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DETERMINING THE EFFECT OF CORTISOL ON THE FUNCTIONAL STATUS OF ATHLETES AND DEVELOPING PHYSIOLOGICAL METHODS OF REDUCING THE NEGATIVE EFFECTS

BERDIYEVA DILNAVOZ TOSHKAN KIZI[1]

CENTRAL ASIAN UNIVERSITY[1]

Address: Barkamol MFY, 264, Milliy, bog street, 111221, Tashkent, Uzbekistan

Email: d.berdiyeva@centralasian.uz

Mobile phone: +998909260509

SHAYDULLAYEVA ZILOLA SHOPULATOVNA[2]

UZBEK STATE UNIVERSITY OF PHYSİCAL CULTURE AND SPORTS[2]

Corresponding author: Berdiyeva D.

Email: d.berdiyeva@centralasian.uz

Mobile phone: +998909260509

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Annotation.In different countries of the world, special importance is attached to the physiological control of athletes during the competition and during training, as well as to the assessment of the hormonal changes occurring in their bodies. Hormonal changes lead to a decrease in athlete endurance, mental stress, and work capacity, which reduces the chances of athletes to succeed in the world Olympics. In this regard, controlling physiological hormonal changes in Uzbek athletes is one of the most important current problems in order to achieve high goals.

Key words: hormonal changes, cortisol, endurance, sambo, athlete, metabolism

The purpose of the article: to determine the change in the concentration of the cortisol hormone due to physical exertion and its effect on the effectiveness and success of sportsmen's training.

Functions of the article:assessment of the impact of changes in the amount of cortisol on the functional state of athletes due to the amount of physical load and development of measures to reduce its negative consequences;

The subjects of the article are 17-20-year-old Uzbek athletes who play football, weightlifting, and people who do not play sports.

Materials and methods. In order to check the concentration of the cortisol hormone, 35 weightlifting athletes, 35 football athletes and 30 non-athletic subjects aged 17-21 years were selected as experimental subjects.In the initial examinations, a venous blood sample was taken from the research subjects at 08:00 in the morning on an empty stomach. Urine samples were also taken as biomaterials and the biomaterials were numbered.We used the ICHLA method for the determination of cortisol in blood serum. The method was performed according to the following protocol:

1. 50 μl of biomaterial was diluted with 200 μl of phosphate buffer and placed in a sample cuvette in 100 ml special test tubes.

2. 25 μl of the diluted solution is placed in the zone of reagents for addition of Cortisol reagent.

3. 100 μl of anticortisol acridinium is also placed in the collibator zone.

4. Incubate at 37°C for 2-3 minutes. During incubation, cortisol and anticortisol are automatically injected into the sample from acridinium reagents through special needles.

5. 20 μl of streptavidin-coated magnetic particles were injected.

6. Then it is incubated for another 2-3 minutes at 37°C.

7. The sample is washed with a washing liquid from special particles and the quantitative indicator is read by a special monitor.

In the course of the study, we examined the amount of cortisol in blood and urine samples before exercise at 08:00 am on an empty stomach. Then, after high-intensity training (4 hours a day of various non-loading exercises), we took blood and urine samples and analyzed them at 08:00 in the evening. The test was carried out three times with an interval of 10 days, and the average results were obtained. The results of the experiment were carried out on the days of training and during the 14-day rest period.

Results and discussion

Cortisol levels vary in blood, urine, and throughout the day in individuals at rest. Also, the amount of cortisol can change after an active working day. For example, the amount of free cortisone in urine in 24 hours is 4.3-180 nmol/l. In the blood of people, the normal value in the morning is 5-23 μg/l (107-610 nmol/l), and in the evening this value is 4-18 μg/dl (83-469 nmol/l) . But these indicators change as a result of physical training. So, depending on the change in the amount of cortisol, it is possible to know the level of exercise and endurance of the body. Accordingly, the increase in cortisol in the body has both negative and positive aspects.Due to its positive nature, an increase in the amount of cortisol is a protective reaction of the body. At this time, the cortisol hormone accelerates the breakdown of proteins into amino acids, which are transferred from the tissues to the bloodstream and liver cells, where they are converted into glucose in gluconeogenesis. High levels of cortisol in the blood for a long time lead to the breakdown of proteins in the tissues and an increase in the level of glucose in the blood. This increases plasma glucose levels and cortisol provides the body with the energy it needs to fight stress, injury, illness, infection, bleeding, and more. Alternatively, having too much cortisol in the blood for too long can have serious negative effects. Protein breakdown in tissues, decreased protein synthesis, and reduced conversion of protein to glucose can lead to decreased muscle mass and increased abdominal fat, which can decrease athletic performance, including endurance!

Also, it reduces the level of growth hormone and sex hormones, has ontogonistic properties and can cause infertility in athletes. It reduces glucose consumption and increases susceptibility to diabetes, and its effect on calcium may increase osteoporosis.

Thus, it is important for the athlete's health to moderate the level of cortisol. For this reason, in order to determine which amount of cortisol has a positive and negative effect, 35 weightlifters, 35 football players and 30 non-athletes had their blood and urine levels of cortisol measured before and after exercise. It was checked after the race as well as during the competition. The experiment was carried out three times and the average result was obtained (see Table 1).

1st table

The amount of cortisol hormone recorded in people who do not play sports (nmol/l); (M±m; n=14)

	Time	**Men who do not play sports**
N		30
Age		18,71
The amount of cortisol in the urine	within 24 hours	124,2 ± 2,4 nmol/l
The amount of cortisol in the blood	08:00 in the morning	367,5 ± 6,1 nmol/l
	20:00 in the evening	328,9± 4,8 nmol/l

Also, among 30 researchers who did not do sports, it was observed that in 2 people (that is, people with the surname O.S. and N.G.), the amount of cortisol increased more in the evening than in the morning. When examined in terms of physiological indicators, vascular pulse registered 80+ indicators in O.S. The abnormality of this indicator caused the blood glucose level to be checked, and it was found that the blood glucose level was 8.8 ml, which indicated that the amount of cortisol was higher than the norm, which indicated an increased tendency to diabetes. One of the scientific reasons for this is that an increase in the amount of cortisol in the blood increases the synthesis of glucogenesis, which is the synthesis of amino acids. Also, the decrease and increase in the amount of cortisol can be considered a disease and a sign of impaired kidney function. In people who don't do sports, cortisol exceeds the norm and causes an increase in appetite. For this reason, there is a high probability of obesity in people prone to stress. If this condition occurs in athletes, intense breakdown of glycogen may occur and various types of diabetes can be observed. None of the people selected for the study above had a normal decrease in cortisol. Therefore, kidney tests were not performed.

Even athletes may be prone to these diseases if the cortisol level exceeds 800 nmol/l. But this indicator is not suitable for all sports. For example, an increase in the amount of cortisol in those engaged in bodybuilding, weightlifting, football, and mountain skiing causes a decrease in muscle mass and breakdown of muscle

proteins. At this time, amino acids participate in the process of gluconeogenesis in the liver. Therefore, it is extremely important for the athlete to control the amount of cortisol.

Athletes engaged in two sports, weightlifting and football, were selected for this study. The main reason for this is to prevent the rise of cortisol according to theoretical data, and to study the negative and positive effects of cortisol on sports results, different sports were chosen [see Tables 1 and 2].

2nd table

Cortisol hormone levels recorded in weightlifting athletes (nmol/l); M±m; n=14

	Duration time	
N		35
Age		18,4
The amount of cortisol in the urine	within 24 hours	141,6±4,1nmol/l
The amount of cortisol in the blood	08:00 in the morning	513,4 ±5,9 nmol/l
	20:00 in the evening	455,3±8,2nmol/l

For the research, 35 weightlifting athletes with different sports performance and different ages were selected. The reason for this is to determine whether the increase or decrease of cortisol is age-related or not, and its effect on sports performance, as well as the development of physiological instructions that prevent various diseases caused by its negative effects. In the experiment, cortisol in the blood was determined 3 times, and the average reading was taken. When analyzing the changes in the amount of cortisol depending on the discharge, some differences were observed in the indicators of athletes with discharge I and discharge III. 7 III grade athletes took part in the experiment, and the amount of cortisol in their blood was 540.6 nmol/l on average in the morning, and 465.7 nmol/l on average in the evening.In the experiment, 18 first class athletes took part, and the average level of cortisol in their blood was 568 nmol/l in the morning, and 451.2 nmol/l in the evening. Despite the fact that there was no difference between training and physical load (daily 4 hours of weight lifting and warm-up) between athletes with

type I and type III, the amount of cortisol in the evening in athletes with type III showed the highest amount of norm indicators.

The amount of cortisol released in the blood of weightlifters in the morning did not exceed the norm (Table 2). But out of 35 weightlifters, three L.K., F.L., S.S. - the amount of cortisol in the blood of famous athletes is higher than 600 nmol/l in the morning. This means the intensity of physical loads on the athlete's body. Table 3.1 shows that the highest level of cortisol in the blood of people who did not do sports was 510 nmol/l, while the highest level of cortisol in the blood of weightlifters was 640 nmol/l in the morning.A high level of this indicator means that the amount of cortisol in the blood is high due to physical activity. In addition, when the amount of cortisol in the blood of athletes was checked at 20:00 in the evening, the amount of cortisol exceeded the norm in 10 weightlifters (athletes listed in numbers 4, 13, 14, 17, 19, 20, 21, 23, 24 and 29). found out. The main reason for this is that these athletes have a high volume of loading and insufficient hours of rest. It was also found that athletes with increased cortisol levels had a decrease in muscle mass and an average strength of 62 kg when measured on a dynamometer (this is not a sufficient indicator for weightlifting athletes), most of them are athletes with III grade.When the pulse was measured, tachycardia was observed in the pulse of these athletes (detected on the Polar beat h 10 device), the pulse was 100 times in 1 minute after physical training, and 94 times on average during the training. It should be noted that these studies were conducted 1 month before the competition, but these indicators may increase or decrease closer to the competition. It is necessary to constantly monitor the amount of cortisol in weightlifters. Because the main physical indicators are divided into three: endurance, speed and strength. Muscle mass is the most important indicator of strength.Because, due to the stress effect of cortisol, oxidative phosphorylation and protein breakdown in muscles increases. This causes a decrease in strength. In weight lifting, strength is more important than endurance and speed.

Therefore, this study was also conducted in players who play sports that require relatively more endurance in terms of strength and speed. 35 players playing in the Shortan football club were selected for the study. Cortisol analysis

was conducted three times for three weeks in the selected players. The amount of cortisol in the blood was analyzed in the morning before training and in the evening after training. Table 3 shows a higher level of cortisol in urine and blood analyzes of people who do not play sports and people who do weightlifting.

The results of the study clearly showed that the amount of physical activity has been proven to increase the amount of cortisol in the blood. In particular, the amount of cortisol in the morning was 90.04 nmol/l in football players compared to weightlifters, and in the evening at 08:00 it was 83.34 nmol/l.

3rd table

A survey on the reasons for the high level of cortisol hormone in football players; M±m, n=18

	Physical exhaustion	Insomnia	Malnutrition	Alcohol	Blood pressure
Average indicator	96%	56%	32%	4%	24%

The result of the survey shows that noted that there is a problem with 96% of football players have physical fatigue, 56% of the study participants suffer from insomnia, 32% of football players eat wrongly, 4% of football players drink alcohol, and 24% of football players have high blood pressure.

We compared our research with the research of world scientists. According to the results of the research of these physiologists from Serbia, the average amount of cortisol in the morning in the athletes, who were the objects of their research, was more than 700 nnmol/l. In the control group, this indicator was about 300 nmol/l on average. So, according to the indicators of our research, it shows that the body's resistance to stress is very close to that of Serbian athletes.Despite the fact that high levels of cortisol are a protective reaction for an athlete, high levels of cortisol in the blood often or for a long time can harm the athlete's body. For example, it causes chronic stress, depression and accelerated cellular aging. It also causes osteoporosis, muscular dystrophy and decreased immunity. Stimulates the process of gluconeogenesis and increases the amount of glucose in the blood.

When the glucose level was measured on an empty stomach in the morning at rest, it was 5.9±0.7 mmol/l in people who did not play sports, 7.3±1 mmol/l in weightlifters, and 8.1±1.2 mmol/l in football players. organized l. These indicators are from the norm indicators (in the norm, the amount of glucose in the blood is 3.5-6.6 mmol/l.

By reducing the amount of cortisol, it is possible to normalize the process of gluconeogenesis and, as a result, reduce the amount of glucose in the blood. Therefore, during the experiment, the reasons for normalizing and reducing the amount of cortisol were determined and applied to athletes. This is especially important for young athletes.

1. First of all, if an athlete loses, they should not remember the defeat and stressful situations. Thinking too much about negative and athlete-injury events increases cortisol synthesis. To test it, 20 weightlifters and football players were selected. They talked for 30 minutes, analyzing the times they were injured, the times they could not participate in team competitions, and the competitions they lost. Before this interview, at 10:00 in the morning, it was found that the average level of cortisol hormone was 510 nmol/l (n=20, this number refers only to athletes with the highest cortisol levels). After this stressful interview, it was found that the amount of cortisol increased by an average of 90 nmol/l, that is, it was 600±nmol/l. It should be concluded that prolonged analysis of stressful situations leads to an increase in the amount of cortisol for the athlete's body, and muscle weakness.

2. Regulation of sleep quality and time. It is easier for a person who sleeps well to overcome the effects of stress and unpleasant situations. Scientific studies show that people who work night shifts and sleep during the day have higher cortisol levels. It was also recommended to do sports until 20:00.

3. It was recommended to add products that reduce the cortisol hormone to the athlete's diet. It is known that athlete's diet affects all metabolic processes in the body. Certain foods increase cortisol levels. For example, foods with trans fat, sugar, alcohol, and caffeine. Although these products raise the mood, they increase the amount of cortisol in the body. 4 players in the study who had high levels of cortisol, and who identified themselves as malnourished in the questionnaire, were

supplemented with cortisol-lowering products, including natural products as well as synthetic products. After introducing these products into the diet for 3 months, it was found that the amount of cortisol in football players decreased by 20 nmol/l.

3. It is necessary to gradually increase the intensity of the physical training process in accordance with the law of sports adaptation.

4. Organization of ozone therapy. By using ozone therapy 10 days before the competition, it helps to cover the oxygen needs of organs and tissues. In world experience, athletes use ozone therapy to eliminate oxygen debt and improve recovery efficiency. When ozone therapy was used for athletes, it was found that breathing rate also improved during training.At rest, heavy athletes breathed 18 times, football players 16 times. After the competition, the number of breaths in weightlifters was 46±2, and in football players was 57±3. After the use of ozone therapy, the number of breaths after the competition improved by 38±3 times in weightlifters and by 43±3 times in football players. The panting has subsided. This means that the access to the athlete's oxygen debt is reduced, and oxygen delivery to organs and tissues is relatively improved. When there is enough oxygen for organs and tissues, the amount of cortisol decreases, and the stress level decreases.

Conclusion. The recommendation and diet developed to reduce the amount of cortisol in the blood of athletes were used in the research process for 3 months, and after eliminating the causes that increase the amount of cortisol, the indicators of the amount of cortisol in the blood were reanalyzed at 08:00 in the morning and at 20:00 in the evening.

Table 4 below shows the results of cortisol levels recorded in control, weightlifting, and soccer athletes after the study.

4th table

The amount of cortisol hormone recorded after the research in control, weightlifting and football athletes (nmol/l)M±m, n=28

Experiments	**At 08:00, cortisol levels in the blood are nmol/l**		**At 20:00, cortisol levels in the blood are nmol/l**	
	Before the experiment	**After the experiment**	**Before the experiment**	**After the experiment**

Control (30 people)	367,5 ±6,1 nmol/l	362,3 ± 5,1nmol/l	328,9 ±4,8 nmol/l	323,6 ±4,5 nmol/l
Weightlifters (35 people)	513,4 ± 5,9 nmol/l	498,2 ±5,6 nmol/l	455,3±8,2 nmol/l	438,2±8,8nmol/l
Football players (35 people)	603,44±5,7 nmol/l	577,8 ±5,9 nmol/l	538,64±11,2nmol/l	516,3 ±10,66 nmol/l

According to the results of the analysis, the amount of cortisol in the blood at 08:00 in the morning was 5.2±2 nmol/l in the representatives of the control group, 15.2±2.2 nmol/l in weightlifters, and 25.64±2.5 nmol in football players. decreased by /l. At 20:00 in the evening, the amount of cortisol in the blood was 5.3±1.7 nmol/l in the control group, 17.1±1.9 nmol/l in weightlifters, and 22.34±2.4 nmol/l in football players. decreased.

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