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A Comparison of Sports Schools Students' Blood Electrolyte Levels Considering Applied Courses

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Abstract: This study aims at an analysis of blood electrolyte levels of male and female students who attend different departments in the School of Physical Education in order to define the effect of applied courses on their electrolyte levels. 60 students aged between 18–23 years volunteered into the study. 5 ml blood samples taken from the forearm antecubital area of the volunteers into yellow-tap jelly tubes were analyzed by the auto analyzer in the central laboratory for their blood electrolyte levels such as calcium, magnesium, sodium, potassium, iron and iron binding capacity. In defining the differences among groups were analyzed through kruskal-wallis one way analysis or one-way ANOVA (post hoc Tukey). $P<0.05$ value was considered to be significant. it was found that the iron and iron binding capacity for male students in Coaching Education was higher than that in other departments and sodium is higher for male students in Physical Education Teaching. it was figured out that iron binding capacity in Sports Management Department was higher than that in other departments. The sodium level was higher for female students in Physical Education Teaching. The iron level was higher for female students in Coaching Education. it is considered that the difference in blood electrolyte levels of students attending different departments are within normal limits and the significant differences among the departments do not stem from the applied courses but are due to personal differences.

Key words: Blood electrolytes · Physical education · Coaching education · Sports management

INTRODUCTION

By its natural-born characteristics, human body needs continuous movement. However, human beings are under the influence of a static life which is considered to be the most insidious ailment of our time. As a result of such a static life, physiological attributes are adversely affected [1]. Yet, it is widely-accepted that regular exercise improves physical and physiological capacity significantly [2]. It is seen that the most important effect of regular exercise is on the biochemistry of blood and the effects of regular exercise on blood-cells, lipids and electrolyte levels are different. It is stated that such differences depend on the magnitude, duration and frequency of the exercise as well as the physical and physiological condition of the subjects of the study [3]. Researches have determined that regular exercise have a positive impact on all body cells and blood bio-chemistry, which also leads to prevention of any possible medical problem [4, 5].

For positive changes in blood biochemistry, loading elements such as magnitude, duration and frequency of exercise should be well-defined [6]. There can be changes in pre- and post-exercise biochemical values depending on the differences in terms of training status, gender, age, environmental factors, nutrition and life quality [7, 8]. Researches on this field suggest various findings on blood-biochemistry in relation to the relevant exercise. In addition to studies suggesting positive developments in blood biochemistry due to a short exercise, there are also other studies and researches claiming that such developments depend on long-term exercise rather than short-term ones [9].

This study aimed at an analysis of blood electrolyte levels of male and female students attending different departments of the School of Physical Education and Sports such as Coaching Education, Physical Education Teaching and Sports Management in order to define the effect of applied courses on blood electrolyte levels.

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MATERIALS AND METHODS

60 students - 30 males and 30 females – aged between 18 – 23 years, attending Coaching Education, Physical Education Teaching and Sports Management Departments of the School of Physical Education and Sports, volunteered into the study. The subjects were not given any exercise program. They just attended the applied courses in their freshmen curriculum in their respective departments. In the fall semester, students attended the applied courses, shown in the table below, in their Coaching Education, Physical Education Teaching and Sports Management Departments.

Departments	Weeks	Course-Hours	Total Hours
Coaching Education	12	14	168
Physical Education Teaching	12	20	240
Sports Management	12	8	96

It was therefore seen that students who participated in the study attended the applied courses with different hours throughout their education and training. At the end of the fall semester, 5 ml blood samples were taken from the forearm antecubital area of the volunteers into yellow-tap jelly tubes in accordance with the hygiene rules and these samples were analyzed by the auto analyzer in the central laboratory for their blood electrolyte levels such as calcium, magnesium, sodium, potassium, iron and iron binding capacity.

A statistical representation arithmetical average (Mean) and standard deviation (SD) (for normally distributed data), or as median (M) with 25%-75% percentile (for skewed data) values were given. In defining the differences among groups were analyzed through kruskal-wallis one way analysis or one-way ANOVA (post-hoc Tukey). SPSS (Statistical Package for the Social Sciences) 13.0 package software was used in statistical appraisal of the study conducted. $P<0.05$ value was considered to be significant.

RESULTS

When we looked at the findings for male students and made a comparison among the departments, it was found that the iron binding capacity for male students in Coaching Education was higher than that in other departments ($p=0.043$), sodium is higher for male students in Physical Education Teaching ($p=0.029$) and the iron level was higher for male students in Coaching Education ($p<0.001$).

When a comparison was made according to the findings for females in different departments, it was figured out that iron binding capacity in Sports Management Department was higher than that in other departments ($p=0.037$). The sodium level was higher for female students in Physical Education Teaching ($p=0.023$). The iron level was higher for female students in Coaching Education ($p=0.006$).

Table 1: Blood electrolyte values of male students

	Departments			
	CE (n=10)	PES (n=10)	SM (n=10)	
Variables	Mean±SD/ Median (%25 -%75)	Mean±SD/ Median (%25 -%75)	Mean±SD/ Median (%25 -%75)	P
Calcium (mg/dL)	9.45 (9.10-10)	9.95 (9.50-10.60)	9.30 (9.10-9.70)	0.230
Iron (µg/dL)	126.10±41.96	64.50±15.91	125.90±48.57	< 0.001
Iron Binding Capacity (µg/dL)	374.20±37.77	358.50±30.0 0	334.10±33.54	0.043
Magnesium (mg/dL)	2.94±0.20	3.05±0.33	2.87±0.38	0.453
Potassium (mmol/L)	4.40 (4.30- 4.80)	4.45 (4.30- 4.60)	4.40 (4.30-4.70)	0.950
Sodium (mmol/L)	141.50 (140.00-143.00)	143.50 (140.00-148.00)	139.50 (138.00-140.00)	0.029

CE: Coaching Education. PES: Physical Education Teaching. SM: Sports Management. SD: Standard Deviation.
All values reported as mean ± SD and median (percentile, 25%-75%).

Table 2: Blood electrolyte values of female students

	Departments			
Variables	CE (n=10) Mean±SD/ Median (%25 -%75)	PES (n=10) Mean±SD/ Median (%25 -%75)	SM (n=10) Mean±SD/ Median (%25 -%75)	P
Calcium (mg/dL)	10.12±0.60	10.22±0.32	9.81±0.58	0.206
Iron (µg/dL)	81.50 (57.00-104.00)	71.50 (21.00-99.00)	30.50 (24.00-31.00)	0.006
Iron Binding Capacity (µg/dL)	376.00 (311.00-407.00)	387.50 (354.00-414.00)	417.00 (413.00-431.00)	0.037
Magnesium (mg/dL)	3.25 (3.10-3.40)	3.50 (3.40-3.60)	3.60 (3.50-3.70)	0.086
Potassium(mmol/L)	4.27±0.14	4.42±0.23	4.32±0.33	0.411
Sodium(mmol/L)	146.50 (139.00-147.00)	147.00 (146.00-147.00)	143.00 (141.00-146.00)	0.023

CE: Coaching Education. PES: Physical Education Teaching. SM: Sports Management. SD: Standard Deviation.
All values reported as mean ± SD and median (percentile, 25%-75%).

DISCUSSION

In this study which was conducted in order to define the effect of applied courses on the blood electrolyte levels such as calcium, magnesium, potassium, iron and iron binding in students attending different departments of the School of Physical Education and Sports, it was observed that there were differences in terms of an increase or decrease in blood electrolyte levels depending on the departments. When a comparison was made between the blood electrolyte levels that we obtained as a result of our study and results of other studies also conducted in this field, differences and similarities were found.

An analysis of our findings that we obtained as a result of our study shows that there was not a significant difference in calcium levels for both male and female students in different departments. In a study conducted to compare the blood electrolyte levels of athletes doing sports in different branches for at least five years or more with those of sedentary students [10], stated that the difference in calcium level was statistically significant ($p<0,01$). In another study [11], reported significant increases in concentrations due to exercises with different duration and magnitude. Such findings in the literature do not support our findings.

An analysis of our findings revealed that there were not significant differences in magnesium levels in both males and females among departments. When we look at the studies conducted on the effect of exercise on magnesium levels, we see that there are different findings [12] found that chronic exercises do not have any effect on magnesium level. This result is in line with our result. Studies have shown that magnesium level increases in subjects who regularly do exercise more than it does in sedentary individuals and it is higher in athletes in resting [13,14]. Studies have also highlighted that the high amount of magnesium discharge due to perspiration and urination might result in deficiency of magnesium [15]. Newhouse *et al.* found that magnesium level decreased after long-distance run [16].

Our findings show that sodium level for male students was the highest in Coaching Department and the lowest in Sports Management Department. This difference was found statistically significant. The sodium level for female students was found highest in Physical Education and Sports Department whereas the lowest in Sports Management Department. This difference was also found statistically significant. In the study for comparison between the blood electrolyte levels of athletes and sedentary students[10], stated that the difference in sodium levels was statistically significant ($p<0,01$) which also supports our findings.

Our findings have not provided any significant difference in potassium levels both for males and females among different departments. In the study conducted for a comparison between the blood electrolyte levels of athletes and sedentary students [10], stated that the difference in potassium levels was statistically significant ($p<0,01$), which does not support our findings.

Although studies have shown that sodium and potassium serum electrolyte levels go down due to perspiration in longer-term exercises, it is known that such serum electrolyte loss can be recovered by the organism itself within its regular nutrition cycle [3, 17, 18].

An analysis of the findings obtained in our study shows that, for males, the iron level is highest in the Coaching Education Department whereas it is lowest in the Physical Education and Sports Department. This difference is statistically significant. It has also been observed that, for females, the iron level is highest in Sports Management Department whereas it is lowest in the Coaching Education Department. This difference was found to be statistically significant. When it comes to the iron binding capacity, for males, it is highest in the Coaching Education Department whereas it is lowest in the Sports Management Department. This difference is statistically significant. It has also been observed that, for females, the iron level is highest in Sports Management Department whereas it is lowest in the Coaching Education Department. This difference was found to be statistically significant. Magazanik *et al.* [19] studied the chronic effects of exercise and found that the iron level decreased and the iron binding capacity increased. However, Büyükyazı *et al.* [12] found that chronic exercises had no effect on the iron level [10]. Expressed in their study that the difference in the values for iron binding capacity of athletes and sedentary subjects was statistically significant ($p<0,01$) whereas the difference in their iron values was not significant ($p>0,05$). After all these evaluations, one might say that findings of studies on iron levels and iron binding capacity display differences. In this sense, our findings are similar to what is in the literature. The body may be exposed to loss of iron in doing some sports-branches. This problem is mostly seen in long-distance runners and the volume of the loss increases during the course of running.

The reported iron deficiency in athletes ranges between 20% and 82% [20]. We consider that such a difference in iron levels stems from the nutrition habits of the athletes or individuals and the very characteristics of the sports they do.

CONCLUSION

It is considered that changes – increase or decrease –in blood electrolyte levels of students attending different departments are within normal limits and the significant differences among different departments are depending on personal differences because it was observed that the idea that more applied course hours in the coaching department resulted in higher values for some given variables is not well-supported by the increasing and decreasing values for variables belonging to female students. This conclusion suggests that the differences in blood electrolyte levels are not due to the applied courses in the curricula of different departments, but stem from the life quality and nutritional habits of the subjects. In order to demonstrate the relation between blood electrolytes and exercise further, conducting such studies on more subjects with more repetitions would help make more realistic evaluations on this field.

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