches thought that menstrual irregularity would cause bone fractures, decrease in bone mineral density, and loss of performance in female athletes. Those who worked with female athletes stated that they encountered stress fractures due to excessive or inappropriate activity were 23,9% (n=32). Those who thought that bone mineral density should be examined in case of menstrual irregularities in female athletes was 23,9% (n=32). The awareness of female coaches on this issue was higher (p < 0.001).

**Table 2.** Opinions of coaches on menstrual irregularity

	n	%
I think it is normal	17	12.7
I think it is normal but if it continues for more than 3-6 months it should be checked	46	34.3
I think it is not normal but I think it is not usually a harmful circumstance for the athlete	15	11.2
I think it is not normal and needs medical examination	56	41.8

Those who always thought that female athletes had a decrease in their desire to train during their menstrual period or had difficulties in completing the training were 15,7% (n=21). While female coaches thought that it was common for this issue to be experienced frequently, male coaches thought it was rare (p < 0.001). The rate of those who always thought that the athletes with menstrual irregularity were at higher risk for bone stress fractures than the athletes with regular menstruation was 19,4% (n=26).

61% of coaches thought that physician should decide the return to sport of female athlete receiving treatment for a diagnosed eating disorder and still showing signs of eating disorder (Table III). Female coaches thought that psychologists should decide on this issue when compared to male counterparts (p=0.03).

**Table 3.** Coach preference on return to sport decision of athlete with eating disorder

	N	%
Physician	82	61.2
Athlete	16	11.9
Dietician	11	8.2
Head coach	10	7.5
Team physiotherapist	5	3.7
Family	4	3.0
Assistant coach	3	2.2
Psychologist	3	2.2

45.5% (n=61) of the coaches said that they would refer their athlete to a physician if they detected one or more components of female athlete triad. The rate of male coaches that said they would not refer the athlete to a physician was higher than of female coaches (p=0.026). In this context, 33.8% (n=22) of the coaches stated that they would refer athletes to gynecology and obstetrics, 30.8% (n=20) to sports medicine and 12.3% (n=8) to psychiatrist.

The rate of those who stated that they wanted to learn more about health problems specific to female athletes was 83.6% (n=112). The subject of 'female athletes and bone health' was the most wanted one to learn about (Table IV). As the method of obtaining information, face-to-face meetings with 38.7% (n=91), online meetings with 24.3% (n=57) and websites prepared on the subject with 14% (n=33) were frequently preferred.

**Table 4.** Demand for information on health problems specific to female athletes

	N	%
Female athlete and bone health	98	22.7
Female athletes and menstrual disorders	96	22.3
Sports nutrition	94	21.8
Female athletes and eating disorders	85	19.7
Strength exercises	58	13.5

Note: Since multiple answers were received in the answer to this question, the value of n exceeds the sample size.

## DISCUSSION

It is essential to provide appropriate nutrition advice, training programs, use of screening tools and directing athletes to appropriate resources to prevent and treat female athlete triad. However, to ensure these it is necessary to have sufficient knowledge about the subject (7). Coaches who have the necessary knowledge play an important role in preventing the female athlete triad. 134 athletes were included in this study, in which the knowledge, attitudes and behaviors of the coaches about the triad were evaluated. The number of coaches who declared that they had heard of the female athlete triad was 44, and the number of those who correctly defined all three components was 20. It was observed that the rate of coaches who stated that they noticed an eating disorder of their female athletes was 48.5%, the rate

of those who noticed the menstrual irregularities experienced by the athletes was 13.4%, and the rate of those who thought that decrease in bone mineral density and bone fractures could occur in case of menstrual irregularity was 23.9%.

In a study conducted by Mukherjee et al., in which 81 coaches participated, the rate of those who stated that they had never heard of the female athlete triad was found to be 85% and the rate of those who could define all the components correctly was 1.9% (11). Lassiter et al., found that senior students of physical education and sports school lacked knowledge, appropriate attitude and behavior regarding the female athlete triad (13). In the study conducted by Kathleen et al., 64% of the participating coaches reported that they had heard of the triad, 48% stated that they could define the components of the triad and 43% were able to define all the components correctly (7). In another study, in which 161 physicians, 31 athletic trainers, 10 physiotherapists and 37 coaches participated, it was found that 48% of physicians, 43% of physiotherapists, 38% of athletic trainers, and 8% of coaches were able to correctly define all components of the female athlete triad (14). In our study, 32.8% of the coaches stated that they had heard of the triad. When they were asked to define the triad, 28.4% answered; 52.6% of these answers included the correct definition. The knowledge of the coaches about the female athlete triad was found to be low, similar to previous studies. It is necessary to include the female athlete triad in the training processes of the coaches and to update their knowledge with continuous training throughout their career.

Identifying early warning signs of eating disorders and menstrual dysfunction by communicating regularly with athletes is important for the prevention and treatment of female athlete triad. In the study by Mukherjee et al., it was shown that 72% of female coaches and 42% of male coaches were easily talking to athletes about their menstrual status (11). In the same study, it was found that 70% of the coaches had no hesitation to talk about the eating behaviors of their athletes but only 28% were aware of their athletes' eating habits. In another study, it was shown that female coaches were considering menstrual irregularities as important issues compared to their male counterparts and they were feeling comfortable in discussing and managing the problem with the athlete (9). Yet in another study, the rate of coaches who can easily talk about eating behavior with female athletes was 86.8%, and the rate of coaches who noticed irregular eating behavior of their athletes was 87.9% (7). In that particular study, the rate of those who stated that they noticed the eating behavior disorder in their athletes was 48.5%, the rate of those who felt comfortable talking with their athletes about eating behavior was

38.5%, and the rate of those who felt comfortable talking about their menstrual status was 28.4%. A study conducted with university student female swimmers showed that the major contributors to athletes' eating behavior were the athletes' parents, coaches, and sports journals (15). It was shown that coaches who had more knowledge about the nutrition and eating behaviors of the athletes, the more likely they would follow the nutritional guidelines for their athletes, help them develop healthy body image and eating habits, talk freely about the menstrual cycle and encourage them to seek medical care when necessary (16). In order for the athletes to continue their participation in sports in a healthy way, coaches' awareness of nutritional behaviors and menstrual functions must be increased..

Most of the coaches participated in this study indicated 'skipping 2 meals a day', 'not eating all day', 'self-induced vomiting after meals', 'use of laxatives', 'use of diuretics', 'eating fast food every day' behaviors as very serious conditions. In a study evaluating eating disorders in female athletes, the behavior of 'self-induced vomiting after meals', 'use of laxatives', 'use of diuretics', 'eating fast food every day' and 'skipping 2 meals a day' was considered as serious conditions by the coaches (12). Although there is a widespread belief that coaches regard an athlete's performance above their health (12), the vast majority of research shows that coaches do not support athletes' behaviors of achieving better athleticism and reducing body fat at the expense of their health; they care about the health of the athlete. In a study by Raymond et al., it was observed that coaches had a belief that cessation of menstruation was normal as body fat reached a level that would maximize performance after optimal training and appropriate diet in athletes (17). We found that the rate of coaches who defined menstrual irregularity as a normal response to training in female athletes was 12.7%. In a study, including 91 coaches, this rate was found to be 24% (7). In a different study, it was found to be 38% (11). Although this rate was lower in our study than previous studies, it is still at an alarming level. Since coaches attribute menstrual irregularities to the athlete's dedication, hard work and success, and see this not as a sign of a health problem but as part of the adaptation process to sports, the solution to the problem will be to eliminate these and similar beliefs through appropriate and continuous training.

In a study evaluating eating behavior, it was stated that 69.8% of the coaches referred the athlete to sports medicine/team doctor or athletic trainer when an eating disorder was noticed in the athlete (12). When coaches were given a scenario where an athlete resorted to self-induced vomiting, 44% of coaches reported that they would talk to the athlete first. (12). In the same study, when asked what was

the most influential factor in a symptomatic athlete's decision to continue playing sports, 35% of the coaches stated that the decision of their athletic trainer was influential. In another study, 93% of the coaches reported that they would talk to the athlete first if they detected an eating disorder (10). Referring the athlete to a psychologist (53%) was the next most frequently used strategy (10). Again in the same study, when amenorrhea was detected in the athlete, the coaches most frequently preferred to talk to the athlete (70%), followed by talking to the athlete's family (60%) and referring them to the family physician (45%), (10). When the athletes encountered a bone injury such as a stress fracture, coaches stated that they would talk to the athlete (84%) and communicate with the family of the athlete (84%), and then they would refer them to sports medicine (58%) or family physician (57%), (10). In our study, it was found that when an athlete is diagnosed with an eating disorder, the most common choice is to talk to the athlete, and in the case of menstrual irregularity, the most common choice is to refer the athlete to a physician. While the coaches thought that they could solve the eating disorder among themselves, they preferred to seek external help for menstrual irregularity. We think that this is due to a lack of knowledge on the subject and/or the society being more closed to talking about the athlete's menstrual cycle. In the study conducted by Brown et al., it was determined that the limited time spent with the athlete and the lack of knowledge about the triad are the most important barriers to the coaches ability to perform triad screening (4). In a study conducted by Kroshus et al., coaches stated that they wanted to learn more about athlete nutrition (88%), eating disorders and health problems related to female athletes (73%), bone health and female athletes (72%) and added that they want to obtain these information mostly through (73%) a website (10). In this study, the topic that coaches wanted to learn most about was 'female athletes and bone health' (22.7%). The most preferred method for obtaining information was face-to-face meetings (24.3%). Moreover, in our study and in many other studies, a significant difference was found between male and female coaches concerning the attitudes and behaviors towards eating disorders and menstrual irregularity. Considering the differences in society, training should be prepared in line with the demands of coaches in order to reduce these gender-based differences and increase awareness.

This study was planned due to the lack of a study on the awareness of the concept of the female athlete triad in our country and the observation of lack of knowledge of coaches in outpatient clinic conditions. Since we kept the age range of coaches wide, we preferred the term of "female athlete triad" that has been used for a longer time. Howe-

ver, it should not be forgotten that there is a more current concept that has been used recently instead of the female athlete triad and has various differences; “relative energy deficiency in sport” (RED-S). (RED-S) is the result of insufficient caloric intake and/or excessive energy expenditure (18). The term ‘Relative Energy Deficiency in Sport’ (RED-S), points to the complexity involved and the fact that male athletes are also affected (19). The syndrome of RED-S refers to impaired physiological function including, but not limited to, metabolic rate, menstrual function, bone health, immunity, protein synthesis, cardiovascular health caused by relative energy deficiency (19). There is a need for future studies involving both genders regarding the term RED-S, which focuses on energy deficiency, which is known to affect men as well as women, and its content, results and treatment, and if necessary, informing/raising awareness of the relevant populations based on the results of the study.

The limitations of our study are that the study was cross-sectional and the questions were not directed to the participants by the researchers in face-to-face interviews.

## CONCLUSION

The most effective treatment for female athlete triad depends on educating coaches and health professionals about early awareness, prevention, and treatment of the triad. Additionally, a survey needs to be developed to increase coaches’ awareness of the female athlete triad. Furthermore, similar studies on RED-S could increase the awareness of those involved in sports.

### **Ethics Committee Approval / Etik Komite Onayı**

The approval for this study was obtained from SBU Gazi Yaşargil Training and Research Hospital Clinical Research Ethics Committee, Diyarbakır, Türkiye (Decision no:823, Date: 02/07/2021).

### **Conflict of Interest / Çıkar Çatışması**

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

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### **Author Contributions / Yazar Katkıları**

Concept: AO, SE; Design: AO SE; Supervision: SE; Materials: AO; Data Collection and/or Processing: AO; Analysis and Interpretation: SE; Literature Review: AO; Writing manuscript: AO; Critical Reviews: AO, SE. All authors contributed to the final version of the manuscript and discussed the results and contributed to the final manuscript.

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