Comparative analysis of mean platelet volume among female volleyball rugby players and yoga practitioners

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Abstract
Purpose. Several studies have shown that platelet size is a reliable indicator of platelet activity and, therefore, a valuable biomarker for cardiovascular events. Many inflammatory and prothrombotic disorders have been linked to it. As a biomarker for inflammation and neoplastic disease, this study aims to examine existing research on changes to mean platelet volume (MPV).

Materials and methods. The present study portrays MPV comparison among the female players who participated in two games and one yoga practitioners, Volleyball, and Rugby conducted at the university level throughout India with age groups ranging from 17 to 25 years in the sample. The sample size is 45, with 15 players chosen from each two game Volleyball, and Rugby and one yoga practitioners.

Results. The results mean, standard deviation (SD), standard error of the mean (SEM), and lowest and maximum scores were used to examine the data. Normality was assessed and confirmed using the Kolmogorov-Smirnov test. SPSS software was used to do the One-Way Analysis of variance. It was observed that there is a significant difference in the MPV of players from two distinct sports players and yoga practitioners. Furthermore, there exists a one-to-one correspondence between the MPV between the players participating in individual games. The present results displayed the values of MPV among players from different games and yoga practitioners are independent of one another and unaffected by one another. The p-value is 0.011252. The result is significant at p < 0.05. As a result, the null hypothesis is rejected in this study.

Conclusion. The study’s findings indicate a significant difference in the MPV of players from two distinct sports players and yoga practitioners. However, when MPV of Volleyball and rugby players were compared, it was discovered that they were connected. In conclusion, MPV among players from different games yoga practitioners are independent of one another and unaffected by one another. Variability in MPV was also observed across all sample sizes in the study.

Keywords: mean platelet volume (MPV), yoga practitioners, volleyball, rugby, female players
Анотація
Ділпріт Каур, Арвінд Малік, Каруппамасті Говіндасамі, Саран К.С., Мітхін Ананд, Чандрабабу Суреш, Джон Боско Аніта, Моу Прамані, Імен Ачурі, Хіба Буганмі, Сігамані Джаясінг Альберт Чандрасекар.

Порівняльний аналіз середнього об’єму тромбоцитів у волейболісток, у регбі та йоги.

Мета. Кілька досліджень показали, що розмір тромбоцитів є надійним показником активності тромбоцитів і, отже, цінним біомаркером серцево-судинних подій. Багато запальних і протромботичних розладів були пов’язані з ним. Як біомаркер запалення та неопластичних захворювань, це дослідження має на меті вивчити існуючі дослідження змін середнього об’єму тромбоцитів (MPV).

Матеріали та методи. У цьому дослідженні представлено порівняння MPV серед жінок-гравців, які брали участь у двох іграх і однойй ойолі, волейболі та регбі, проведенному на університетському рівні по всій Індії з віковими групами від 17 до 25 років у вибірці. Розмір вибірки становить 45, по 15 гравців, обраних із кожного з двох ігор у волейбол та регбі, і один практикуючий йогу.

Результати. Середне значення результатів, стандартне відхилення (SD), стандартна помилка середнього (SEM), а також найнижчі та максимальні бали були використані для вивчення даних. Нормальность оцінювали та підтверджували за допомогою тесту Колмогорова-Смирнова. Програмне забезпечення SPSS використовувалося для виконання одностороннього дисперсійного аналізу. Було помічено, що існує значна різниця в MPV гравців від двох різних спортсменів і практикуючих йогу. Крім того, існує однозначна відповідність між MPV гравців і йоги. Настоящі результати показали, що значення MPV серед гравців з різних ігор і йоги не залежать один від одного і не впливають один на одного. Р-значення становить 0,011252. Результат достовірний при p < 0,05. Як наслідок, нульову гіпотезу в цьому дослідженні відхилено.

Висновки. Результати дослідження вказують на значну різницю в MPV гравців від двох різних спортсменів і практикуючих йогу. Незалежно, коли порівнювали MPV волейболісток і волейболісток, виникло відчуття, що вони пов’язані. Підсумовуючи, MPV серед гравців і йоги не залежать один від одного і не впливають один на одного. Варіабельність MPV також спостерігалася у всіх розмірах вибірки в дослідженні.

Ключові слова: середній об’єм тромбоцитів (MPV), йоги, волейбол, регбі, гравці.

Анотация
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Сравнительный анализ среднего объема тромбоцитов у женщин, играющих в волейбол, регби, и занимающихся йогой.

Цель. Несколько исследований показали, что размер тромбоцитов является надежным индикатором активности тромбоцитов и, следовательно, ценным биомаркером сердечно-сосудистых событий. С ним связаны многие воспалительные и протромботические расстройства. В качестве биомаркера воспаления и неопластического заболевания это исследование направлено на изучение существующих исследований изменений среднего объема тромбоцитов (MPV).

Материалы и методы. В настоящем исследовании проводится сравнение MPV среди игроков, которые участвовали в двух играх и одной практике йоги, волейболисток и регбисток, проведенных на университетском уровне по всей Индии с возрастными группами от 17 до 25 лет в выборке. Размер выборки составляет 45 человек, по 15 игроков, выбранных из каждой игры в волейбол и регби, и один человек, занимающийся йогой.

Результаты. Для изучения данных использовались средние результаты, стандартное отклонение (SD), стандартная ошибка среднего (SEM), а также самые низкие и максимальные баллы. Нормальность оценивали и подтверждали с помощью теста Колмогорова-Смирнова. Программное обеспечение SPSS использовалось для проведения однофакторного дисперсионного анализа. Было замечено, что существует значительная разница в MPV игроков двух разных спортсменов и практикующих йогу. Кроме того, существует однозначное соответствие между MPV между игроками, участвующими в отдельных играх. Настоящие результаты показали, что значения MPV среди игроков из разных игр и практикующих йогу не зависят друг от друга и не зависят друг от друга. Значение p равно 0,011252. Результат значим при p < 0,05. В результате нулевая гипотеза в данном исследовании отвергается.

Выводы. Результаты исследования указывают на значительную разницу в MPV игроков двух разных спортсменов и практикующих йогу. Однако при сравнении MPV волейболисток и игроков в регби было обнаружено, что они взаимосвязаны. В заключение, MPV среди игроков из разных игр, практикующих йогу, не зависят друг от друга. Изменчивость MPV также наблюдалась для всех размеров выборки в исследовании.

Ключевые слова: средний объем тромбоцитов (MPV), занимающиеся йогой, волейбол, регби, спортсменки.
Introduction

Hematological parameters may be important in deciding which game participants exhibit the best physical performance. Additionally, it provides information about the players' health and physical condition. Platelet size has been shown to correlate with platelet activity and appears to be a helpful biomarker for cardiovascular events both predictive and prognostic. There are many ways that platelets contribute to atherosclerosis, including sticking to injured endothelium and releasing their granules. Regular physical activity has been found to benefit physical, physiological, and other health outcomes. Scientific research indicates that the acute and chronic impacts of frequent exercise on a variety of physiological systems are beneficial.[1] MPV is regularly evaluated in automated hematological analysers, along with other parameters, as a sign of platelet activation and/or reactivity. As a result, it could be employed as a simple and low-cost biomarker of bodily activity in a variety of additional exercise settings.[2] Ahmadizad et al. discovered that anaerobic exercise resulted in a considerable rise in platelet count.

It has been observed that high-intensity interval training enhances platelet secretion by boosting epinephrine secretion. Physical activity affects platelet function both directly and indirectly. Numerous processes and cell/tissue types are thought to contribute to the observed impacts in this area. Acute exercise increases catecholamine levels, as well as shear and oxidative stress, which are all known to activate platelets. This is particularly significant because arterial blood flow and shear rate rise in direct proportion to exercise intensity.[3] Platelets are produced under controlled, stimulated conditions. The platelet count will increase during sports due to fresh platelet release from spleen arteries, bone marrow, and other platelet sources in the body. Epinephrine release causes a severe contraction of the spleen, which contains about one-third of the body's preserved platelets. This method may help to explain why platelets are increased in sports. Additionally, in the most extreme stages of platelet activation, such increases can be generated by alterations in the development of megakaryocytic components of the cytoplasm [4][5].

While physical activity has a significant effect on a variety of laboratory markers, data on medium-distance runners are unlikely to experience hematological alterations. After completing the 21.1 km marathon, the mean platelet volume rose rapidly and returned to normal within three hours. Before the run, at the end, and three hours later, blood samples were collected. For MPV (fl), the starting volume was 9.2, the post-run value was 9.5, the volume after three hours was 9.1, and the final volume after 20 hours was 9.2. The study concluded that moderate exercise increases mean platelet volume and restore it to its pre-exercise level within three hours [6]. One Aerobic and weight training session significantly improve the mean platelet volume in non-player women (They were randomly divided into three groups of 15 subjects: two experimental groups (resistance exercise group and aerobic exercise group) and one control group. The resistance training and aerobic training were conducted in one session for 60 minutes. The blood sample was obtained before and after the activity. They observed that before the resistance exercise group mean was 9.08(fl), the post-test mean was 9.18(fl), the control group's means was 10.11(fl). This research showed that Mean Platelet Volume considerably increases with resistance type of exercise.[7] Following a light intensity circuit resistance training session, the mean platelet volume of male physical education students (35 percent of a maximum repetition) is dramatically raised. The observer discovered that MPV (fl) in the Exercise group was 9.44 0.25, 10.13 0.36 P0.73. Where 9.03 0.17, 9.53 0.38, and P-0.319 are the values for the Control group, respectively [8].

Kirbas et. al. conduct a study in which they compare the blood platelet levels of players who participate in sports regularly over five years to those of inactive university students. Blood samples were taken and platelet, mean platelet volume, platelet crit, and platelet distribution width were assessed for players and sedentary university students, respectively. This study included 18 willing male players from various team sports with an average age of 20.550.70 years and 18 sedentary university students with an average age of 20.880.75 years as subjects. To determine the difference between the two groups, an independent samples t-test was performed (P0.05) [9] During an exercise stress test, Yilmaz et al. examined MPV. The mean MPV levels before and after treadmill activity were 8.520.63 and 8.450.58, respectively, in the control and experimental groups, respectively (P0.001). Before TMET, the patient group exhibited a substantial increase in MPV (P0.001), while the control group showed no significant increase in this parameter.[10]. Erdemir et.al conducted a study to analyze the hematologic parameters of high school students who exercised in the morning and evening. Twelve healthy, untrained male students, around the age of twenty, volunteered to participate in this study.

Blood samples were collected before and following submaximal activity in the morning between 8-9 a.m., whereas blood samples were
collected before and following evening exercise between 8-9 p.m. Platelets, platelet crit, M.P.V., and P.D.W. were also measured and evaluated using an Archem H3000 Hematology Analyzer. It was revealed that there was a substantial increase in PLT and MPV levels in the morning before and after exercise, as well as in the evening before and after exercise, at a significant level of P0.05. PLT levels increased much greater in the morning pre-exercise period than in the morning post-exercise period [11]. MPV is a numerical value generated by a machine that represents the average size of platelets detected in the blood. It is frequently included in blood tests as part of the complete blood count. Since the average platelet size increases when the body produces more platelets, the MPV test result can be used to infer platelet production in the bone marrow or platelet destruction problems. The usual range of platelet volumes is 9.7-12.8 fl (femtolitre), which corresponds to spheres with a diameter of 2.65 to 2.9 m. The normal range is 7.5-11.5 fl. However, the measurement must typically be considered in conjunction with various other parameters to decide what constitutes a good range for a particular subject. Additionally, research suggests that the average healthy size of platelets may vary amongst individuals from different parts of the world.[12] 

Hematology analysis has established that the effect of daily exercise on hematology is variable. According to the authors, these variances are due to the severity, duration, and frequency of exercise, as well as the subjects' physical and physiological conditions. Additionally, the intensity, duration, and frequency of exercise must be carefully planned to have a similarly excellent effect on blood biochemistry [13]. Monocytes and platelets were found to be more abundant in basketball players than in yoga practitioners, although red blood cells, neutrophils, eosinophils, basophils, and lymphocytes were comparable between groups [14]. 

Combination training has been shown to benefit physiological and haematological alterations, as well as the performance of elite basketball players [15]. Warlow and Ogston analyse 24 male colleagues and medical students between the ages of 20 and 35. All subjects were in good health for this study, but many were unfamiliar with intense activity. Before and after 15 minutes of intense activity, blood samples were taken. Using the spinning bulb approach, they discovered a highly significant increase in the venous platelet count without affecting platelet adhesion to glass [16]. In research on 15 inactive healthy male volunteers at rest or immediately following two standardized activity tests on a bicycle ergometer for 30 minutes.

The author discovered that when exercise was performed at a constant load equivalent to 50% or 70% of maximal oxygen uptake, the platelet count (x109 /l) increased significantly from rest to vigorous activity (Resting- 2185, 50% Vo2 Max- 247, 70% Vo2 Max- 2758, P0.001) [17]. Recent research examined the hematological response to acute and chronic exercise. While it is widely established that both acute and chronic exercise cause a variety of hematological alterations in humans [18]. Hematological parameters including RBCs and WBCs are associated with the physical performance of players. It is thought that an increase in the concentration of the RBCs indicates an improvement in aerobic performance [19]. In scientific studies, these reasons may explain why players' blood values are inconsistent. Research into the long-term effects of physical activity on blood parameters for a variety of age groups and populations is needed to accurately conclude the impact of regular exercise on blood parameters. Many kinds of research in the literature have focused on the acute and short-term effects of physical activity on hematologic markers [20-22]. Therefore, the purpose of the study was to find out comparative analysis of mean platelet volume among female volleyball rugby players and yoga practitioners. We hypothesized that there is no difference between the MPV of participants from the two different games and one yoga practitioners. No difference exists between the MPV of players in the two games and one yoga practitioners.

Material and Methods

To accomplish the study's purpose, the research assistant planned the entire process in terms of a study-appropriate research design.

Sample Size

Sample Selection: The population of the study is female players playing two games viz. Volleyball, Rugby and one yoga practitioners groups (conducted at the university level throughout India) with age groups ranging from 17 to 25 years in the sample. The sample size is 45, with 15 players chosen from each two game Volleyball, Rugby and one yoga practitioners group (Table 1).
Table 1

| Physical activity | Total female players (Volleyball,Rugby) & practitioners (Yoga) = 45 |
|-------------------|----------------------------------------------------------------------|
| Respondents from Volleyball | Respondents from Yoga | Respondents from Rugby |
| 3 | 15 | 15 | 15 |

**Research Design**

Static Group Comparison (SGCD) was used:
1: There is no difference between the MPV of participants from the three different games.
2: No difference exists between the MPV of players in the three games.

**Sample Collection**

The data was taken from all subjects during the All India Inter-University Training Camps for all of the games. Regarding the sample collection, proper approvals were obtained from the individual coaches. A qualified medical technician venepuncture the blood samples from the Median Cubital Vein. The venepuncture site was first disinfected with antiseptic-soaked cotton before applying a tourniquet around the biceps area of the upper arm. Each participant received a new IV syringe, and spent syringes were disposed of, away with extreme caution.

**Mean Platelet Volume (MPV)**

MPV is a precise assessment of their size that is determined by hematological analyzers using the volume distribution of platelets during standard blood morphology testing. MPV is between 7.5 and 12.0 fl, whilst the proportion of big platelets should be between 0.2 and 5% of the total platelet population.[23].

Analytical tools utilized in the present study:
In this study, Haematological Analyzer was utilized as a tool to measure the mean concentration of different variables of the individuals. Hematology analyzers are frequently used in clinical and research settings to count and categorize blood cells to diagnose and monitor the illness. Basic analyzers provide a complete blood count (CBC) and a differential white blood cell (WBC) count in three parts. Sophisticated analyzers determine the shape of cells and are capable of detecting tiny cell populations to diagnose uncommon blood disorders. In this study, we have used. Horiba's Yumizen H500 analyzer is capable of determining the concentrations of 27 parameters, including full WBC. It is based on cytometry and cytochemistry concepts. The following ideas are implemented using the DHSS (Double Hydrodynamic Sequential System). The incubators that come with this analyzer are used to store blood samples from patients who are being monitored by the system. It is necessary to combine a particular serum with the blood that is present in these incubators to keep the blood analyzable for the entire one-hour length of the experiment.

**Statistical Analysis**

Quantification of data is the process of converting quantitative data into qualitative replies to facilitate calculation. Data are presented as mean, standard deviation (SD), standard error of the mean (SEM), and lowest and maximum scores were used to examine the data in tables. Normality was assessed and confirmed using the Kolmogorov-Smirnov test.

Data were analysed using a 3 (groups: volleyball, rugby and yoga) The alpha level of significance was set at $p \leq 0.05$. All data analyses were performed using the statistical package for social sciences (SPSS) software was used to do the One-Way Analysis of variance.

**Results**

The goal of the study was to compare hematological parameters in different types of sports. This study will give some hematological information and help us figure out how different each game player is from the rest. Figure.1 demonstrates the MPV (Fl) as a function of total number of female player participants of three different games. It can be Visualized for the figure that MPV values of female players playing yoga are remarkably higher than that of Volleyball and Rugby, whereas Volleyball and Rugby are comparable.
Fig. 1. Plot depicting MPV of female players for two different games and one yoga practitioners

Table 2

| Statistical Data     | Yoga  | Volleyball | Rugby |
|----------------------|-------|------------|-------|
| Mean                 | 9.25  | 8.08       | 7.95  |
| Standard Error       | 0.46  | 0.20       | 0.22  |
| Median               | 8.7   | 7.9        | 7.9   |
| Standard Deviation   | 1.79  | 0.79       | 0.86  |
| Sample Variance      | 3.20  | 0.63       | 0.75  |
| Kurtosis             | 4.17  | 3.96       | 3.04  |
| Skewness             | 1.08  | 0.5        | 0.38  |
| Range                | 5.9   | 3          | 2.9   |
| Minimum              | 7.1   | 6.7        | 6.7   |
| Maximum              | 13    | 9.7        | 9.6   |
| Sum                  | 138.8 | 121.3      | 119.3 |

Table 2. Displays the statistical parameter carried out using MPV values determined from the haematological samples obtained from the female athletes participants of different games. It can be concluded that mean MPV value of the female yoga practitioners is the maximum as compared to the other two games i.e. volleyball and rugby.

Table 3. The mean and standard deviation of the MPV in female players participating in Yoga Volleyball and rugby are given in the table above. It presents a descriptive study of the data obtained on MPV in selected yoga practitioners, players from volleyball, and rugby. Their responses average between 7.9 and 9.2. This demonstrates their independence from one another. SD is also used to quantify variability, indicating that there is still a difference in the amount of MPV amongst players competing in different games.
Mean and Standard Deviation (SD) of MPV in the female sports of volleyball and rugby players and yoga practitioners.

| Indicators | Treatments       | Yoga | Volleyball | Rugby | Total |
|------------|------------------|------|------------|-------|-------|
| N          | 15               | 15   | 15         | 45    |
| ΣX         | 138.8            | 121.3| 119.3      | 379.4 |
| Mean       | 9.2533           | 8.0867| 7.9533     | 8.431 |
| ΣX²        | 1329.26          | 989.87| 959.39     | 3278.52 |
| Std. Dev.  | 1.7908           | 0.7999| 0.8684     | -     |

Table 4 summarises the findings of the statistically significant difference between the groups. The derived statistical value (5.0026) of the data collected is more than the significant level (0.05), indicating a substantial difference between and within players in terms of MPV level of the blood samples. The table demonstrates that MPV for players of two different games and one yoga practitioners is independent of one another. As a result, the null hypothesis is rejected in this study.

Table 5 shows the relationships within the group, such as the mean MPV of Yoga with Volleyball and rugby and the MPV of Volleyball with rugby. The statistics in the table indicates that there is a statistically significant difference between Yoga and Volleyball and between Yoga and Rugby. However, no difference in MPV was observed between Volleyball and Rugby at the indicated significance level. Because the null hypothesis is rejected in the situation of Yoga combined with Volleyball and rugby, it is accepted in the case of Volleyball and rugby.

**Discussion**

Nowadays, the hematological investigation of players was elucidated by routine blood morphology shed a light on players’ physical fitness in terms of platelet crit (PCT), MPV, platelet count (PLT), and (PDT). In the present study, a modern hematological analyzer provides information related
to large MPV (> 15 fl) and gigantic platelets of MPV > 20 fl. The current research has depicted that parameters of platelet may have to contribute to the diagnosis of an athlete’s physical conditions and can have an impact on prognostic value in some pathologies [24]. Currently, hematological studies on PLT and MPV are part of routine assessment and these are also recommendation made by the International Committee for Standardization in Hematology (ICSH) [25]. MPV is a highly accurate and notable parameter that can be measured using haematological analyzers based on distribution of volume throughout routine blood morphology tests. MPV varies around 7.5 and 12.0 fl, while the proportion of giant platelets should be between 0.2 and 5.0 per cent [26]. In physiological conditions, the MPV is proportional to the platelet size, which is related to maintaining hemostasis and stable platelet mass [27]. This suggests that a rise in platelet production correlates with a decrease in average volume. Various disorders change this physiological proportion. Changes in PLT and MPV ratios might come from increased or atypical thrombocytopoiesis, growing wear, or the action of activating factors on blood platelets [28].

Furthermore, MPV correlates to platelet exercise and is therefore regarded as a platelet activity marker [29].

Platelets in the blood are not a relatively homogeneous group. Those with excessive MPV (>15 fl) tend to be younger and more responsive than those with average MPV. Their synthesis is related to the intense stimulation of mega karyocytes by cytokine, which also tends to enhance the ploidy of these cell lines and enable the release of larger platelets[30]. MPV could be an easy and inexpensive biomarker of the physical performance or fitness of the players. The present study portrays a comparative investigation of MPV of female athletes participating in different games viz. Yoga, Volleyball, and Rugby. The statistical analysis confirmed that the mean value of MPV of female participants of Yoga is more than that of Volleyball and Rugby. This implies that the female players participating in Yoga exhibit enhanced MPV levels, which depicts their high fitness and physical condition.

The objective of the research was to compare haematological markers across various sports. This research will provide haematological data and help us determine how different each game is from the others. The analysis displays the MPV (fl) is the result of the total number of female players participating in three games. It can be seen from the graph that the MPV levels of female yoga players are much greater than those of rugby and volleyball, but volleyball and rugby have similar MPV values.

**Conclusion**

This study aims to determine the MPV among yoga practitioners, volleyball, and rugby players. To accomplish the study's objectives, data were gathered via questionnaires. Standard deviation and ANOVA were utilized to examine the effect of MPV on one another. ANOVA and post-Tukey’s HSD were employed to determine the difference to determine the outcome following the study's objectives. The study's findings indicate a significant difference in the MPV of players from two distinct sports and yoga practitioners. However, when MPV of Volleyball and rugby players were compared, it was discovered that they were connected. In conclusion, MPV among players from different games are independent of one another and unaffected by one another. Variability in MPV was also observed across all sample sizes in the study.

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Conflict of Interest

The authors hereby declare that they don’t have any financial and personal conflict of interest.

References

1. Koç HÜ, Özen GÖ, Abanoz HA, PULUR AT. Comparative analysis of hematological parameters in well-trained athletes and untrained men. *Pedagogics, psychology, medical-biological problems of physical training and sports*. 2018;5:260-4. https://doi.org/10.15561/18189172.2018.0506

2. Lippi G, Banfi G, Botrè F, De La Torre X, De Vita F, Gomez-Cabrera MC, Maffulli N, Marchioro L, Pacifici R, Sanchis-Gomar F, Schena F. Laboratory medicine and sports: between Scylla and Charybdis. *Clinical chemistry and laboratory medicine*. 2012 Aug 1;50(8):1309-16. https://doi.org/10.1515/cclm-2012-0062

3. Ahmadizad S, El-Sayed MS, MacLaren DP. Effects of time of day and acute resistance exercise on platelet activation and function. *Clinical hemorheology and microcirculation*. 2010 Jan 1;45(2-4):391-9. https://doi.org/10.3233/CH-2010-1321

4. Wu HJ, Chen KT, Shee BW, Chang HC, Huang YJ, Yang RS. Effects of 24 h ultra-marathon on biochemical and hematological parameters. *World journal of gastroenterology: WJG*. 2004 Sep 9;10(18):2711. https://doi.org/10.3748/wjg.v10.i18.2711

5. Karakoc Y, Duzova HA, Polat AL, Emre MH, Arabaci I. Effects of training period on haemorheological variables in regularly trained footballers. *British journal of sports medicine*. 2005 Feb 1;39(2):e4-. https://doi.org/10.1136/bjsm.2003.010637

6. Lippi G, Salvagno GL, Danese E, Tarperi C, Guidi GC, Schena F. Variation of red blood cell distribution width and mean platelet volume after moderate endurance exercise. *Annals of Applied Sport Science*. 2017 Apr 10;5(1):15-23. https://doi.org/10.18869/acadpub.aassjournal.5.1.15

7. Sadeghi E, Omidi M, Yousefi M, Rahimi A, Branch I. The Impact of One Aerobic and Resistance Training Session on Some Hematological Responses Of Non-Athlete Women. *Indian Journal of Fundamental and Applied Life Sciences*. 2014;4(4):2667-72.

8. Ghanbari-Niaaki A, Tayebi SM. Effects of a low intensity circuit resistance exercise session on some hematological parameters of male collage students. *Annals of Applied Sport Science*. 2013 Apr 10;1(1):6-11.

9. Kirbaş S, Tetik S, Aaykora E, Duran B. An examination of the impact of regular exercise participation on blood platelet parameters. *World Journal of Medical Sciences*. 2015;12(2):79-82. https://doi.org/10.5829/idosi.wjms.2015.12.2.9330

10. Yılmaz MB, Sarıcan E, Biyikoglu SF, Guray Y, Guray U, Sasmaz H, Korkmaz S. Mean platelet volume and exercise stress test. *Journal of thrombosis and thrombolysis*. 2004 Apr;17(2):115-20. https://doi.org/10.1023/B:THRO.0000037666.01018.9c

11. Erdemir I. The comparison of blood parameters between morning and evening exercise. *European Journal of Experimental Biology*. 2013;3(1):559-63.

12. Alis R, Sanchis-Gomar F, Risso-Ballester J, Blesa JR, Romagnoli M. Effect of training status on the changes in platelet parameters induced by short–duration exhaustive exercise. *Platelets*. 2016 Feb 17;27(2):117-22. https://doi.org/10.3109/09537104.2015.1047334

13. Baltaci AK, Mogulkoc R, Ustdug B, Koç S, Ozmerdiveli R. A study on some hematological parameters and the levels of plasma proteins and serum zinc, calcium and phosphorus in young female athletes. *J Phys Educ Sport Sci*. 1998;3(2):21-8.

14. Rahaman A. A Comparative Study Of Hematological Variables Between Basketball Players And Yoga Practitioners. *Journal Of Advances In Sports And Physical Education*. 2021;4(5):90-4.

15. Talae M, Nazem F, Taherabadi SJ, Sadaji S. Effects of Six Weeks Combined Training Program on Hematological Parameters in Elite Basketball Players. *Annals Of Applied Sport Science*. 2017 Apr 10;5(1):15-23. https://doi.org/10.18869/acadpub.aassjournal.5.1.15

16. Warlow CP, Ogston D. Effect of exercise on platelet count, adhesion, and aggregation. *Acta haematologica*. 1974;52(1):47-52. https://doi.org/10.1159/000208219

17. Cadroy Y, Pillard F, Sakariassen KS, Thalamas C, Boneu B, Riviere D. Strenuous but not moderate exercise increases the thrombotic tendency in healthy sedentary male volunteers. *Journal of applied physiology*. 2002 Sep 1;93(3):829-33. https://doi.org/10.1152/japplphysiol.00206.2002

18. Wadyn GG, Rennard SI, Brusnahan SK, McGuire TR, Carlson ML, Smith LM, McGranaghan S, Sharp JG. Effects of exercise on hematological parameters, circulating side population cells, and cytokines. *Experimental hematology*. 2008 Feb 1;36(2):216-23. https://doi.org/10.1016/j.exphem.2007.10.003

19. Schumacher YO, Schena F. Laboratory and clinical aspects of microcirculation. *Advances in hematology*. 2006;2016:1-10. https://doi.org/10.1155/2016/2689091

20. Pedersen BK, Toft AD. Effects of exercise on lymphocytes and cytokines. *British journal of sports medicine*. 2000 Aug 1;34(4):246-51. https://doi.org/10.1136/bjsm.34.4.246
21. Carlson LA, Lawrence MA, LeCavalier K, Koch AJ. Salivary lymphocyte responses following acute anaerobic exercise in a cool Environment. The Journal of Strength & Conditioning Research. 2017 May 1;31(5):1236-40. https://doi.org/10.1519/JSC.0000000000001593

22. Ohno H, Sato Y, Yamashita K, Doi R, Arai K, Kondo T, Taniguchi N. The effect of brief physical exercise on free radical scavenging enzyme systems in human red blood cells. Canadian journal of physiology and pharmacology. 1986 Sep 1;64(9):1263-5. https://doi.org/10.1139/y86-213

23. Sikora J, Kostka B. Blood platelets as pharmacological model. Post Biol Kom. 2005;232:561-70.

24. Budak YU, Polat M, Huysal K. The use of platelet indices, plateletcrit, mean platelet volume and platelet distribution width in emergency non-traumatic abdominal surgery: a systematic review. Biochemia medica. 2016 Jun 15;26(2):178-93.

25. Korniluk A, Koper-Lenkiewicz OM, Kamińska J, Kemona H, Dymicka-Piekarska V. Mean platelet volume (MPV): new perspectives for an old marker in the course and prognosis of inflammatory conditions. Mediators of inflammation. 2019 Oct;2019. https://doi.org/10.1155/2019/9213074

26. Sikora J, Kostka B. Blood platelets as pharmacological model. Post Biol Kom. 2005;232:561-70.

27. Thompson CB, Jakubowski JA. The Pathophysiology and Clinical Relevance of Platelet Heterogeneity. Blood. 1988 Jul 1;72(1):1-8. https://doi.org/10.1182/blood.V72.1.1.1

28. Panasiiuk A. Płytki krwi w przewlekłych chorobach wątroby. Medical Science Review-Hepatologia. 2011;11:83-6.

29. Ntoliios P, Papanas N, Nena E, Boglou P, Kouliefidis A, Tzouvelekis A, Xanthoudaki M, Tsigalou C, Froudarakis ME, Bouros D, Mikhailidis DP. Mean platelet volume as a surrogate marker for platelet activation in patients with idiopathic pulmonary fibrosis. Clinical and Applied Thrombosis/Hemostasis. 2016 May;22(4):346-50.

30. Burstein SA, Downs T, Friese P, Lynam S, Anderson S, Henthorn J, Epstein RB, Savage K. Thrombocytopenia in normal and sublethally irradiated dogs: response to human interleukin-6. Blood. 1992 Jul 1;80(2).420-8. https://doi.org/10.1182/blood.V80.2.420.420

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