PRINT: ISSN 0972-0073 ONLINE: ISSN 2456-6802
Anthropologist, 18(3): 691-696 (2014)
DOI: 10.31901/24566802.2014/18.03.04

Effects of a Year Long Wrestling Training Season on Biochemical Blood Parameters of Elite Wrestlers

Mehmet Özal

Genaral Directorate of Sports, Ankara, Turkey
E-mail: mehmetozal73@gmail.com

KEYWORDS Biochemical Parameters. Leukocytes. Erythrocytes. Thrombosis. Wrestlers.

ABSTRACT The focus of this study is aimed at examining the effects of a year-long wrestling session on variation of hematological parameters of forty-two elite wrestlers. Biochemical parameters were studied during transition period of a year long wrestling season for each year. The findings of the study indicated that among the hematological variables studied, only RBC counts, MO, MCH, MCHC, and hematocrit had significant variations. According to the findings, MO, hematocrit, and RBC count increased significantly after one year of wrestling training while MCH and MCHC values decreased after one-year training. There were differences between pre and post-test results of SGOT, cholesterol, and urea variables. The study results indicated that more experience wrestling training had some positive effects on hematological parameters. The increase in red blood cells, and decrease cholesterol and urea values of the wrestlers after wrestling season are positive signs of improvements in hematological parameters of the wrestlers.

INTRODUCTION

Physical activity influences a large number of systems, and also hematologic and biochemical parameters. Many other factors such as hematologic and biochemical levels play vital role on the management of physiological response such as adaptation to exercises, adjustment of cardiovascular activities and physical and physiological balance (Ibis et al. 2010; Horswill 1992) While regular physical activity exerts a range of beneficial physiological effects, a very long-duration ultra-endurance exercise might produce substantial changes in biochemical parameters (Waœkiewicz et al. 2012) Hematologic and biochemical parameters are very important ones for these adaptations. Wrestling is a physical activity and sport that requires remarkable physical and physiological preparation. Both anaerobic and aerobic characteristics are very important for a wrestler's success (Ibis et al. 2010; Meyer and Meister 2011; Horswill 1992; Yoon 2002; Hubner-Wozniak et al. 2004). Hematologic and biochemical parameters may affect these characteristics.

In the body system, blood carries oxygen, carbon dioxide, and other substances essential for tissues (Edington and Edgerton 2004). Blood consist of plasma, red blood cells (RBCs), white blood cells (WBCs) and platelets (Gaeini 2001). Primarily, red blood cells and hemoglobin are responsible for transferring nutrients and oxygen to active tissues, as well as carrying excretory substances and carbon dioxide from tissues for expulsion from the lungs. Physical exercises intended at improving aerobic competence and body endurance depend on several factors. The most important factor is oxygen carrying capacity of the blood. Also, RBC count, hemoglobin level and hematocrit seriously affect the ability of transportation of oxygen to tissues and secretion of carbon dioxide (Gaeini 2001). Therefore, optimal levels of biochemical parameters such as leucocytes, erythrocytes, thrombosis, and urine values are very important for both health and athletic performance of wrestlers.

In spite of the latest advancements in the field of sports hematology, the effects of continual long-term training on blood parameters remain to be investigated. Besides, investigating the trends of hematological variations consequential from regular physical training in skilled athletes may offer a proper position for improvement of well-organized exercises. Thus, discovering the hematological outcomes of these specific exercises will help sports facilitators to think about the useful or harmful results of their training programs. Hence, taking into consideration the significance of a year-long wrestling training session for wrestlers and the lack of adequate data on the influence of regular whole year wrestling program on hematological parameters of elite wrestlers, this study aims at examining the effects of a year-long wrestling session on the variation of hematological parameters of

wrestlers representing national the team of Turkey. It was expected that the training program would affect blood values of the wrestlers in a positive manner.

METHODS

Participants: This study consists of a forty-two elite wrestlers representing national team of Turkey who volunteered to participate in the study. Participant characteristics were presented in Table 1. Written and oral consent from each participant was obtained at the beginning of the study as they were informed of potential risks in the experiment. The participants were not informed of the outcomes until the study was concluded.

Procedures: Biochemical parameters (leucocytes, erythrocytes, thrombosis, and urea values) were determined during transition period of a year long wrestling season for each year. The bloods were drawn in a resting state for each *participant.*

Blood Analysis: To evaluate the variations in hematological parameters following, 8 cc venous blood samples from each participant in sitting position during transition session for each year from the competitions in resting state. Blood samples were directly referred to a legitimate clinical laboratory in test tubes containing anticoagulant, and the hematological parameters were determined using "Echo Biochemistry Analyzer".

Statistical Analysis: Kolomogrov- Smirnov test was used to determine data distribution. A paired T tests was used to check the variations in hematological parameters, with p values < 0.05 considered significant. Data were analyzed on SPSS software version 16.

RESULTS

According to the Table 2, significant differences were found in MO (p = 0.009 <0.005) between the groups. The post values were higher than Pre-test values. Again, MO # values were found to be significantly different from each other (p = 0.027 <0.005). Post-test values were higher than pre-test values. All findings were within normal limits accordingly and also for athletes indicates a positive development.

According to the Table 3, RBC's (p = 0.000 <0.005), HCT (p = 0.000 <0.005), MCH and MCHC (p = 0.000 <0.05) values were significantly differ-

Table 1: Subject characteristics (n =42)

Variable	*Group*	*N*	*Mean*	S_D	*t*	*p*
Age	Pre	21	23.2857	2.77746	-.737	.465
	Post	21	23.9524	3.07370		
Height	Pre	21	175.4286	9.91247	.106	.916
	Post	21	175.0952	10.37258		
Weight	Pre	21	81.3810	19.31444	-.191	.849
	Post	21	82.6190	22.51772		

Table 2: Leukocytes parameters

Variable	*Group*	*N*	*Mean*	S_D	*t*	*p*
WBC	Pre	21	6.5095	1.29186	-1.323	.193
	Post	21	7.0446	1.34336		
LYMPH	Pre	21	40.3429	7.44598	.628	.534
	Post	21	38.7619	8.81019		
MO	Pre	21	6.5952	2.12167	2.757	.009*
	Post	21	4.9095	1.83000		
GRAN	Pre	21	53.0476	8.21088	-1.136	.263
	Post	21	56.0333	8.81461		
LYMPH%	Pre	21	2.5714	.44288	-.631	.532
	Post	21	2.6667	.53135		
MO%	Pre	21	.4333	.16228	1.996	.053*
	Post	21	.3381	.14655		
GRAN%	Pre	21	3.5286	1.09323	-1.326	.193
	Post	21	4.0286	1.33796		

*(p = 0.000 <0.005). WBC (White blood cells), LYMPH (Lymphocytes), MO (Monocytes), GRAN (Ggranulocytes)

ent between pre-test and post-test values. Post-test RBC and HCT values were higher than pre-test values while MCH and MCHC are variables were significantly higher in pre-test values. Post-test values in this table is high, all signs within normal limits and also for athletes indicates a positive development.

According to the Table 4, there are no statistical differences between pre and post-test values of all parameters.

Table 3: Erythrocytes parameters

Variable	*Group*	*N*	*Mean*	S_D	*t*	*p*
RBC	Pre	21	4.8481	.31579	-3.976	.000*
	Post	21	5.2238	.29637		
HGB (g/dL)	Pre	21	14.9333	.83146	-.278	.782
	Post	21	15.0095	.94016		
HCT (%)	Pre	21	42.5619	2.55880	-3.889	.000*
	Post	21	45.8857	2.96535		
MCV	Pre	21	87.7238	2.38200	-.162	.873
	Post	21	87.8952	4.24116		
MCH (pg)	Pre	21	30.7857	1.09238	4.850	.000*
	Post	21	28.5571	1.80016		
MCHC (g/dL)	Pre	21	35.0857	.73095	7.941	.000*
	Post	21	32.7048	1.16339		
RDW (%)	Pre	21	12.8190	.56623	-.872	.389
	Post	21	12.9619	.49343		

*(p = 0.000 <0.005). RBC (Red Blood Cell), HGB/Hb (Hemoglobin), HCT (Hematocrit), MCV (Mean Corpuscular Volume), MCH (Mean Corpuscular Hemoglobin), MCHC (Mean Corpuscular Hemoglobin Concentration), RDW (Red Cell Distribution Width)

Table 4: Thrombosis parameters

Variable	*Group*	*N*	*Mean*	S_D	*t*	*p*
PLT	Pre	21	205.4762	36.48646	-1.351	.192
	Post	21	306.3810	34.40498		
MPV (fL)	Pre	21	8.6524	.76787	-.068	.946
	Post	21	8.6700	.88977		
PCT (%)	Pre	21	.1776	.03456	-1.525	.135
	Post	21	.1940	.03508		
PDW	Pre	21	16.0905	.51274	.189	.851
	Post	21	16.0571	.62335		

PLT (Platelets), MPV (Mean Platelet Volume), PCT (Platelet Crit), PDW (Platelet Distrubition Width). All results in this table are in the normal range.

Table 5: Liver function parameters

Variable	*Group*	*N*	*Mean*	S_D	*t*	*p*
SGOT	Pre	21	40.8048	39.30771	2.170	.042*
	Post	21	22.0471	4.92821		
SGPT	Pre	21	26.9471	14.25027	1.603	.118
	Post	21	21.1387	8.51525		
ALKALIN	Pre	21	204.0762	45.76137	-.443	.661
	Post	21	211.2143	58.02666		
CHOLESTEROL	Pre	21	172.0619	28.82777	2.425	.021*
	Post	21	153.5286	19.89234		
TRIGLISERIN	Pre	21	84.6662	40.14335	-.943	.351
	Post	21	96.6786	42.35963		
GGT	Pre	21	14.6253	6.93348	-.743	.463
	Post	21	15.9404	4.20974		
UREA	Pre	21	39.5400	15.95571	3.092	.005*
	Post	21	28.5486	3.29126		

*(p = 0.000 <0.005). SGOT (Serum Glutamic Oxalocetic Transaminase), SGPT (Serum Glutamic Pyruvic Transaminase), GGT (Gama Glutamil Transferaz)

According to the Table 5, there were differences between pre and post-test results of SGOT variable (p = 0.042 <0.05), cholesterol variable (p = 0.020) and urea variables (p = 0.005 <0.05). All three variables were higher in pre-test than the post –test values. The post-test measurements in this table is low, all signs within normal limits and also for athletes indicates a positive development.

DISCUSSION

The aim of this study was to examine the effects of a year long wrestling session on variation of hematological parameters of wrestlers. It was hypothesized that the training program would affect blood values of the wrestlers in positive manner. Hematologic changes are well known in the athletes depending on the long-term exercises (Ibis et al. 2010; Meyer and Meister 2011; Beydagi et al. 1993). Blood functions as a carrier apparatus for the distribution of hormones and transport of oxygen (O2) to the tissues, and enables exchange of messages between the distant organs in order for ordinary cells to continue their functions, and for body defense (Junqueira et al. 2006). All these factors have a part in athletic performance.

The present study investigated the variations in hematological parameters, including WBC, RBC, HCT, Hb, MCH, MCHC, MCV, PLT and PV, during one-year wrestling season. The findings of the study indicated that among the hematological variables studied, only RBC counts, MO, MCH, MCHC, and hematocrit had significant variations (P<0.05) Tables 2, 3. According to the findings, MO, hematocrit, and RBC count increased significantly after one year of wrestling training (P<0.05) while MCH and MCHC values decreased after one-year training Tables 2, 3. Çýnar et al. (2013) conducted a study on footballers and it can be stated that match program of 10 days has caused significant alterations in complete blood values of RBC, PLT and HGB values. Kara et al. (2010) conducted a study on 15 elite wrestlers and 14 elite basketball players. Hemoglobin, hematocrit, erythrocyte, leukocytes, platelets and triglycerides did not find significant differences between the groups. Çakmakçi (2009) conducted a study on taekwondo athletes and acknowledged that and there was not a significant difference in hemoglobin and hematocrit parameters in pre-camp and post-camp samples. In addition, findings of (Ibis et al. 2010; Meyer and Meister 2011; Arslan et al. 1992) reported that students. The physical activity level of athletes was higher than that of the control group. Mollanovruzi et al. (2012) examined that wrestling exercise led to significant increase in PLT in the morning and afternoon. Increase in PLT was higher in the morning than afternoon with Eta squared 0/45 and 0/35 respectively. Furthermore, the RDW and MPV significantly decreased in the afternoon than morning session in the experimental group although was not significant compared to the control group. Sazvar et al. (2013) showed on their study during an 8 – week morning exercise the number of red blood cells, hemoglobin levels, and hemotocrit percentage increased. Also the leeding times and the number of platelets decreased significantly. Ýn the other research Ghanbari et al. (2013) examined some Hematological Parameters of Male Collage Students and their studies showed that in the exercise group with 35 percent of one maximum repetition, only MCV had a significant decrease but other tested blood variables showed no significant change; PLT, PDW, MPV, P-LCR, WBC, NEUT, RBC, HGB, and MCH had an insignificant increase, while LYM, MXD, HCT, RDW, and PV had an insignificant decrease. In the control group, NEUT and HGB showed a significant increase, LYM and PV had a significant decrease, PLT, MPV, P-LCR, WBC and MXD showed an insignificant increase, and PDW had an insignificant decrease. These results partially support the findings of current study. Depending on the level of exercise on blood biochemistry findings is different. In another study (Hammouda et al. 2013), Mean levels of the selected biochemical markers were raised after the YYIRT exercise (P<0.001 for the other markers). Moreover, lipid parameters increased significantly after the test (P<0.01 for Tri and P<0.001 for HDL). In a similar study (Drygas et al. 2014), ultra-marathon swimmer exposed to long periods exercise although some decreases in blood parameters, exercises were completed without any health problems. Acute blood chemistry shows improvements because of exercise as well as with exercise in chronic studies, indicating that there are changes (Sekeroglu et al. 1997; Özhan et al. 2000). In another study (Koç et al. 2010) are 54 athletes and 54 sedentary in his work on the RBC, HCT, RDW, HGB and MCHC

values compared statistically significant, and it is also found that MCH have found similar results. (Chamera et al. 2014) found that AST, ALT, and GGT activities could be a valuable tool to assess the metabolic response in high-level fitness female athletes. Therefore, monitoring of those well-known diagnostic markers could prevent the trainee from harmful overtraining. In our study, the detected value is within the boundaries of the reference values. These results are similar to levels as determined by previous studies (Colombini et al. 2014; Günay et al. 2001; Noyan 2000; Guyton et al. 1996; Yilmaz 1999).

CONSLUSION

There were differences between pre and post-test results of sgot, cholesterol, and urea variables. All three variables were higher in pre-test values than the post – test values. These results indicated that more experience training in wrestling have positive results of biochemical values. All athletes' pre-test and post-test results all within normal limits, while the parameters in the training process is seen to be affected in a positive direction, based on these results in terms of athlete health and disease risk can be said to have a positive impact.

To sum, the findings of the study indicated that long term wrestling training had some positive effects on biochemical blood parameters of elite wrestlers. The increase in red blood cells, and decrease cholesterol and urea values of the wrestlers after wrestling season are positive signs of improvements in hematological parameters of the wrestlers.

RECOMMENDATION

According to the results obtained in the study; blood parameters and their levels are one of the most important factors that directly affect performance. Long and intensive training season also have a positive effect on blood parameters and therefore can be said that in term of health beneficial effects, athletes with intensive training for a long time are at an advantage. In addition to a variety of sporting performance, they also gain positively in some hematological recovery. The training, monitoring in athletes should be performed using measurements of performance and biological or physiological parameters. Therefore, monitoring of those well-known diagnostic markers could prevent the trainee from harmful overtraining.

ACKNOWLEDGEMENT

I would like to thank SESAM (Athletes Training and Research Centre) health care professionals who I worked with, especially for blood sampling and laboratory analysis. I also wish to express my appreciation to PhD. Ersan KARA for his assistance.

REFERENCES

Arslan C, Gönül B, Kaplan B, Dinçer S 1992. Anaerobic Exercise, *International Journal of Human Comparison of Some Respiration and Blood Sciences*, 7(1): 70-82.

Beydagi H, Çoksevim B, Temoçin S, Akar S et al. 1993. Effect of acute sub maximal exercise on the leucocytes of persons doing and not doing sports, *Sports Medicine Maga*, 28: 52-62.

Chamera T, Spieszny M, Klocek T, Kostrzewa-Nowak D, Nowak R, Lachowicz M, Buryta R, Ciêszczyk P 2014. Could biochemical liver profile help to assess metabolic response to aerobic effort in athletes? *J Strength Conditioning Res*, 28(8): 2180-2186.

Colombini A, Machado M, Lombardi G, Lanteri P, Banfi G 2014. Modifications of biochemical parameters related to protein metabolism and renal function in male soccer players after a match. *J Sports Med Phys Fitness*, 54(5): 658-64.

Çakmakci E 2009. Effects of camp term on some sedantary individuals. *Nigde University Journal of Physical Education and Sport Science*, 3(1): 21-29.

Çinar V, Cengiz S, Pala R, Dündar A 2013. Effect of football practices on certain blood values of athletes. *Advances in Environmental Biology*, 7(5): 924-927.

Drygas W, Rêbowska E, Stêpieñ E, Golañski J, Kwaœniewska M 2014. Biochemical and hematological changes following the 120-km open-water marathon swim. *Journal of Sports Science and Medicine*, 13: 632-637.

Edington DW, Edgerton VR 2004. *The Biology of Physical Activity.* Trans: H Nikbakht. 5th Edition (Persian) Tehran: Samt Publ.

Gaeini AA 2001. Comparing the effect of a maximal exercise and exercise under maximal on the response hematological factors of adolescent athletes and non-athletes. *J Mov, (Persian)* 10: 125-135.

Ghanbari-Niaki A, Tayebi SM 2013. Effects of a low intensity circuit resistance exercise session on some hematological parameters of male collage students. *Annals of Applied Sport Science*, 1(1): 6-11.

Guyton MD, Hall JE 1996. *Textbook of Medical Physiology:* Tibbi Fizyoloji. (Trans: H Çavusoglu). Alemdar Ofset, Istanbul: Yüce Yayinlari.

Günay M, Cicioðlu I 2001. *Spor Fizyolojisi. Baran Offset.* Ankara: Gazi Kitabevi.

Hammouda O, Chtourou H, Chaouachi A, Chahed H, Zarrouk N, Miled A, Chamari K and Souissi N 2013. Biochemical responses to level-1 Yo-Yo intermittent recovery test in young Tunisian football players. *Asian Journal of Sports Medicine,* 4(1): 23-28.

Horswill CA 1992. Applied physiology of amateur wrestling. *Sports Med,* 14(2): 114-143.

Hubner-Wozniak E, Kosmol A, Lutoslawska G, Bem 2004. Anaerobic performance of arms and legs in male and female free style wrestlers. *J Sci Med Sport,* 7(4): 473-80.

Ibis S, Hazar S, Demirci I 2010. The chronic effect of plyometric training on hematological parameters in Alpine Skiers. *Br J Sports Med,* 44(1): i23-i24.

Junqueira LC, Carneiro J 2006. *Basic Histology.* (Trans, Edit: Y Aytekin, S Solakoglu), Istanbul: Nobel Bookstore.

Kara E, Özal M, Yavuz HU 2010. Elit Güresçi ve Basketbolcularin Kan ve Solunum Parametrelerinin Karsilaþtirilmasi, *Selçuk Universitesi Beden Egitimi ve Spor Bilim Dergisi,* 12(1): 36–41

Koç H, Saritas N, Büyükipekci S 2010. The Comparison of hematological and blood levels of athletes with sedentary. *Saglik Bilimleri Dergisi (Journal of Health Sciences),* 19(3): 196-201

Meyer T, Meister S 2011. Routine blood parameters in elite soccer players. *Int J Sports Med,* 32(11): 875-881

Mollanovruzi A, Koushki MH, Rashidlamir A 2012. The Effect of Wrestling Exercise in Morning and Afternoon on Some Leukocytes, Thrombocytes and Erythrocytes Indices. *International Shomal Sports Science Conference.*

Noyan A 2000. Yasamda ve Hekimlikte Fizyoloji, *Meteksan Ank.* Sirk, 12, Ankara.

Özhan E, Hizmetli S, Özhan F, Bakir S 2000. The effect of the exercise on the blood lipoprotein levels of male athletes. *C Ü Tip Fakültesi Dergisi,* 22(2): 88-92

Sazvar A, Mohammadi M, Nazem F, Farahpour N 2013. The effect of morning aerobic exercise on some hematological parameters in young, active males. *Iranian Journal of Health and Physical Activity,* 4(1): 23-28.

Sekeroglu MR, Aslan R, TarakcIoðlu M, Kara M, Topal S 1997. Sedanterlerde Akut ve ProgramlI Egzersizin Serum Apolipoproteinleri ve Lipidler Uzerine Etkileri, *Ege Univ Spor Hek Derg,* 32: 130

Waskiewicz Z, Klapcinska B, Sadowska- Krêpa E, Czuba M, Kempa K, Kimsa E, Gerasimuk D 2012. Acute metabolic responses to a 24-h ultra-marathon race in male amateur runners. *European Journal of Applied Physiology,* 112: 1679-1688.

Yilmaz B 1999. Hormonlar ve Ureme Fizyolojisi, *Feryal Matbaa,* 1: 247-371.

Yoon J 2002. Physiological profiles of elite senior wrestlers. *Sports Med,* 32(4): 225-33