

Hematological Parameters of Elite Female Wrestlers and Sedentary College Students

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Abstract: This study has been conducted in order to determine effects of chronic exercise on hematological parameters (erythrocytes, leukocytes and platelets) of elite female wrestlers. Twenty four female wrestlers (FW) on elite level and 24 sedentary female college students (SF) who do not perform sports and are healthy have participated in this study voluntarily. After being informed, blood samples of subjects have been taken on an empty stomach in laboratory between 9:00-10:00 in the morning. Levels of Leukocytes (WBC), Erythrocytes (RBC) and Platelets (PLT) parameters have been determined by using blood count device. Significance level has been recognized at $p < 0.05$. Results showed that difference between the levels of leukocyte parameters; Mid, Lymph%, Mid% and Gran%, erythrocyte parameters; HGB, MCH, MCHC and RDW-SD, platelet and platelet related parameters; MPV, PDW and PCT of the two studied groups is statistically significant ($p < 0.05$). Although some blood cells of elite female wrestlers and sedentary subjects in the same age group were in the reference range, it is thought that their being high or low in number is related to exercise programs followed for long duration of time.

Key words: Chronic Exercise • Female Wrestler • Hematology

INTRODUCTION

Wrestling is a sport branch that is provided for both males and females and includes high level of basic and compound motor features. Wrestling success depends on power, power endurance, maximum strength, muscular endurance of short duration, flexibility as well as technique and tactical skills. Wrestling is an intermittent sport characterized by short duration and high intensity bursts of activity [1-3].

Since wrestling is performed at a high pace in recent years, it requires exercises for the competitions to be just as hard [4]. It is a general finding that exercises performed regularly for a long duration of time have an effect on organism [5-6] and hematology that is included within the blood biochemistry which reflects all the changes in the organism is also affected by this positive result [7]. When the studies conducted in this subject are reviewed, there is no consensus about effects of exercising on hematology; while some studies suggested that hematological parameters increase [6, 8, 9]. Others suggested they decrease [10] and some others suggested exercise does not make any difference in hematologic levels [11]. It is pointed out that these differences are

related to method and time of the experiment, exercise type, ages and genders of subjects, intensity, time and frequency of the exercise and physical, physiological and condition state of the participants [8, 12].

When the studies are reviewed, there is not a complete consensus about what kind of effects exercise has on hematologic parameters. Due to this conflict, this study was conducted in order to determine effects of exercise performed by elite female wrestlers for a long duration of time on hematologic parameters.

MATERIALS AND METHODS

Twenty four elite female wrestlers (FW), on average $20,75 \pm 2,23$ years old and 24 healthy sedentary females (SF), on average $20,83 \pm 0,96$ years old; a total of 48 people have participated in this study on a voluntary basis.

Subjects have been selected among people who do not use drugs constantly and do not drink addictive beverages. Determination of subjects' ages has been based on information indicated in their IDs.

Subjects were warned about not to eat or drink anything after 22.00 pm one day before their blood

samples were taken. Blood samples were taken in laboratory between 9:00-10:00 in the morning on an empty stomach. Five ml blood samples were taken into tubes with EDTA and hematological parameters such as red blood cell count (CBC), hemoglobin (HGB), hematocrit value (HCT), mean corpuscular volume (MCH), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), erythrocyte distribution width (RDW), total leukocytic count (TLC), lymphocyte count, lymphocyte percent (Lymph %), granulocyte count (Gran), granulocyte percent (Gran %), monocyte count (Mid), monocyte percent (Mid %), platelet (PLT), platelet crit?? (PCT), mean platelet volume (MPV) and platelet distribution width (PDW) were analyzed with "architect" brand blood count device in central laboratory.

SPSS (Statistical Package for the Social Sciences) package program has been used in assessment of the data. Results of measurements have been presented as Mean (M) and Standard Deviation (S_D). One-Sample Kolmogorov-Smirnov test was applied in order to test if

the data distribution was normal and since it was, student t test was applied in independent groups to compare them. 0.05 value was accepted as significant.

RESULTS

In table 1, it is indicated that difference in HGB, MCH, MCHC and RDW-SD values of elite wrestlers and healthy sedentary subjects of the same age group is statistically significant (p<0.05), while RBC, HTC and RDW-CV values are not significant (p>0.05).

In Table 2, it is indicated that difference in Mid, Lymph%, Mid% and Gran% values of elite wrestlers and healthy sedentary subjects of the same age group is statistically significant (p<0.05), while WBC, Lymph and Gran values are not significant (p>0.05).

In Table 3, it is indicated that difference in PLT, MPV, PDW and PCT values of elite wrestlers and healthy sedentary subjects of the same age group is statistically significant (p≤0.001).

Table 1: Erythrocyte Parameters of Elite Female Wrestlers (n=24) and Sedentary Female Groups (n=24)

Variables	Normal range of erythrocyte parameters	Group	M±S _D	t	p
RBC	4.00-6.00	FW	4,59±0,29	-1,822	0,075
		SF	4,76±0,38		
HGB (g/dL)	11.00-18.00	FW	12,67±1,10	-2,940	0,005*
		SF	13,58±1,05		
HCT (%)	35.0-57.0	FW	39,92±2,70	-1,895	0,064
		SF	41,96±4,51		
MCH (pg)	27.00-31.00	FW	27,60±1,61	-2,098	0,041*
		SF	28,67±1,90		
MCHC (g/dL)	32.00-37.00	FW	31,70±0,93	-2,201	0,033*
		SF	32,79±2,24		
RDW-CV (%)	11.50-14.50	FW	14,20±1,06	0,130	0,897
		SF	14,17±0,91		
RDW-SD (fL)	37.0-54.0	FW	44,04±2,67	-2,174	0,036*
		SF	46,31±4,55		

*p<0.05

Table 2: Leukocyte Parameters of Elite Female Wrestlers (n=24) and Sedentary Female Groups (n=24)

Variables	Normal range of leukocyte parameters	Group	M±S _D	t	p
WBC	4.50-10.50	FW	7,02±2,00	-0,818	0,418
		SF	7,48±1,85		
Lymph	1.50-4.00	FW	2,19±0,710	0,684	0,497
		SF	2,07±0,508		
Mid	0.30-0.80	FW	0,49±0,14	2,508	0,016*
		SF	0,40±0,12		
Gran	2.2-4.8	FW	4,16±2,04	-1,600	0,116
		SF	5,00±1,56		
Lymph%	20.50-45.50	FW	35,80±9,74	2,098	0,041*
		SF	29,90±9,72		
Mid%	5.50-11.70	FW	7,49±1,10	3,307	0,002*
		SF	5,85±2,16		
Gran%	43-65	FW	56,70±13,59	-2,696	0,010*
		SF	65,33±7,83		

P<0.05

Table 3: Platelet Parameters of Elite Female Wrestlers (n=24) and Sedentary Female Groups (n=24)

Variables	Normal range of platelet parameters	Group	M±S _D	t	p
PLT	150-400	FW	252,54±37,84	3,425	0,001*
		SF	218,79±29,96		
MPV (fL)	7.40-10.40	FW	10,40±0,58	5,725	0,000*
		SF	9,18±0,86		
PDW	9.00-15.00	FW	11,98±1,20	-8,703	0,000*
		SF	15,80±1,78		
PCT (%)	0.150-0.70	FW	0,26±0,03	6,119	0,000*
		SF	0,20±0,03		

P<0.05

DISCUSSION

This study was conducted for determining the effects of chronic exercise on the hematological parameters. Erythrocyte parameters; HGB, MCH, MCHC and RDW-SD have been found to be lower in elite wrestlers, while leukocyte parameters; Mid, Mid% and Lymph% were higher in elite wrestlers and Gran% was higher in sedentary subjects. Platelet and platelet related parameters MPV and PCT were higher in wrestlers and PDW was higher in sedentary subjects.

In this study, values of erythrocyte parameters were low. A slight decrease may be observed in blood volume due to fluid loss [6]. In sports people who perform intense exercise programs, hemoglobin and hematocrit values decrease and this is recognized as sportsman anemia [13]. In a study conducted by Magazanik and colleagues [14], effects of chronic exercise were studied and as a result it has been indicated that erythrocyte parameters decrease. Nieman and colleagues [15] found out that after the exercise sedentary hemoglobin values increase. Ünal [16] indicated that after 8 weeks of aerobic exercises, hemoglobin values of subjects increased significantly. Arslan and colleagues [17] indicated that hematocrit and erythrocyte values of elite wrestlers are high in comparison to control group. Patlar and Keskin [18] indicated that sub maximal exercise has a significant effect (Increase) on WBC, RBC, HGB and HCT levels.

In this study, it has been observed that leukocyte parameter values of FW except Gran and Gran% are high. This increase in leukocyte parameters is explained with the participation of marginal leukocytes in circulation. In other words, in exercise blood stream increases and circulation becomes faster, that way leukocytes that are on vessel walls join in blood stream and leukocyte quantity increases in the blood [419]. The more stress accompanies the exercise, the more the leukocyte increases. Especially in intense exercises, this increase is more obvious. Many studies has indicated that intense exercise increases leukocyte concentration and apart from intensity of the exercise, condition state of the person is

also significant in this increase [20]. Ersöz [21] indicated that in sub maximal exercises leukocyte number increases. Büyükyazı and Turgay [22] indicated that constant and common interval running exercises cause acute increases in leukocyte numbers.

In this study, it has been observed that platelet parameter values of FW are high. Some studies indicated that acute exercise increase the number of platelet [23], while other studies indicated it does not have an effect [16, 18]. Increase in platelet parameters may be explained with exercise related hem concentration. It may also be explained with factors that force the body and cause stress, that way enable nerve system activation and raise the number of platelets [6]. There are various findings about exercise and changes in platelet numbers [24]. Özyener and colleagues [25] indicated that short-term and maximal intensity exercise has an effect on platelet parameters. While Patlar and Keskin [18] indicated that sub maximal exercise has a significant effect on PLT levels. Ersöz [21] indicated that sub maximal exercises do not cause a significant increase in platelet numbers. It is indicated that the difference stems come from intensity and duration of the exercise [26]. In literature, it is indicated that maximal and sub maximal intensity exercises cause short-term temporary increases in peripheral platelet numbers, however the number does not change with low intensity and short-term moderate exercises [4, 19, 27].

Ibiş *et al.* [20] indicated that intense exercises affect hematologic parameters more in comparison to moderate exercises because hematocrit level change due to blood plasma volume decrease during and after exercise. Ricci *et al.* [10] indicated in their study that hematologic parameters decrease due to chronic exercises. In his study conducted on teakwondo performers, Çakmakçı [28] indicated that there is not a significant difference between leukocyte, platelet, hemoglobin and hematocrit parameters of the blood samples taken before and after the camp. Kara *et al.* [29] indicated that there is not a statistically significant difference in hemoglobin, hematocrit, erythrocyte, leukocyte and platelet values of elite sports people of two different branches.

As a conclusion, it is thought that although blood cells of groups are within the reference range, their being low or high in numbers is based on participation in sports depending on type, intensity, duration and frequency of the exercise and condition state of the subjects. Similar studies with multi subject and multi repetition are needed.

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