Original Article

RESEARCHING OF HORMONE PARAMETERS OF FOOTBALL PLAYERS

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Abstract

The aim of this study is to examine the hormonal changes of players competing in different leagues. A total of 21 soccer players (play 20 matches) who play in professional leagues train 4.88±1.32 days a week, and 36 soccer players (play 20 matches) who play in amateur leagues train 2.45±1.12 days a week participated in the study. The study was carried out at the end of the 2020-2021 soccer season. The data were analyzed using the SPSS 22 package program. The independent t-test was used to compare the hormonal parameters. A significant difference was found in the height of the football players participating in the study ($p<0.05$). No significant difference was found in age, athlete's age, body weight, BMI and other hormonal parameters ($p>0.05$). The main finding of the study is that there is no difference in endocrine markers between professional and semi-professional football players, despite the number of days they train. The reason why there is no difference may be due to the fact that semi-professional footballers play in a lower league and the number of matches is equal, even if the training times are different. To mention the importance of the study, it is to constantly monitor the endocrine parameters of the football players, to determine the training loads of the football players according to the league and level, to prevent injuries, to follow the performance and to ensure that there is no overtraining.

Keywords: soccer players, professional leagues, SPSS 22 package.

INTRODUCTION

The diversity of hormones, their active role in providing hemostasis, exercise, stress, etc. hormones due to reasons such as changes in situations; It has become one of the subjects that sports scientists have been working on for years and has managed to maintain its current status (Ozbay et al., 2020; Ince, 2020). Hormonal markers (eg, cortisol and testosterone) have been identified as reliable markers of training stress and can therefore be considered important in the biochemical assessment of athletes (Hackey, 2020).

Physical exercise plays an important role in the production and regulation of testosterone (TT), cortisol (C), growth hormone (GH), and insulin-like growth factor-1 (IGF1) (Kanaley et al., 1997; Nobari et al., 2021a). TT and C have been reported to respond to metabolic stress associated with fatigue and recovery from soccer-specific exercises (Kraemer et al., 2004; Walker et al., 2010) and their ratio (TT: C), anabolic/catabolic balance, psychophysical stress and has been shown as an indicator of information for adjusting fatigue and training loads (Adlercreutz et al., 1986; Papacosta and Nassis, 2011; Nobari et al., 2021b). A decrease in this rate has previously been associated with overtraining syndrome (Viru and Viru, 2001; McLellan et al., 2010). da Silva et al. reported that 12 weeks of training with professional football players resulted in increased cortisol concentration with simultaneous decreases in testosterone and TT/C ratio. Therefore, hormonal parameters are sensitive to training periods (da Silva et al., 2011) that differ in volume and intensity, and to the frequency of matches in the competition period (Silva et al., 2014). In addition, TT is very important in the power performance of Professional football players (Moreira et al., 2013; Hammami et al., 2017) and it has been noticed that the growth in football performance is associated with the increase in plasma TT levels and the reduction or maintenance of plasma C levels (Hammami et al., 2017; Nobari et al., 2021b). On the other hand, when GH production is suppressed, performance and exercise tolerance decrease (Schmikli et al., 2012), endurance training increases IGF-1 circulating levels (Maimoun et al., 2004). This information is valid for trainers and practitioners to analyze the effectiveness of the training load. In fact, it allows for the necessary adjustments to be made to maximize training stimuli and adaptations. Finally, there is a lack of studies investigating cortical-gonadotropic-related critical hormones in intensive training in professional football players. Therefore, further studies are required for this population (Nobari et al., 2021b; Hammami et al., 2017).

Considering the importance of physical fitness, training workload and endocrine biomarkers in football performance (Nobari et al., 2021c, d), a better understanding of end-of-season physical and hormonal parameters is required for better management of training and competitive workloads with competitors competing in different leagues. Therefore, it has been assumed that players competing in different leagues will have hormonal changes. In addition, it is to reveal the endocrine parameters (ACTH, FSH, LH, TT, C, GH and IGF-1) values in football players at the end of the season.

Materials and Methods

A total of 21 soccer players (play 20 matches) who play in professional leagues train 4.88±1.32 days a week, and 36 soccer players (play 20 matches) who play in amateur leagues train 2.45±1.12 days a week participated in the study. The study was carried out at the end of the 2020-2021 soccer season. Completing the informed consent forms by all participants. Blood samples tests, which require a protocol for the laboratory tests applied in the study, were cross-referenced (Pagana et al., 2014). The Sivas Cumhuriyet University Clinical Research Ethics Committee found this study ethically appropriate with the decision number 2022-04/05 dated 19.04.2022. The data were analyzed using the SPSS 22 package program. The independent t-test was used to compare the hormonal parameters.

Findings

Table 1: Hormonal parameters of the study amateur and professional group.

Variables	Level	x̄±Sd	F	t	df	P
Age	Semi-Professional (n=36)	22,66±3,85	0,695	-0,569	55	0,572
	Professional (n=21)	23,23±3,28				
Athlete age (years)	Semi-Professional (n=36)	12,76±3,72	0,120	0,431	44	0,668
	Professional (n=21)	12,30±3,57				
Body Height (cm)	Semi-Professional (n=36)	178,11±6,67	0,250	-2,129	55	**0,038**
	Professional (n=21)	181,80±5,65				
Body Weight (kg)	Semi-Professional (n=36)	72,73±7,36	0,413	-1,397	55	0,168
	Professional (n=21)	75,40±6,20				
BMI (kg/m2)	Semi-Professional (n=36)	22,93±1,97	1,594	0,073	53	0,942
	Professional (n=21)	22,90±1,46				
Adrenocorticotropic Hormone (ACTH), pg/ml (7-69 pg/ml normal)	Semi-Professional (n=36)	31,74±17,21	0,476	-0,759	46	0,452
	Professional (n=21)	35,38±15,57				
Growth hormone (GH), ng/ml (<5,00 ng/ml normal)	Semi-Professional (n=36)	0,40±0,95	0,000	0,001	46	0,999
	Professional (n=21)	0,40±1,22				

Fsh mIU/mL (1.42-15.4 mIU/mL normal)	Semi-Professional (n=36)	3,23±1,73	2,999	0,326	55	0,745
	Professional (n=21)	3,09±1,29				
Insulin-like Growth Factor 1(IGF1), ng/mL (105-367 ng/mL normal)	Semi-Professional (n=36)	214,65±51,88	0,001	-0,202	44	0,841
	Professional (n=21)	217,55±42,85				
Insulin, µU/mL (6-26 µU/mL normal)	Semi-Professional (n=36)	8,01±3,35	0,229	0,670	26	0,509
	Professional (n=21)	7,16±2,97				
Cortisol, mcg/dL (5-23 mcg/dL normal)	Semi-Professional (n=36)	14,68±3,41	0,250	0,422	39	0,676
	Professional (n=21)	14,21±2,76				
Luteinizing Hormone (LH), IU/L (1.24-7.8 IU/L normal)	Semi-Professional (n=36)	5,46±1,97	0,726	0,344	54	0,732
	Professional (n=21)	5,28±1,86				
Prolactin, ng/mlb (3-13 ng/mlb normal)	Semi-Professional (n=36)	14,24±7,12	0,235	0,617	31	0,542
	Professional (n=21)	12,69±5,07				
Free T3(fT3), pg\ml (2,60-4,37 pg\ml normal)	Semi-Professional (n=36)	3,87±0,42	1,622	0,491	52	0,626
	Professional (n=21)	3,81±0,31				
Free T4(fT4), ng/dL (0.8-2.8 ng/dL normal)	Semi-Professional (n=36)	1,37±0,19	0,983	1,362	56	0,179
	Professional (n=21)	1,31±0,13				
Total Testosterone (TT), ng/ml (1,75-7,8 ng/ml normal)	Semi-Professional (n=36)	5,81±1,87	0,132	-0,176	52	0,861
	Professional (n=21)	5,90±1,74				
TSH, mIU/L (0.35-4.5 mU/ml normal)	Semi-Professional (n=36)	3,55±1,67	0,833	1,802	44	0,078
	Professional (n=21)	2,63±1,70				

In Table 1, a significant difference was found in the height of the football players participating in the study ($p<0.05$). No significant difference was found in age, athlete's age, body weight, BMI and other hormonal parameters ($p>0.05$).

Discussion and Conclusion

In the study, it was discussed whether there is a difference in hormonal parameters between professional football players playing at the 3rd league level and semi-professional (regional amateur league) football players in a lower league. According to the result, no significant difference was found between professional and semi-professional football players in ACTH, GH, FSH, IGF1, Insulin, Cortisol, LH, Prolactin, fT3, fT4, TT and TSH parameters ($p>0.05$) (Table 1). Looking at the averages of hormone parameters, the average of professional football players in ACTH, IGF1 and TT parameters was higher than that of semi-professional footballers. FSH, Insulin, Cortisol, LH, Prolactin, fT3, fT4, TT and TSH parameters were higher in semi-professional football players. Hormonal values were all normal in both professional and semi-professional football players. According to the results of the study, there is no hormonal difference between professional football players and semi-professional football players even if they are in a higher league. Nobari et al (2021e) looked at the endocrine markers of football players competing in the English Premier League at the end of the season. As a result of the study, endocrine markers of football players; He found IGF-1 455 ng/ml, GH 3.5 ng/ml, cortisol 11.5 µg/dl and testosterone 4.1 ng/ml. In addition, in his study, he found a positive relationship between the physical performance of professional football players and endocrine markers. Similarly, Eliakim et al. (2010) found a positive correlation between fitness parameters and overnight GH levels in adolescent women. In contrast, GH levels have not been found to be associated with physical performance in U17 football players (Hammami et al., 2018). The fact that there are different results in the literature may be related to the GH response to training, the intensity of the training, gender, age and physical activity applied (Nobari et al. 2021e). Exercise stimulates the release of growth hormone, and growth hormone induces the production and increase in plasma of insulin-like growth factor 1 (Pavelic et al., 2007).

In this study, semi-professional football players train 2.45±1.12 days a week, while professional football players train 4.88±1.32 days. It is known that exercise causes various anthropometric and physiological changes in the human body (Fry and Kramer, 1997; Sariakcali, 2021; Sariakcali et al., 2022). Physical exercise also plays an important role in the production and regulation of testosterone, cortisol, GH and IGF1 (Kanaley et al., 1997; Nobari et al., 2021a). In addition, exercise stimulates the release of growth hormone and induces the production of IGF 1 and its increase in plasma (Pavelic et al., 2007). It has been reported that TT and cortisol respond to metabolic stress associated with fatigue and recovery from soccer-specific exercises (Kraemer et al., 2004; Walker et al., 2010). Plasma cortisol level in exercise varies depending on the duration and intensity of exercise (Rhind, 1999). Over-reaching/over-training can be monitored with Cortisol measurement and as a result, excessive stress in athletes can cause performance decline. (Kraemer et al., 2004; Hammami et al., 2018). Looking at the relationship between Cortisol and fitness parameters may indicate that lower Cortisol levels improve soccer performance. Therefore, the data show that it is important to control endocrine markers to design training loads well during a football season and consequently to prevent over-reaching/over-training injuries and improve fitness performance (Kraemer et al., 1998; Nobari et al., 2021e). Inder et al. (1998) showed that in normal training routines, long-term exercises repeated every day, well-trained athletes have a persistent, chronic increase in hypothalamic CRH (Corticotropin-releasing hormone) levels, which causes an increase in basal ACTH levels. There are studies showing that aerobic exercise elevates T3 and T4 in an intensity-dependent manner [Ciloglu, et al., 2005; Ratamess, 2012). However, there are also studies in the literature showing that thyroid hormones do not increase acutely during exercise (Premachandra, et al., 1981) It has been demonstrated that thyroid hormones exhibit inconsistent changes during periods of prolonged exercise (Premachandra, et al., 1981). In studies on moderately trained individuals and highly trained rowers, it has been reported that the levels of T4 hormone (Pakarinen, et al., 1988) fT4 (free thyroxine in plasma) (Pakarinen, et al., 1988) and fT3 (free triiodothyronine in plasma) (Simsch, 2002) and TSH (Simsch, 2002) are significantly lower at rest. Another study examined the pituitary-thyroid system responses to exercise in 11 elite weightlifters before, during, and after a one-year strength training period (Alen, et al., 1993). It has been reported that no systematic changes were observed in serum TSH (aka thyrotropin), T4, fT4 and T3 concentrations during a total 1-year training period. It has been concluded that daily intense training in power-strength sports will not cause major changes in pituitary-thyroid function in elite athletes, but training in the normal range causes only minor physiological responses in pituitary-thyroid function (Alen, et al., 1993; Kraemer and Ratamess, 2005). As a result of the researches; Both decreased, unchanged and increased responses of TSH and thyroid hormones to strenuous exercise have been reported (Gençoğlu and Akkuş, 2020). In this study, TSH levels were lower in professional football players than in semi-professional football players. In addition, there are results in some studies that TSH levels decrease as a result of exercise (Sarı et al., 2021; Ibrahim et al. 2020). However, prospective studies should monitor the response of endocrine parameters to long-term training loads to help coaches control the training process, improve players' performance, and stimulate their maximum physiological adaptation without overtraining. Endocrine markers have been found to be good variables for predicting strength (eg 1-RM) and VO2max performance. Endocrine markers are considered to be important factors in performance (Nobari et al., 2021e).

The aim of this study was to analyze the endocrine marker differences between professional and semi-professional football players. The main finding of the study is that there is no difference in endocrine markers between professional and semi-professional football players, despite the number of days they train. The reason why there is no difference may be due to the fact that semi-professional footballers play in a lower league and the number of matches is equal, even if the training times are different. To mention the importance of the study, it is to constantly monitor the endocrine parameters of the football players, to determine the training loads of the football players according to the league and level, to prevent injuries, to follow the performance and to ensure that there is no overtraining. In order to make a stronger interpretation, we suggest that the endocrine parameters of the players in both leagues should be taken at regular intervals throughout the season and observation should be made.

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