

# Evaluation of Post-Exercise Test Hematuria in Hamadan, Iran

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## Abstract

**Background-** Hematuria associated with sports activity is a well-recognized entity in subjects who participate in a variety of sports. This study was designed to determine the incidence of post-exercise hematuria in patients participating in exercise test.

**Methods-** 120 patients who were referred by cardiologists from August to October 2003 to participate in treadmill exercise tests were randomly selected. The first urine sample was taken before exercise and the second urine sample after the completion of the exercise test. In those patients who had post-exercise hematuria, ultrasound studies were performed to rule out other potential causes of hematuria.

**Results-** 85% of the participants in the exercise-test had post-exercise test hematuria (59.8% microscopic, 25.2% macroscopic). Regarding age, there was no statistically significant difference between the mean age of the patients who had hematuria and those who did not (55.2 vs. 55.8 yrs,  $P>.05$ ). Regarding gender, the incidence of post-exercise test hematuria was higher in women, but the difference was again not statistically significant (87.2% vs. 83.8%,  $P>.05$ ).

**Conclusion-** The incidence of post-exercise hematuria is high, and it is very important to be familiar with this entity in patients who participate in treadmill exercise tests to properly deal with them and avoid unnecessary work-ups, especially if they are young and have transient hematuria (*Iranian Heart Journal 2007; 8 (3): 32-35*).

**Key words:** exercise test ■ hematuria ■ Hamedan, Iran

Hematuria associated with various sports is a well-recognized entity in subjects who participate in a variety of sporting activities. This entity up to now has been known by several names, including “sports hematuria”, “stress hematuria”, “bongo drum hematuria”, “athletic pseudonephritis”, and “10,000-meter hematuria”.<sup>1</sup>

Although it has been described earlier, the first formal description of exercise-induced hematuria was given in 1910, when red blood cells were detected in the urine of 18 marathon runners after a 40-kilometer race.<sup>2</sup> To date, exercise-induced hematuria has been described in association with a variety of different sports, including swimming,

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lacrosse, track, football, rowing, boxing, hockey, spinning, bicycling and soccer.<sup>1,3,4</sup>

This study was designed to determine the incidence of post-exercise hematuria in patients participating in exercise test.

### Methods

120 patients who were referred by cardiologists from August to October 2003 to participate in treadmill exercise testing were randomly selected.

A briefing session was held with the patients; the aim and method of research were explained, and the patients were interviewed about personal history, disease history and drug history.

The first urine sample was taken before exercise and the second urine sample after the completion of the exercise test. In those patients who had post-exercise hematuria, ultrasound studies were performed to rule out other potential causes of hematuria. Since the presence of myoglobin or hemoglobin may result in a positive dipstick test when the urine contains no red blood cells, all urine samples were primarily evaluated by dipstick strips; and if positive, followed by microscopic analysis to confirm hematuria. We defined microscopic hematuria as 2 or more red blood cells per high-power field on microscopic examination.

Those patients who had hematuria in the first urine sample, abnormal ultrasound findings after the second urine sample, positive history of renal diseases and menstruation and also patients who failed to complete stage II of the exercise test (Bruce protocol) were excluded from the study.

Statistical analysis was conducted with SPSS software by using chi square and Fisher-exact tests. This study was approved by the hospital committee on ethics, and informed consent was obtained from all the patients.

### Results

The mean age of the patients was 52.3 years.

77 (64.2%) of the patients were male and 43 (35.8%) were female. Four patients had microscopic hematuria and three patients had macroscopic hematuria in the first urine sample and were excluded, and another six patients who had renal stones discovered in renal ultrasonography study were also excluded from the study.

In the remaining 107 patients, 85% had post-exercise test hematuria (59.8% microscopic vs. 25.2% macroscopic). Regarding age, there was no statistically significant difference between the mean age of the patients who had hematuria and those who did not (55.2 vs. 55.8,  $P>0.05$ , Table I).

**Table I. Mean age of patients in exercise test based on the presence or absence of hematuria**

Urinalysis	No.	Mean age	Standard deviation	P-value
+ Hematuria	16	55.48	10.7	$P>0.05$
- Hematuria	91	55.25	8.2	

Regarding gender, the incidence of post-exercise test hematuria was higher in women, but the difference was again not statistically significant (87.2% vs. 83.8%,  $P>0.05$ , Table II).

**Table II. Gender-related post-exercise hematuria in patients in exercise test**

Sex	+ Hematuria		-Hematuria		Total		P-value
	No	Percent	No	percent	No	percent	
Male	11	16.2	57	83.8	68	100	$P>0.05$
Female	5	12.8	34	87.2	39	100	
Total	16	15	91	85	107	100	

### Discussion

Exercise hematuria has been described in a

large proportion of long distance runners. Fasset and associates found an above normal increase in the urinary red blood cell counts in 33 of 48 runners (69%) after long distance runs of 9 to 14 km.<sup>5</sup> Microscopic and macroscopic hematuria following a marathon race also has been described by others.<sup>1,6,7</sup> In all cases, hematuria was most pronounced in the first urine voiding after exercise, normalizing often within 24-72 hours after running, and seems to be independent of the exercise intensity.

Alyea and Parish investigated athletes in a wide range of sporting professions, such as swimming rowing, lacrosse, football and track.<sup>3</sup> They observed that 60-80% of the athletes had an abnormal amount of red blood cells in the urine specimen taken after exercise. Traumatic and non-traumatic sports show little difference in the percentage of hematuria. Swimming, lacrosse, and track gave similar rates of hematuria (80%), and football and rowing also caused approximately equal rates of hematuria (55%). Our data showed an incidence of post-exercise hematuria of about 85%, which was slightly higher than that in previous studies and may be due to the older age of our patients, although our study failed to show any relation between age and hematuria.

Because the early reports of exercise-related hematuria were almost exclusively in men, some investigators thought that the condition only occurred in male athletes. Fred and Natelson even suggested that exercise hematuria does not occur in women, since it is due to bladder neck and prostate disease, and thus appears only in men.<sup>8</sup> However, recent evidence in a population of male and female runners suggests a 15-30% incidence without a gender-related basis. Our study also supported this view with an equal incidence of exercise-related hematuria in men and women.

The pathophysiology of this entity can be either traumatic or non-traumatic. Renal trauma and/or bladder injury due to repeated impact of the posterior bladder wall against

the bladder base can cause vascular lesions and consequently hematuria.<sup>8</sup> Non-traumatic injury also can act either by vasoconstriction of renal vessels causing hypoxic damage to nephrons or by more marked vasoconstriction of efferent glomerular arterioles, resulting in an increased filtration pressure and forcing excretion of red cells in urine.<sup>9</sup> McInnis et al. claimed that exercise-related changes in renal function were associated with weight-bearing exercise intensity rather than non-weight-bearing exercise duration.<sup>10</sup> Running without a completely empty bladder<sup>8</sup> and preventing dehydration<sup>11</sup> by high fluid intake even in the form of beer, had been advised to prevent exercise-related hematuria.<sup>12</sup>

Definitions vary for microscopic hematuria: from 1 to more than 10 red cells per high power field. We defined microscopic hematuria as 2 or more red blood cells per high-power field on microscopic examination to follow the most accepted definition.<sup>13</sup> Dipstick testing for heme is sensitive, detecting hemoglobin from 1 or 2 red cells per high-power field but unfortunately lacks specificity, since the presence of myoglobin or hemoglobin may result in a positive test when the urine contains no red cells. Therefore, if the dipstick test is positive, the presence of red cells should be confirmed by microscopic examination.<sup>13</sup>

The diagnosis of exercise-induced hematuria can be made in the athlete under 40 years old who has asymptomatic microscopic hematuria following exercise if the hematuria clears after 24 to 72 hours of rest and there are no other signs or symptoms.<sup>14</sup> However, in the following conditions, other causes should be ruled out: (1) lack of clearance after 24 to 72 hours,<sup>15</sup> (2) presence of gross hematuria, (3) males over 40 years old,<sup>16,17</sup> (4) recurrent episodes of hematuria and (5) hematuria in the absence of strenuous exercise.

It has been claimed that no further evaluation is required in patients meeting the criteria for exercise-induced hematuria, but they should be followed closely with repeat urinalysis; and for those who fail to meet the criteria of

exercise-induced hematuria, proper evaluation may include intravenous pyelography, a serum creatinine level, a urine culture, urine cytology and cystoscopy.<sup>18</sup>

Finally the important point to remember is that not all exercise hematuria is benign. Running can be a "stress test" for the bladder (perhaps by causing the bladder walls to bang together) as well as for the heart. Exercise – induced hematuria can reveal covert bladder cancer while it is still curable.<sup>19</sup>

Also it must be noted that exercise related hematuria differs from and should be differentiated early from other conditions that may cause reddish discoloration of the urine due to physical exercise, such as march hemoglobinuria and exercise myoglobinuria, which only show excretion of hemoglobin and myoglobin molecules and not intact red blood cells in the urine.

Thus it is very important to be familiar with this entity in patients who participate in exercise testing to properly deal with them and avoid unnecessary work-ups if they are young and have a transient hematuria. On the other hand, those who are older should be followed to rule out potentially harmful diseases.

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