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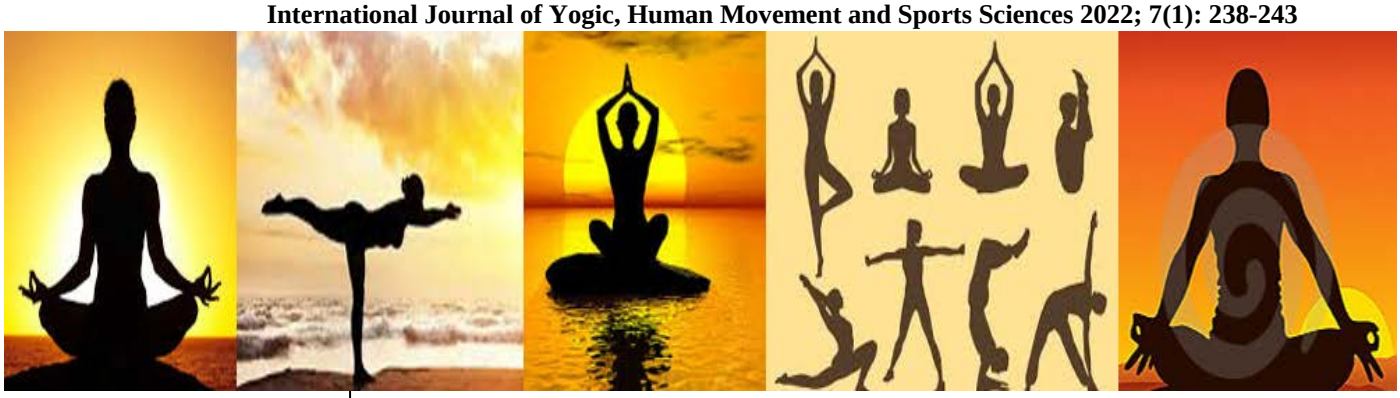

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Dr. Nashwan Ibrahim Al Nuaimi
Assistant Professor, College of Physical Education and Sports Sciences, University of Mosul, Iraq

Dr. Omar Yousif Khaleel
Lecturer, College of Physical Education and Sports Sciences, University of Mosul, Iraq

Dr. Omar Alaaulddin Ahmed
Lecturer, Department of Physical Education and Sports Sciences, College of Basic Education, University of Mosul, Iraq

Corresponding Author:
Dr. Nashwan Ibrahim Al Nuaimi
College of Physical Education and Sports Sciences, University of Mosul, Iraq

Response of a number of components of urine to the interval and continuous aerobic effort

Dr. Nashwan Ibrahim Al Nuaimi, Dr. Omar Yousif Khaleel and Dr. Omar Alaaulddin Ahmed

Abstract
This study aimed to detection response of a number of components of urine to the period and continuous aerobic effort have been studied for 10 students in Physical Education and Sports Sciences, and adopted the experimental methodology. The study concluded that both the interval aerobic effort and continuous aerobic effort led to a significant increase in red blood cells (RBCs) in the urine, while they did not lead to any significant change in the pH value of urine. Also, not lead to the appearance of white blood cells (WBCs), sugar, protein, and blood in the urine.

Keywords: response, urine, period effort, continuous aerobic effort

1. Introduction

1.1. Introduction and importance of research

The study of the functional responses of the various organs and systems of the body is one of the important axes that have attracted the attention of researchers. Many studies and research have been conducted, most of which include studying the responses and adaptations of the circulatory and respiratory systems. As well as the nervous and muscular system to compete or exercise in various sports activities. These studies have reached scientific results that enriched the library of physical education and the scientific movement in the field of physical education all over the world. However, this field needs more research and study on other functional organs, including the urinary system, and in particular the functions of the kidneys, which have not received their share of research and study except for some studies and research.

The effects of effort have been studied in various sports activities, and accurate scientific conclusions have been reached in them. Abbas, (2000) [5] has found statistically significant changes in red blood cells (RBCs) in the urine of swimmers (Abbas, 2000, 102) [5]. While Shaalan and Nasr, (1993) [4] reached a conclusion which is the appearance of protein and red blood cells (RBCs) and a decrease in urine (PH) in swimmers and cross-country runners (Shaalan and Nasr Al-Din, 1993, 21) [4]. Furthermore, Mohamed and Al-Wakeel, (1989) [7] found significant differences in the (PH) values of urine after the game among basketball players (Mohamed & Al-Wakeel, 1989, 95) [7]. While Tawfiq and Youssef, (1983) [1] reached the emergence of protein as a result of the training modules in handball (Tawfiq and Youssef, 1989, 311) [1], and Abdul-Fattah and Ali, (1989) [6] and Al-Jabali, (1988) [2] found a decrease in urine PH values after speed drills compared to endurance training for arena and field players (Abdul-Fattah and Ali, 1983, 159) [6] and (Al-Jabali, 1988, 97) [2].

As for the studies that dealt with the effect of the intensity and type of exercise on the functions of the kidneys, a study has by Bene, (1976) [10] showed a significant decrease in the urination PH values after performing a high-intensity physical load (Bene, 115, 1976) [10]. While Al-Halafi, (1999) concluded the appearance of protein in the urine as a result of the use of training modules using the high-intensity circuit training method (Al-Halafi, 1999, 10-12).

From the foregoing, we note that studying the effect of the type of physical effort, whether it is continuous, periodic, intermittent, or graded in intensity, on the response of the components of urine did not receive its share of researches.

Hence the importance of the research in providing accurate scientific information regarding changes in some components of urine according to the specificity or type of physical effort. This thus can give a clear picture of the functions of the kidneys as a result of physical effort to be of help to researchers and those concerned in this field, with a view to understanding the nature of the changes taking place in the functions of the kidneys. As well as enriching the sports library with such information that it lacks.

1.2. Research problem
By looking at the research and studies related to the response of the components of urine, we did not find any of them that dealt with the comparison between the effects of different types of physical effort on the components of urine. This motivated the study of the response of a number of components of urine to the continuous and periodic aerobic effort to answer the following question: Is the response of a number of components of urine to the continuous and the interval aerobic effort similar, or is there a difference in the response of each of them? Or in other words, does the type of physical effort (interval, continuous) have an effect on the response of a number of diuresis components?

1.3. Research objectives
This research aims to:
1. Detection of the response of a number of components of urine[1] to the continuous aerobic effort.
2. Detection of the response of a number of urine components to the interval aerobic effort.
3. Comparing the response of a number of urine components between the continuous and interval aerobic effort.

1.4. Research hypotheses
The researcher assumed the following:
1. There is no significant difference between the pre and post-measurement of continuous aerobic effort in a number of urine components.
2. There is no significant difference between the pre and post-measurement of interval aerobic effort in a number of urine components.
3. There is no significant difference between the two post-measurement of both continuous and interval aerobic efforts in a number of urine components.

1.5. Research fields
1. **Human field:** This study has been applied to a sample of the third stage students of the Faculty of Physical Education and sports sciences.
2. **Spatial field:** This study has been applied in the Human Achievement Laboratory of the Faculty of Physical Education and sports sciences.
3. **Time field:** This study was conducted for the period from 06/21/2021 to 7/1/2021.

2. Theoretical framework
In this study, we will be sufficient to specify the terminology of the components of urine that have been studied only, in order to avoid dwell and elaboration. The following defines the terminology of the components of urine that have been studied.

[1] Urine components: (pH) of urine - red blood cells (RBCs) - white blood cells (WBCs) - (sugar - protein - blood) in urine.

First: Erythrocytes (red blood cells (RBCs))
They are cells without a nucleus in the shape of a disc with concave sides when looking at them from the side. They contain hemoglobin, which gives the red color to the blood, and their number is about 5 million cells per cubic millimeter of blood in a man, and its number decreases by about half a million in a woman (Arabs, 1989,437) [19].

Second: Hydrogen exponent (pH) of urine
It is the function of measuring the concentration of hydrogen ions in the solution, values greater than (7) indicate an increase in the basic. The weak value ranges in (pH) urine (5 - 7.8) and an average value of (6) (Gerard, 1984, 796) [14].

Third: Leucocytes (white blood cells (WBCs))
They are cells that have a nucleus inside and do not contain hemoglobin, so they do not have the ability to carry oxygen. They differ from red blood cells in number, structure, and function, and their number ranges from (6000) to (10000) cells per one cubic millimeter of blood. They live approximately (4-13) days, and they develop in the lymphatic vessels and pharyngeal nodes, and their most important functions are to defend the body (Arab *et al.*, 1989, 473) [19].

Fourth: Sugar
It is the main energy source for all types of cells in the body (Gerard, 1984, 786) [14].

Fifth: Protein
It is a substance that is composed of the same elements that make up sugars and fats, to which nitrogen is added, as well as phosphorous and sulfur (Gerard, 1984, 797) [14].

3. Research procedures
3.1. Research methodology
The experimental method was used to design a single group due to this method fits the nature of the research.

3.2. Research sample
The research sample consisted of (10) ten students from the third stage in the College of Physical Education and Sports Sciences for the academic year (2020-2021). They were chosen in an intentional manner, and Table (1) shows some specifications of the research sample.

Table 1: Shows the statistical parameters of some specifications of the research sample.

Statistical features / Variables	Arithmetic mean	Standard deviation
Height (cm)	177.400	6.059
Weight (kg)	87.700	10.499
Age (year)	23.600	1.713

3.3. Techniques and tools used in research
1. Rotating tape device of the type (L.G.I.SPORT) Chinese-made, number (1).
2. Plastic containers (Tips) or bottles for collecting urine samples.
3. Electronic thermometer to measure the temperature of the laboratory (weather thermometer), number (2) Chinese-made.
4. Two (2) Chinese-made manual electronic stopwatches.
5. Medical scale for measuring weight and height, type ((Detecto Medical), American-made, measures to the nearest (200) g.

6. Korean-made (LG) air conditioner, the size of (4) tons.
7. The device of (UriSed mini) microscope urine sediment analyzer is a Hungarian-origin microscope for general urine examination, from (e77) company that specializes in urine testing devices only.
8. Micropipette.

3.4. Data collection methods
Measurement, analysis, and collection of available materials were used as means of information and data collection.

3.5. Description of the measurement of the components of urine
A model microscope urine sediment analyzer (UriSed mini) was used. For a general urine examination. It works with the chip cuvette system, not by using solutions. Thus, the urine sample taken does not need any treatment, we only take (175) microliters of urine, after that the process of centrifuging is done inside the device because it contains an internal centrifuge. After the sample is centrifuged, (15) full field-of-view images are taken for each sample through a built-in microscope. Then it evaluates images using the Automatic Image Evaluation Module (AIEM), a high-quality image processing program. Images and results can be viewed and validated in the (UriSed mini) user program, where the scan duration was one (1) minute, after that, the examination results report is printed on a sheet of paper (A4).

3.6. Description of the continuous and interval aerobic effort tests
3.6.1. Description of the continuous aerobic effort tests
This test involves running on a rotating band (treadmill) for 30 minutes continuously without interruption at the same work intensity at the interval aerobic effort (60% - 70%) from the maximum value of the heart rate. where the heart rate ranged between (140-160) beats per minute.

3.6.2. Description of the interval aerobic effort tests
The interval aerobic effort was determined for the experiment of the current study by taking advantage of the fourth region of the (Fox) tables, as the time was adopted from 4 to 5 minutes. The work included two groups and three repetitions for each group, so that the time of one repetition ranged (5) minutes, using a rest period of (1:1/2) between the repetitions (Fox, 1984, 214). Thus, the interval aerobic effort test was determined by running on the rotating (treadmill) in two groups with a period of (15) minutes for each group. Each group included three repetitions, the time of each repetition (5) minutes, and the intensity of work (60% - 70%) of the maximum value of the heart rate. It ranged between (140-160) beats per minute and at a rotation speed of the rotating tape (8) km/hour with a rest period of 2.5 minutes of positive comfort between one repetition and another and (5) minutes between one set and another.

3.7. Determining the intensity of work with continuous and interval aerobic efforts
The intensity of work was determined by the continuous and interval aerobic efforts for the research sample using the pulse indicator through the following procedures:

- Measuring the pulse rate of the research sample at rest.
- Determining the maximum pulse rate of the research sample using the following equation:

(220 - Age = maximum heart rate) (1)

- Determine the percentage of intensity used from the maximum pulse rate.

After obtaining these values, the intensity of the aerobic effort was determined using the following equation (Nieman, 2002, 243):

(Maximum heart rate - Resting heart rate) x Percentage of intensity to work (%) + Resting heart rate (2)

The intensity of the continuous and interval efforts of the research sample ranged between (140-160) beats/minute.

3.8. Exploration experiments
3.8.1. Exploratory experience to ensure the safety of devices and tools
On 6/8/2021, an exploratory experiment was conducted to ascertain the validity and safety of the rotating tape device and the weight and length measuring device.

3.8.2. Exploratory experiment to adjust the intensity of work with continuous and interval efforts
Two exploratory experiments were conducted on the members of the first search sample on (10/6/2021) to control the intensity of the work with continuous effort and the second on the date (14/6/2021) to control the work with continuous effort with intensity (60% - 70%) of the maximum value of the heart rate after determining the intensity of both constant and interval efforts paragraph (3- 7), through these experiments, the work was adjusted so that the heart rate was within the range of intensity that was determined for both efforts, between (140-160) pulse/ minute and at a rotor speed of (8) km / h. It was not until it was confirmed that the search sample had been set to run within the heart rate limits which was identified above and for both efforts.

3.8.3. Exploratory experiment to ensure the progress of the research experience and to adjust the laboratory temperature
An exploratory experiment was conducted on 20/6/2021 on one of the students who was excluded from the research sample. The purpose of conducting the exploratory experiment was to identify the following:

1. Work obstacles that a researcher may face during the final experiment.
2. Identify the time needed to reach the laboratory temperature to (21 - 23) ° C, as well as the time range to maintain it within the thermal range specified for the research experiment.

3.9. Final Experiments
The final research experiments were conducted for the period from (21/6/2021) to (1/7/2021) and included two continuous aerobic effort experiments on the first search sample on (21/6/2021) and the second on (24/6/2021), while the first interval aerobic effort test was conducted on (28/6/2021) and the second on (1/7/2021). All experiments were initiated at 9 a.m., and the procedures for all experiments included each individual's entry into the laboratory and sitting in the laboratory for (15) minutes before the pre-measurements were carried out.
Continuous and interval aerobic experiments have been conducted as follows:

3.9.1. Continuous aerobic effort test

The two experienced continuous aerobic effort including the following procedures

1. Pre-measurement: Urine samples were taken before the warm-up process began from the individuals of the search sample.
2. Warm-up for (10) minutes**.**
3. Continuous running on the rotating tape (treadmill) for 30 minutes and intensity working (60% - 70%) of the maximum heart rate value, ranging from 140-160 pulse/minute and at a speed of rotating tape (8) km/h.
4. Post-measurement: After completing the running for (30) minutes, the urine samples were taken from the individuals of the research sample after (5) minutes of the recovery period.

3.9.2. Interval aerobic effort test

The two experiments of interval aerobic effort include the following procedures

1. Pre-measurement: Urine samples were taken before the warm-up process began from the individuals of the search sample.
2. Warm-up for 10 minutes.
3. Running on the rotor tape (treadmill) for a period of time (30) minutes in two groups with a time limit of (15) minutes per group and each group included three repeats of one repeat duration (5) minutes and intensity of work (60% - 70%) of the maximum heart rate value ranging from (140-160) pulse/minute with rotating speed (8) km/h with a respite of (2.5) minute, positive rest between one repetition and another and (5) minutes between one set and another.
4. After completion of the interval effort test, the excretion samples were taken from the individuals of the research sample after (5) minutes of the recovery period.

3.10. Points are taken into account

1. Conduct continuous and interval aerobic testing at the same time and place.
2. Continuous and interval aerobic testing at moderate temperatures ranging from (21-23) ° C humidity ranging (35-45)
3. Standardization of the warm-up process in terms of content and timing.
4. Give a period of (7) days between continuous aerobic test and interval aerobic test so as to avoid any effect of the first test on the second.

3.11. Statistical methods

The researcher used the following statistical methods:

1. Arithmetic mean.
2. Standard deviation.
3. Test (t) for linked and independent samples.
4. Statistical package (SPSS), version (13) was used.

4. Results and Discussion

4.1. Presentation discussion of the results of red blood cells (RBCs) in urine

Table 2: The statistical parameters of the tests for red blood cells (RBCs) in urine between the continuous and interval aerobic effort tests.

H.P.F					
Statistical parameters Tests	**Arithmetic mean**	**Standard deviation**	**t-value**	**Difference between the two arithmetic averages**	**Percentage of the difference %**
Pre resting values for the continuous aerobic effort	1.900	2.025	0.397	0.300	15.79%
Pre-resting values for interval aerobic effort	1.600	1.265			
Pre resting values for the continuous aerobic effort	1.900	2.025	3.074*	1.400	42.42 %
post-test for continuous aerobic effort	3.300	2.974			
Pre-resting values for interval aerobic effort	1.600	1.265	3.515*	1.800	52.94 %
post-test for interval aerobic effort	3.400	2.271			
post-test for the continuous aerobic effort	3.300	2.974	0.086	0.100	2.94 %
post-test for interval aerobic effort	3.400	2.271			

* Significant at an error rate of ≥ 0.01 in front of a degree of freedom = 9, tabular (t) value = 2.821.

**** Significant at an error rate of ≥ 0.01, in front of a degree of freedom = 18, tabular (t) value = 2.552.**

It is evident from Table (2) that:

- There was no significant difference at the error rate (≥ 0.01) in the red blood cells (RBCs) in urine between the resting pre values for the continuous and periodic aerobic effort, if the calculated (t) value was (0.397), which is less than the tabular (t) value (2.552).
- There is a significant difference at an error rate (≥ 0.01) in the red blood cells (RBCs) in urine between the values of the pre-test and the post-test of continuous aerobic effort in favor of the post-test if the calculated (t) value was (3.074) which is greater than the tabular (t) value (2.821).
- There is a significant difference at an error rate (≥ 0.01) in the red blood cells (RBCs) in urine between the values of the pre-test and the post-test of periodic aerobic effort in favor of the post-test, if the calculated (t) value was (3.515), which is greater than the tabular (t) value (2.821).
- There was no significant difference at an error rate (≥ 0.01) in red blood cells (RBCs) in urine between the two post-tests for continuous and periodic aerobic effort, if the calculated (t) value was (0.086), which is less than the tabulated (2.552) value.

This result is consistent with the findings of (Abbas, 2000) [5], (Al-Halfi, 1994) [3], (Shaalan and Nasr Al-Din, 1993) [4], and (Abdul-Fattah and Ali, 1983) [6]. It also agrees (Karpovich & wayne, 1971, 125), (Boileau *et al*., 1980), and (Berman, 1977) that there is the appearance of red blood cells (RBCs) in the urine after effort. (Abbas, 2000, 102) [5], (Al-Halafi, 1994, 10-12), (Shaalan and Nasr Al-Din,1993,21) [4], (Abdul-Fattah and Ali,1983,59) [6], (Boileau *et al*., 1980,471), (Karpovich & wayne,1971,125), and (Berman, 1977,753). t also agrees with (Gareth & Ian, 1997) [13] finding the presence of red blood cells (RBCs) in urine in runners after the race (1500 m) and also citing (Eichner,1985) indicating that the size of red blood cells in the urine, it is directly proportional to the overall distance of running or sprinting (Gareth & Ian,1997,119 - 125) [13], It also agrees with what it found (Newhouse & Mclnnis, 1993) where they found a significant increase in red

blood cells after the period running protocol (3 * 400) meters with a recovery period of one minute between repetitions. (Newhouse & Mclnnis,1993), while this finding is inconsistent with the findings (Al-Nuaimi, 2013, 88-102) that found no change in red blood cells in urine after running (5000 m). The foregoing shows that physical activity or effort leads to the appearance of red blood cells in the urine, and this condition is not considered a case of illness, but it goes away (24-48) hours after the end of the physical effort. This is confirmed by (Gareth & Ian, 1997) [13] and indicated the difference between athletic pseudonephritis and Clinical Nephritis is that changes in urine return to normal shortly after the recovery period from a severe exercise bout. (Gareth & Ian, 1997,119 – 125) [13].

The researchers believe that the appearance of red blood cells (RBCs) in the urine after aerobic physical exertion may be due to the pressure inside the renal vein, which leads to increased filtration of red blood cells with urine, as (Abdul-Fattah, 1988) [6] emphasizes that the pressure inside the renal vein It leads to an adverse reaction that affects the filtration of red blood cells with urine. (Abdel-Fattah, 1988, 287) [6]. It may also be attributed to the liberation or release of catecholamines due to physical effort, which in turn results in a narrowing of the glomerulus artery and thus an increase in the magnitude filtration pressure and the increased subtraction of red blood cells with urine. Stressing (2019, Richard & Davendra) that the relative narrowing of the glomerular artery caused by catecholamines in blood circulation results in increased magnitude filtration pressure and increased excretion of red blood cells. Catecholamines also transform blood into muscles away from the kidneys during physical effort, especially in endurance sports This results in damage to the Nephron due to hypoxic damage to the Nephron or to renal hypoxia or consequently to increased permeability of glomeruli and subsequent release of red blood cells in the filter. (Richard & Davendra, 2019, 914). The appearance of red blood cells may be associated with an increase in body temperature, dehydration, the release of free radicals ions, and red blood cell hemolysis or foot-strike hemolysis as a result of the intensity or duration of exercise or physical effort (exercise duration or physical effort. (Gareth & Ian, 1997,119 - 125) Mojgan, 2011, 217) [13].

4.2. Presentation and discussion of urine (PH) results

Table 3: The statistical parameters of urine PH tests between the continuous and periodic aerobic effort tests

H.P.F					
Statistical parameters Tests	**Arithmetic mean**	**Standard deviation**	**t-value**	**Difference between the two arithmetic averages**	**Percentage of the difference %**
Pre resting values for the continuous aerobic effort	*6*	0.408	0.557	0.100	1.66%
Pre-resting values for interval aerobic effort	5.900	0.394			
Pre resting values for the continuous aerobic effort	*6*	0.408	0.318	0.05	0.83%
post-test for continuous aerobic effort	5.950	0.284			
Pre-resting values for interval aerobic effort	5.900	0.394	1.406	0.150	2.54%
post-test for interval aerobic effort	5.750	0.264			
post-test for the continuous aerobic effort	5.950	0.284	1.633	0.200	3.36%
post-test for interval aerobic effort	5.750	0.264			

* Significant at an error rate of ≥ 0.01 in front of a degree of freedom = 9, tabular (t) value = 2.821.

**** Significant at an error rate of ≥ 0.01, in front of a degree of freedom = 18, tabular (t) value = 2.552.**

It is clear from Table (3) that there is no significant difference in the error rate (≥ 0.01) in (PH) urine between the values of pre-rest for each of the continuous and periodic aerobic efforts, as well as between the two post-tests of the continuous and periodic aerobic effort, Also, between the values of pre-test and the post-test for each of the continuous and interval aerobic efforts.

The insignificance of the difference in the value of (PH) urine in all measurements and tests is due to the fact that the intensity of the effort exerted in both continuous and periodic aerobic efforts was not at the level that leads to an accumulation of lactic acid (LA) and thus to a decrease in the value of (PH) urine, i.e. an increase its acidity. This interpretation is consistent with what was indicated by the study (Buckler, 1973) [11] that the use of physical loads of moderate-intensity does not lead to an increase of lactic acid in the urine to a large degree compared to its amount during rest. (Buckler, 1973, 193-197) [11].

4.3. Presentation and discussion of the results of white blood cells (WBCs) in urine

It was found through all measurements and tests for both continuous and interval aerobic effort that urine does not contain white blood cells (WBCs), and this indicates that there is no significant difference in white blood cells (WBCs) between all measurements and tests for both continuous and interval aerobic effort and this result does not agree with what was reached by (Al-Nuaimi, 236, 2006), (Tawfiq and Youssef, 311, 1989) [1], (Abdul-Fattah and Ali, 214, 1983) [6], (Al-Naimi, 272-29-2), perhaps the reason why urine does not contain white blood cells (WBCs) is that white blood cells are larger than red blood cells, which makes it difficult for them to appear in the urine.

4.4. Presentation and discussion of the results of sugar in the urine

It has been found by all measurements and tests for both continuous and interval aerobic effort that the urine does not contain glucose. This indicates that there is no significant difference between all measurements and tests for both continuous and periodic air stresses. The insignificance of the difference in glucose in urine in all measurements and tests is due to the fact that most of the sugar in the urine is reabsorbed and returned to the bloodstream, and this confirms by (Harold, 1969) and indicated that about (99%) of the water and all the sugar are reabsorbed through the walls of the renal tubes and return again to the bloodstream (Harold, 1969,130).

4.5. Presentation and discussion of the results of protein in the urine

It has been found by all measurements and tests for both continuous and interval aerobic effort that urine does not

contain protein. This indicates that there is no significant difference in protein between all measurements and tests for both continuous and interval aerobic stresses. This result does not agree with the reached (Tawfiq and Youssef, 1989, 311) [1], (Abdul-Fattah and Ali, 1983, 56) [6], (Peter & Karl, 1997, 214), (Gareth & Ian, 1997, 119 - 125) [13] and (Portmans, 1994,32), as they concluded that there is an appearance of protein in the urine after physical effort.

5. Conclusions and Recommendations

5.1. Conclusions

1. Both continuous and periodic aerobic efforts lead to the appearance of red blood cells (RBCs) in the urine.
2. Both continuous and periodic aerobic efforts did not lead to any significant change in the pH value of the urine, as well as to the appearance of white blood cells (WBCs), sugar, and protein in the urine.
3. There was no discrepancy or difference between the continuous and periodic aerobic efforts in the response of the components of urine.

5.2. Recommendations

1. The necessity of education and awareness athletes and trainers. about the condition of the appearance of red blood cells in the urine (Hematuria) as a result of physical effort or repetitive, high-intensity, or long-term exercises, and that this condition enhances cases of anemia in athletes as a result of the repeated loss of red blood cells in the urine.
2. The necessity of paying attention to the periodic examination and urine analysis and not allowing players to participate in sports competition and training that lasts for a long period of time only after ensuring their safety from urinary system diseases due to the burden on the kidneys during sports activity.
3. The necessity of conducting more studies related to the effect of different methods and methods of training and different types of physical effort to determine the extent of the effect of the method of training and the type of sports activity on the components of urine.

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