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Fluids and Exercise in Young adults: a pilot Study

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Abstract: *Many works are still spent on effects of fluids intake during exercise. Different types of solutions are used with so many different concentrations of electrolytes. Trying to understand the physiological effects of different solutions in one set of experiment, we set our work. Three types of fluids which already being used in medical practice for patient postoperatively or with diseases such as acute diarrhea as replacement therapy are involved in this experiment as well as water to compare their outcome on individuals. 10 Healthy female students of twenty year old who have no significant medical history are our volunteers. Every young lady has five sessions of treadmill exercise for thirty minutes in each session. First session is performed without taking any type of fluid. The other sessions (2, 3, 4, and 5) are performed during which exercisers drunk water, 5% glucose water, glucose saline (isotonic) and Ringer's solution respectively. Blood pressure and heart rate were measured before and after every session of exercise. Histograms were drawn to see the differences among these sessions. It was concluded that using solutions that contain energy, Sodium in addition to other electrolytes can give the best performance required.*

Keywords: *treadmill exercise, nutrition, tachycardia, hypertension*

I. Introduction:

Sport nutrition is taking a lot of time and effort from so many scientists to fluid the needs of exercisers for better performance and less adverse effects on different parts of human body. All researchers agreed that water and electrolytes are essential to improve performance. The main constituent of sport nutrition is water which is to overcome the effects of Dehydration like rapid heartbeats (1).Exercise requires additional fluids to keep the blood from clotting and for cells to efficiently use energy (5).Electrolytes are also needed to keep their balance in our body (5).

Sport drinks are beverages specially formulated to contain appropriate amounts of electrolytes and carbohydrates as well as to replace the fluid and sodium lost through sweat during athletic activities (7).Trying to use formula already prepared to treat dehydration in diseased in diseased conditions, some formula were chosen and used as supplement during exercise in this pilot study.

II. Method and Materials:

Fluids used to feed exercisers during tests:

Glucose water: composed of 5% Dextrose in water from ADWIC pharmaceuticals division/ ELNASR PHARMACEUTICAL CHEMICALS CO. ABU ZAABAL / EGYPT.

Glucose saline: Sodium Chloride 0.9% + Dextrose 5% in water from ADWIC pharmaceuticals division/ ELNASR PHARMACEUTICAL CHEMICALS CO. ABU ZAABAL / EGYPT.

Ringer's solution: Sodium 147mEq/L, Potassium ion 4mEq/L, Ca ion 4.5mEq/L, Chloride ion 156mEq/L from ADWIC pharmaceuticals division/ ELNASR PHARMACEUTICAL CHEMICALS CO. ABU ZAABAL / EGYPT.

1- 10 female students in collage of science for women were randomly selected.
2- Water, 5% glucose water, glucose saline (isotonic) and Ringer's solution were used.
3- Brachial arterial blood pressure and heart rate were measured before and after each session of exercise.
4- Treadmill test for 30 minutes was our exercise in this study.
5- We planned to stop exercise when exerciser heart rate exceeds the limit of (220-age) ×80%. (10)
6- Session (S1): Students exercise without any fluid intake.
7- Session (S2): Students drank water during exercise.
8- Session (S3): Students drank 5% Glucose water during exercise.
9- Session (S4): Students drank Glucose saline during exercise.
10- Session (S5): Students drank Ringer's solution during exercise.

III. Results:

	Brachial blood pressure(Systolic/Diastolic in mm Hg					
	Before exercise	After session1	After session2	After session3	After session4	After session5
1	110/60	160/70	150/70	100/60	150/80	130/60
2	110/70	130/70	130/70	110/70	140/80	120/80
3	120/60	140/60	130/60	100/70	150/70	130/60
4	100/60	110/70	110/60	90/60	120/70	120/60
5	90/60	120/70	110/50	100/70	170/60	100/60
6	100/60	110/60	110/60	90/70	120/60	110/60
7	110/70	120/80	150/70	100/70	180/80	130/70
8	100/40	120/50	140/40	100/50	110/60	110/40
9	120/60	110/60	120/70	100/70	130/60	140/60
10	100/60	130/70	140/50	90/70	170/70	120/60

Table1: Brachial blood pressure measurements before and after each exercise session in mm Hg (Systolic/Diastolic).

	Heart rate in beats/minute					
	Before exercise	After session1	After session2	After session3	After session4	After session5
1	74	98	95	93	90	75
2	68	101	98	95	80	70
3	60	88	85	90	73	70
4	60	105	99	90	95	65
5	71	112	98	105	80	73
6	72	94	62	91	90	73
7	64	98	96	90	83	75
8	66	108	89	95	84	68
9	68	70	88	90	70	70
10	72	107	96	90	72	77

Table2: Heart rate measured in Beats / minute before and after each exercise session.

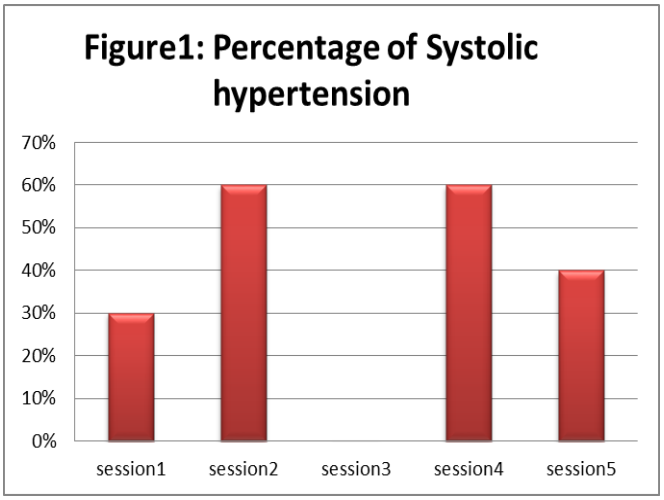

Fig1: Percentage of systolic hypertension during different sessions.

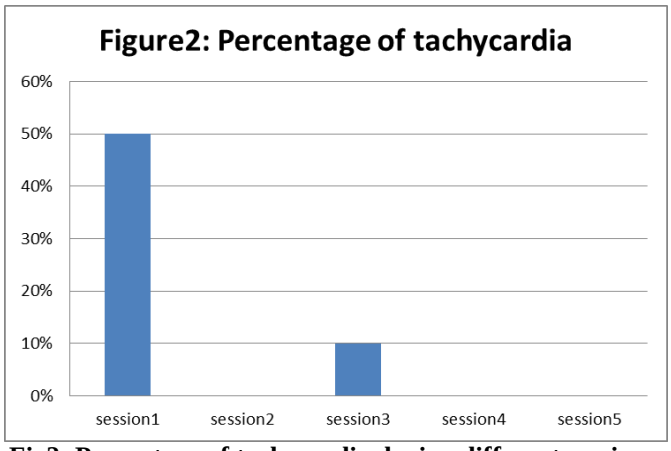

Fig2: Percentage of tachycardia during different sessions.

1- Nobody exceeded heart rate limit.
2- Most of exercisers, felt tired and weak and they would like to stop exercising in S1, S2, S3.
3- All of them, felt ready to continue exercising in S4 and S5.
4- Figure1: 30% of them developed systolic hypertension in S1 while in S2 60% had hypertension. However none had that in S3. 60% and 40% had hypertension in S4 and S5 respectively.
5- Figure2: Regarding heart rate, 50% of S1 and 10% of S3 had mild tachycardia. Normal heart rate was noticed in all other sessions.

IV. Discussion

Endurance:

All fluids used in this experiment are isotonic as they can quickly replace fluids lost through sweating (8). Feeling tired and exhausted and wishing to stop exercising are probably due to dehydration (7) and also can be due to electrolytes consumption (2). What happened in S1is probably due to fluid and electrolytes loss as well as energy presented by glucose. But in S2 although they took water, exercise stopped as they felt tired and weak and this was probably due to electrolytes and energy loss. This was the difference between the two sessions. Giving them glucose in S3 should have replaced fluid and energy loss so ending session can be due electrolytes loss. Hyponatremia can be a cause of exhaustion during exercise (2) so that they were supplemented with glucose saline to overcome this factor. What was noticed in S4 can probably support this idea as they expressed the willing to continue and no feelings of tiredness and exhaustion were announced and this was the same in S5.

Physiological parameters:

Exercise without fluid supplement can lead to increase in blood pressure and heart rate (1,2,3,4,5,6). This is well known and is clearly seen in session1. It can be noticed that training and drinking glucose water induces stabilization in blood pressure but causes increase in heart rate (table1, 2). This is the reverse of other supplemented sessions as all others induced systolic hypertension with stabilization in heart rate (fig2).

There is general agreement that the systolic blood pressure increase determined by isotonic exercise usually ranges from 50 to 70 mm Hg in both normotensive or hypertensive subjects(9). This was noticed in sessions 2 and 4(fig1). So those who developed such increase in systolic pressure have to stop exercise and should be informed that they are susceptible to develop hypertension in future. These effects should be more clearly seen if submaximal treadmill test has been used (9).

This experiment was set to 30minutes limit as a pilot study so it is not expected to reach submaximal heart rate. However, tachycardia is seen in session of glucose water and session of no fluid intake. This may lead us to expect more significant increase in heart rate in such fluid supplement and fluids containing electrolytes are more preferable to control heart beating.

Also it be concluded that fluid supplements in general have more significant effect on heart rate of trainer than on his/her blood pressure. And so trainer who does not develop hypertension can take fluids containing electrolytes for better performance. This may lead us to suggest that people who develop hypertension during exercise (even if they are not already hypertensive) and welling to continue exercising should be given antihypertensive agents in a calculated dose either before or during sport. This probably should be done individually in the laboratory to find the best antihypertensive agent that will not affect his/her performance and control blood pressure.

It can be concluded that 5% glucose water and Ringer's solution are better in performance improvement associated with stabilization of blood pressure and heart rate (fig1, fig2). So Ringer's lactate should have been used in this experiment but it was not available within the market during our work. From this work, the best results can be expected from this type of fluid as it contains glucose in addition to electrolytes of Ringer's solution.

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