

The Comparison between the Effects of Two Methods of Weight Loss (Dehydration and Diet) on Some Physiological and Biochemical Factors in Elite Wrestlers

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Abstract

Introduction: In this study, the effects of dehydration (sauna) and diet (reduction of daily food intake) on selected physiological and biochemical factors were compared in two groups of wrestlers weighting between 65 -85 kgs who lost 4% of their weight using one of the mentioned methods. Factors measured in the pre- and post-test were : glucose , urea , cratinin , uric acid , cholesterol , Na , k , protein , cortisol , white and red cells , hemoglobin and hematocrite.

Material and Methods: This study is a semi-experimental research. The population of the study includes wrestlers of 65 to 85kgs from Razavi Khorason province who have wrestled for about 5 years. The participants were randomly divided into two experimental groups (10 dehydration and 10 diet). The diet group were on diet for 10 days to lose about 4 percent of their weight while the dehydration group went to sauna for 3 hours to lose the same amount of weight. Blood samples were taken before and after the weight loss. and were analyzed using the Auto Analyzer system.

Results: The statistical analysis ($\alpha=0.05$) showed a significant decrease in cratinin , monocytes, eosinophiles and a significant increase in glucose , cholesterol , Na , k , cortisol, white and red cells , hemoglobin , hematocrit and nutrophiles of the dehydration group. In the diet group cratinin and eosinophiles had a significant decrease while urea, uric acid and protein had a significant increase.

Discussion and Conclusion: According to the results and the background studies of this research, we may infer that losing weight through dehydration and diet may cause undesirable changes in physiological and biochemical factors of blood especially plasma volume decrease, blood density increase, and changes in ions , electrolytes and hemoglobin. Generally, according to the results of this research, long-term diet along with doing some exercise is recommended for weight loss.

Key words: Weight loss, Dehydration, Diet, Physiological and biochemical factors, Elite wrestler

Introduction

Wrestling is one of the sports that has a long history. Wrestling is an Iranian national sport, has roots in the ancient history of this country and is interwoven with their heroic culture. Wrestling has been very popular from ancient times, has been held in national, religious ceremonies and celebrations and had a very important role in international relationships [1].

Today, wrestling is held in different weights and in two styles: Free style and Greco – Roman. Most of the wrestlers try to control their weights according to their body and physical conditions and they even try to lose weight to compete in a lower weight group [2]. Since the minimum difference

between most wrestling weights is between 5 to 10 kg, most wrestlers tend to lose weight in different ways [1, 3, 4]. Coaches and wrestlers think that losing weight before competitions cannot really affect their efficiency and fitness, but they ignore the fact that losing weight specially through dehydration may bring about unwanted side effects such as fitness decrease [1] , weakness and inefficiency of the muscle cells' metabolism, blood density increase, blood circulation decrease in active tissues, tension in Cardiopulmonary systems to provide the needed oxygen [5], body temperature increase [6], problems in the endurance of upper and lower extremities, upper extremity weakness [7], disorder in food metabolism, muscle cramps, nerve intrigues problems, and reduction of strength performance capacity [1, 8, 9].

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Some researches about weight loss and its effect on different physiological and biochemical factors have been done in other countries and the results have been contradictory, but the number of researches in our country, Iran, is not a lot. In this research, the effects of weight loss on some physiological and biochemical factors in two groups of elite wrestlers of 65 to 85 kgs has been examined and compared.

Material and Methods

The population of the study included wrestlers from khorasan-e-Razavi province (weight 65 to 85kgs, age 17 to 27 yrs), , who have been wrestling about 5 years.

To do the sampling, first, twenty out of 70 wrestlers who met the above conditions were randomly selected , then they were randomly divided in two experimental groups: dehydration group (10 wrestlers with mean age=20/8±2/32; weight=75/3±5/8 kg; height=175±0/63; weight loss percent=3/9±0/16) and diet group (10 wrestlers with mean age=21/6±3; weight=74/7±6 kg; height=173±0/63; weight loss percent= 4/1±0/37).

In this research we decided that the wrestlers lose about 4 percent of their body's weight through dehydration and diet. Then the effects of weight loss on some physiological and biochemical factors including: glucose, urea , cratinin, uric acid , cholesterol , Na , k, protein, cortisol , white and red cells , hemoglobin and hematocrite were examined and compared.

After dividing the sample into two groups, the diet group were weighed at 5 o'clock in the afternoon and then the blood samples were collected by a lab specialist. . Then they were provided with some nutritional information such as food names along with their calorie content, the list of different activities along with their calorie expense, the way of writing different activities and daily food intake and some recommendations, and finally they learned how to fill out the forms.

In order to lose weight the diet group were on diet for 10 days. During this time, the participants in this group were weighed everyday at 5 p. m and before exercising by the researchers. . The completed forms including the activities done and the food eaten by the participants were also delivered to the researchers and the participants were advised to be on the diet. They planned to lose weight about $\frac{1}{10}$ percent of their body weight

every day in order to lose about 4 percent of their body weight after 10 days. By the way, they were asked not to decrease their water and other drinks intake. After 10 days the diet group were weighed again at 5 p. m and the second blood samples were collected by the lab specialists.

Participants in the dehydration group were also initially weighed at 5 p. m and their first blood sample was collected.. On the next day, they went to a dry sauna from 2 p. m to 5 p. m to lose weight about 4 percent and then the second blood sampling was done.. All the blood samples were immediately taken to the lab for the analysis. Blood samples were analyzed by Auto Analyzer system.

To examine the results of research, descriptive statistics (average, standard deviation and tables) and parametric statistics, t test for pair and individual samples were used. To analyze the results, spss (version 16) software was used and Alpha (α) was considered to determine the level of significance at 0/05.

Results

The effects of weight loss through dehydration and diet are presented in table 1.

The results of pre – test and post – test in the dehydration group showed that as a result of losing weight about 4 percent, blood glucose, urea, uric acid, cholesterol, sodium, potassium, plasma protein, cortisol, white blood cells, red blood cells, hemoglobin, hematocrite, and notrophiles increased, while the level of cratinin, lanphocytes, monocytes and eosinophiles decreased. Analyzing data from dehydration group showed that blood glucose, cratinin, cholesterol, sodium, potassium, cortisol, red and white blood cells, hemoglobin, hematocrite, notrophiles, monocytes and eosinophiles changed significantly ($p < 0/05$), while the changes of other factors were not statistically significant (Table 1).

The results of pre- test and post – test in the diet group showed that after losing weight about 4 percent, the level of blood glucose, urea, uric acid, cholesterol, sodium, plasma protein, white blood cells, red blood cells, notrophiles increased , while cratinin, potassium, cortisol, hemoglobin, hematocrite, lanphocytes, monocyte and eosinophiles decreased. Analyzing data from diet group showed that the changes of urea, cratinin, uric acid, plasma protein, and eosinophiles were statistically significant while the changes of other factors were not statistically significant (Table 1).

Table 1: Mean difference of variables in two groups (dehydration and diet) in pre and post test

Variable	Dehydration			Diet		
	Pre test	Post test	Significant level (P-Val)	Pre test	Post test	Significant level (P-Val)
Blood glucose (mg/dl)	73/7	100/4	0/002	85	91/9	0/382
Urea (mg/dl)	30/7	32/8	0/551	26/67	34	0/036
Cratinin (mg/dl)	1/170	0/87	0/01	1/13	0/8	0/004
Uric acid (mg/dl)	5/88	6/53	0/209	5/09	6/13	0/017
Cholesterol (mg/dl)	170/9	190	0/043	165/8	173	0/538
Na (mEq/l)	138/4	140/9	0/009	142/4	142/67	0/914
K (mEq/l)	3/64	4/33	0/001	4/31	4/06	0/291
Protein (g/dl)	8/23	8/56	0/179	6/97	7/91	0/01
Cortisol (micg/dl)	11/6	19/4	0/006	14/4	13/44	0/861
WBC (milion/mm ³)	7/31	9/43	0/002	7/518	8/14	0/26
RBC (milion/ mm ³)	5/13	5/61	0/000	5/095	5/156	0/222
HB (g/dl)	15/18	16/33	0/004	17/78	14/83	0/353
HCT (%)	43/04	46/6	0/000	48/43	43/05	0/306
Notrophiles (%)	58/2	65/4	0/028	56/89	64/56	0/053
Lanphocytes (%)	36/4	31/8	0/093	36/67	31/40	0/139
Monocytes (%)	2/52	¼	0/005	2/67	2	0/111
Eosinophiles (%)	2/9	¼	0/022	3/78	2	0/014

Discussion and Conclusion

In this study, the effects of dehydration (sauna) and diet (reduction of daily food intake) on selected physiological and biochemical factors were compared in two groups of wrestlers (65 -85 kgs weight) who lost 4% of their weight using one of the mentioned methods. Our findings show that after losing weight through dehydration and diet, blood glucose increased in both groups and this change was statistically significant in the dehydration group. In the diet group however, only urea and plasma protein increased significantly.

Cratinin levels decreased significantly in both groups. Our results also demonstrate that cholesterol increased significantly in the dehydration group. The observed increase in the mentioned physiological and biochemical factors (except for cratinin) of the dehydration group is probably due to the plasma volume reduction in this group.

Our findings are consistent with those of Hickner et al [8] who developed a test to study the physical performance of wrestlers following weight loss and also with the results of Oopik et al [9] who studied

the effects of rapid weight loss on metabolism and isokinetic performance capacity.

The observed increase of the selected physiological and biochemical factors in the diet group is probably a result of a reduction of plasma volume and the energy needed for glucose, fat and protein metabolism. The increase of Urea and uric acid, - two byproducts of proteins metabolism- in this group could probably be the result of having insufficient energy. creatinin levels has also decreased because of protein metabolism during weight loss through diet [8, 9].

The result of this study demonstrates that the amount of sodium increased in both groups. potassium increased in the dehydration group and decreased in diet group and the change was only significant in the dehydration group. The increase of sodium and potassium is probably because of plasma volume reduction resulting from the weight loss (especially through dehydration method). These findings are consistent with the findings of Moeini [10] who studied the effects of weight loss (dehydration) on some physiological factors and physical fitness in wrestlers.

Because of the osmotic pressure of inside – cell water toward outside of the cell, the blood is decreased that could probably disturb muscle cell metabolism, decrease the strength, speed, and resistance and increase the reaction time [1, 7, 11, 12]. The changes of sodium and potassium in the blood cells result in thermal disorders, anerve stimulus speed reduction, an increase in the frequency of muscle cramps and also heart disorders [9, 13]. Our findings show that cortisol levels increased in the dehydration group and decreased in the diet group, and that these changes were only significant in the dehydration group. .

Cortisol increase in the dehydration group is probably because of the plasma volume reduction. This finding is consistent with that of Ziaei et al [2] who studied the effects of weight loss and glutamine-creatine supplementation on peripheral white blood cells in elite wrestlers. Some studies show that losing weight through dehydration has no effect on the level of blood cortisol. On the other hand, the Cortisol decrease in the diet group is probably because of the increase in the blood glucose, and fat and the proteins of plasma [14]. In both dehydration and diet groups the amount of white and red blood cells increased but changes were only significant in the dehydration group [2].

hemoglobin and hematocrite increased in the dehydration group and decreased in the diet group but changes were only significant the in dehydration group. . Hemoglobin and hematocrite increase in the dehydration group was probably because of the plasma volume reduction resulting from sweating that increases blood density. This finding is consistent with the results of Moeini [10]. According to the results and the of background studies of the present research, we may infer that losing weight through dehydration and diet may cause undesirable changes in physiological and biochemical factors of blood especially plasma volume decrease, blood density increase, and undesired changes in ions, electrolytes and hemoglobin. It may also interfere with oxygen delivery, resulting in an increase in the lactic acid levels and could also impair nerve-muscle stimulus processes and also interfere with cell metabolism [1, 9, 10]. However the results of this research show that the undesired consequences of weight loss through diet are fewer than dehydration.

In the end, a long – term diet program along with exercising is recommended for losing weight, (if necessary) [1, 7].

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