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Fluid electrolyte balance associated with badminton match play

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Abstract

The aim of the study was to investigate the fluid and electrolyte imbalance associated with Badminton match play. Six female badminton players (age 16-18 years) currently competing at state level and national levels, played a best of three matches against a competitively matched opponent. Pre and post data on body weight, hemetocrit, hemoglobin, serum sodium, serum potassium, urine specific gravity, urine sodium and urine potassium were analysed from blood samples and urine samples taken before and after matches. Aweat rate, quantity of fluid consumed during match and duration of the matches were also calculated.

The paired T-test and Pearson's product moment correlation were used to analyse the data. The percentage were also computed to find out the magnitude of differences from pre to post on selected variables. The study results indicated significant decrease from pre to post match for body weight among the badminton players. Urine sodium showed significantly decreased levels from pre to post match following the badminton matches. No significant differences for other body fluid and electrolyte variables pre to post after the badminton match. The percentage changes from pre to post match for body weight showed a range from 0.22 to 1.73% for the six badminton players, with an average of 0.99%. The relationship of sweat rate to the differences score from pre to post match for selected variables indicated significant correlation for sweat rate to changes in body weight. The study results suggest that badminton players need to match fluid intake to sweat rate losses to avoid dehydration. Quantity of water intake alone may not be sufficient, a hydration protocol involving proper fluid and electrolyte fluid replacement should be planned and individually monitored for players.

Keywords: The study was to assess the fluid –electrolyte losses associated with badminton match play

1. Introduction

Badminton is one of the fastest indoor game, an intermitted game exposing both aerobic and anaerobic demands put considerable energy and metabolic demand in the players. Considerable importance have not been given to the metabolic and body fluid or electrolyte imbalance following matches. Players and coaches have not been considering proper hydration and electrolyte supplementation to sustain the demands of consecutive matches. Raising awareness of these factors considered for players to optimize for their performance.

2. Materials and Methods

For the purpose of the study six female badminton players (age 16-18 years) playing at state levels were selected. The participants for this study were competitive badminton players participating at the state and national levels who had been training for last 4 to 5 years.

2.1 The following fluid electrolyte variables were selected for the study.

- Body weight
- Sweat rate
- Quantity of fluid consumed during the match.
- Duration of the match.
- Hemetocrit.
- Hemoglobin
- Red blood corpuscles.

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- Blood potassium.
- Urine sodium.
- Urine potassium.
- Urine sodium.
- Urine specific gravity.

The participants were asked to complete a food and fluid intake diary for the previous 48 hours. No dietary or life style restriction were placed on them. The descriptive data on the subjects age, height, body weight, were measured. After the participants arrived badminton courts and they were asked to provide a urine samples and then their body weight (pre match BV) was measure using a set of precision balance scales. Subjects were also required to provide a small capillary blood samples. Blood samples were taken from either 3rd and 4th finger on the non dominant hand. The drop of blood drawn was wiped clean with a 1ml capillary tube was then filled.

The participants then completed a standard 5minute match warm up. players were required wear only shirts and shorts. Stop watch were used for entire of the match. The amount of water consuming was measured and weighed for estimating the fluid intake during match play.

Once the match was completed, the subjects were required to provide a post match capillary blood samples as per protocol outline previously. The subjects provided another urine samples prior to their final mass being recorded subjects were instructed to themselves down before weighing to remove any excess sweat that would influence their weight.

The sweat rate was obtained by the difference in the body weight measures before the total time duration of the match.

The blood samples were assessed for plasma volume, hemotocrit, hemoglobin, red blood corpuscles, blood sodium and blood potassium. The urine samples were analysed for urine sodium specific gravity, urine sodium, sodium urine potassime. The blood and urine samples were in specialized laboratory using standard laboratory techniques.

3. Statistical Technique

The [present study conducted on badminton players for the pre and post match data on selected variables were analyzed for statistical significance using the paired T test. The percentage to find out the magnitude of difference from pre to post on selected variables. The pearson’s product moment correlation was also used to find out relationship of independent variables to present changes in dependent variables from pre to post match. The level of significance was set at 0.05.

4. Analysis of Data Results

In order to compare fluid electrolyte balance associated with badminton match play analysed by dependent t test and find out the relationship between fluid intake and sweat rate was computed by using pearson’s product moment correlation. The statistical analysis was done by usinf package for Social Science (SPSS) Version16,and tested for significance at 0.05.

4.1 Findings

The descriptive statistics of fluid electrolyte balance in badminton match play is shown in table 1

Table 1: Descriptive statistics for body weight, sweat rate, fluid intake and blood electrolyte balance in badminton match play.

Variables	Minimum	Maximum	Sum	Mean	Std Deviation
Body weight Pre	42.60	53.60	290.60	48.43	4.47
Body weight Post	42.30	53.10	287.70	47.95	4.41
Sweat rate	.40	1.50	6.00	1.00	.42
Fluid intake	60.00	460.00	1390.00	23.617	169.99
Hemoglobin pre	11.00	12.90	70.80	11.80	0.76
Hemoglobin post	9.90	13.00	68.10	11.35	1.06
Hematocrit pre	33.00	39.00	213.00	35.50	2.34
Hematocrit post	30.00	39.00	205.00	34.17	3.06
RBC Pre	3.60	4.30	23.50	3.95	0.29
RBC Post	3.30	4.30	22.70	3.78	0.34
Serum Sodium pre	146.00	148.00	881.00	146.83	0.98
Serum Sodium post	145.00	149.00	883.00	147.17	1.72
Serum Potassium pre	3.80	5.80	26.80	4.47	0.69
Serum Potassium post	3.50	5.10	25.80	4.30	0.52

Table 2: Descriptive statistics for urine electrolyte balance in badminton match play.

Variables	minimum	maximum	Sum	Mean	Std Deviation
Urine Specific Gravity pre	1.01	1.02	6.08	1.01	0.003
Urine Specific Gravity post	62.10	185.00	776.50	129.42	47.52
Urine Sodium pre	23.50	134.80	555.80	92.63	39.65
Urine Sodium post	59.00	145.00	625.90	104.32	35.72
Urine Potassium pre	21.10	94.40	422.20	70.37	29.41
Urine Potassium post					

Table 2 of descriptive statistics of urine electrolyte balance match play indicate that the pre and post mean and standard deviation urine fluid were pre match 1.01 and 0.003 and post match 1.02 and 0.005 for urine specific gravity. PRE match 129.42 and 47.52 and post match 92.63 and 39.65 for urine

sodium; pre match 104.32 and 35.72 and post match 70.32 and 29.41 for urine potassium.

The comparison of pre to post match data on selected fluid – electrolyte variables are presented in tables 3 to 11.

Table 3: Comparison of body weight from pre match to post match of Badminton players.

Body weight	Mean	SD	Mean difference	'T'	Sig. (2-tailed)
Pre match	48.43	4.68	0.483	4.045	0.010
Post match	47.95	4.40			

Significant at 0.05 and 0.01 levels .t0.05(5)=2.57;0.01(5)=4.03

The result indicates that there was significant decrease in body weight from ore to post match level of the badminton players.

Table 4: Comparison of hemoglobin from pre match to post match of badminton players.

Hemoglobin	mean	SD	Mean difference	't'	Sig. (2-tailed)
Pre match	11.80	0.76	0.45	1.496	0.195
Post match	11.35	1.05			

This result indicates that there was no significance difference in hemoglobin levels from pre to post match levels of the badminton players.

Table 5: Comparison of Hemotocrit from pre to post match of badminton players.

Heotocrit	Mean	SD	Man difference	't'	Sig. (2-tailed)
Pre match	35.50	2.34	1.33	1.45	0.26
Post match	343.17	3.06			

T0.05(5)=2.57;t0.01(5)=4.03

This result indicate that there was no significant difference in hemotocrit levels from pre to post match levels of badminton players.

Table 6: Comparison of RBC from pre match to post match of badminton players.

RBC	Mean	SD	Mean difference	't'	Sig. (2-tailed)
Pre match	3.92	0.29	0.13	1.19	0.28
Post match	3.78	0.34			

T0.05(5)=2.57;t0.01(5)=1.03

This result indicate that there was no significant difference in RBC from pre to post match of the badminton players.

Table 7: Comparison of Serum Sodium from pre to post match of badminton.

Serum Sodium	mean	SD	Mean difference	't'	Sig. (2-tailed)
Pre match	146.83	0.98	0.33	-0.60	0.57
Post match	147.17	1.72			

T0.05(5)=2057;t0.01(5)=4.03

This result indicates that there was no significant difference in serum sodium levels from pre to post match levels of the badminton players.

Table 13: Correlation coefficient of fluid intake to difference scores of selected variables for pre to post match levels.

Variable correlated	Hg	Hemotocrit	RBC	SNa	SK	Urine Na	Urine K	Body weight
Sweat rate	.083	.062	-1.74	.640	.000	.464	.153	.880

Difference score from pre to post match

This translates that higher the rate of the players greater was the loss in body weight from pre to post match. The correlation for sweat rate to difference scores from pre to post

Table 8: Comparison of Serum Potassium from pre to post match of badminton players.

Serum potassium	Mean	SD	Mean difference	't'	Sig. (2-tailed)
Pre match	4.47	0.69	0.17	0.60	0.57
Post match	4.30	0.52			

T0.05(5)=2.57;t0.01(5)=4.03

This results indicate that there was no significant difference in serum potassium levels from pre to post match levels of the badminton players.

Table 9: Comparison of Urine specific Gravity from pre to post match of badminton players.

Urine specific gravity	Mean	SD	Mean difference	't'	Soig. (2-tailed)
Pre match	1.01	0.004	-0.002	-1.17	0.30
Post match	1.02	0.005			

T0.05(5)=2.57;t0.01(5)=4.03

This result indicates that there was no significant difference in urine specific gravity levels from pre to post match levels of the badminton.

Table 10: Comparison of Urine sodium from pre match to post match of badminton

Urine sodium	Mean	SD	Mean difference	't'	Sig. (2-tailed)
Pre match	129.42	47.52	36.78	4.45	0.01
Post match	92.63	39.65			

Significant at 0.05 and 0.01 t0.05(5)=2.57;t0.01(5)=1.03

Table 11: Comparison of urine potassium from pre to post match of badminton.

Urine potassium	Mean	SD	Mean difference	't'	Sig. (2-tailed)
Pre match	4.47	0.69	0.17	0.60	.576
Post match	4.30	0.51			

T0.05(5)=2.57;t0.01(5)=4.03

This result indicate that was no significant difference in potassium levels from pre to post match level of badminton players.

Table 12: The percentage change in body weight from pre to post matches for the badminton players

Player	%change in body weight
Player 1	0.22
Player 2	1.17
Player3	0.56
Player 4	0.70
Player 5	1.63
Player 6	1.12

match levels for the other vatriables does not show significant relationship.

Table 14: Correlation coefficient of fluid intake to difference score of selected variables for pre to post match levels.

Variable Selected	hg	hemocrit	rbc	SNa	SK	Urine sp Gr	Urine Na	Urine K	Body weight
Fluid intake	.090	.091	.397	-.355	.446	-.216	-.481	-.315	-.642

Difference score from pre to post match

This result indicate a trend that lesser fluid intake higher the changes in body weight and urine sodium.

5. Result and Discussion

There was significant decrease from pre to post match in case of urine sodium. In case of other variables no statistically significant difference were observed from pre to post match data after the badminton matches. In case of percentage changes from pre to post match it was seen that percentage changes in body weight ranged from 0.22 to 1.73% with an average of 0.99%.

The relationship of sweat rate to the difference scores from pre to post match variables indicated significant correlations for sweat rate to changes in body weight. The relationship of sweat rate to the difference score from pre to post match for selected variables indicated significant correlations for sweat rate of the players greater was the loss in body weight from pre to post match. The correlation for sweat rate difference scores from pre to post match levels for the other variables does not show significant relationship. The correlation coefficient of fluid intake to the difference scores from pre to post match for selected variables indicated no significant correlation for fluid intake to change in selected variables for pre to post match. However, the correlation values were higher for body weight and sodium with negative correlation for these two years variables. This indicates a trend that lesser the fluid intake hi her the changes in body weight and urine sodium.

6. Conclusion

The study result indicated significant decrease from pre to post match for body weight among the badminton players. Urine sodium showed significantly decreased level from pre to post matches. There was no significant difference for other body fluid and electrolyte variables from pre to post data after the badminton matches. The percentage changes from pre to post match for body weight showed a range from 0.22 to 1.73 for he six badminton players. The correlation for sweat to difference score from pre to post match levels for the other variables does not show significant relationship. And the correlation coefficient of fluid intake to the difference score pre to post match for selected variables indicated no significant correlation for fluid intake to chanes in selectyed variables for pre to post match.

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