Analysis of platelet count among female athletes of volleyball, judo, and football: a comparative study

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Authors’ Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript preparation; E – Funds Collection

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How to Cite

Abstract

Purpose: To analyze platelet counts in university-level female athletes playing volleyball, football and judo, respectively.

Material and methods. 54 athletes were selected for the study (18 from each sport). The relationship of platelet count was the criterion for the present study to distinguish between the physical standards of female athletes in three different sports. To obtain a statistical analysis, one-way ANOVA and Tukey's HSD post hoc test were used to establish a p<0.05 significance level.

Results. We found that the present results show that the platelet count of judo athletes is comparatively higher than that of soccer and volleyball athletes.

Conclusions. It was observed that there was no correlation between platelet counts between female athletes participating in the three sports. There is no relationship between athletes from different sports regarding the number of platelets. For comparative statistical analysis, there was no significant correlation between the three sports individually, since their p > 0.05.

Keywords: platelet count, football players, volleyball players and judokas

Анотація

Ділпріт Каур, Арвінд Малік, Каруппасамі Говіндасамі, Саран К.С., Мітхін Ананд, Чандрабабу Суреш, Джон Боско Аміт, Моу Праманік, Імен Ачурі, Хіба Боуганмі, Сігамані Джасінг Альберт Чандрасекар. Порівняльний аналіз середнього об’єму тромбоцитів у волейболісток, у регбісток та тих, хто займається йогою.

Мета: аналіз кількості тромбоцитів у спортсменок університетського рівня, які грають у волейбол, футбол та займаються дзюдо відповідно.

Матеріал та методи. Для дослідження було відібрано 54 спортсменки (по 18 із кожного виду спорту). Взаємозв’язок кількості тромбоцитів був критерієм для цього дослідження, що дозволяє розрізняти фізичні стандарти спортсменок у трьох різних видах спорту. Для отримання статистичного аналізу використовували односторонній ANOVA та апостеріорний критерій HSD Тьюкі, щоб встановити рівень значущості p < 0,05.

Результати. Ми виявили, що справжні результати показують, що кількість тромбоцитів у спортсменок, які займаються дзюдо, порівняно вища, ніж у футболісток та волейболісток.

Висновки. Було відмічено, що не було кореляції між кількістю тромбоцитів між спортсменками, які займаються трьома видами спорту. Між спортсменками з різних видів спорту немає жодного зв’язку щодо кількості тромбоцитів. Для порівняльного статистичного аналізу значимої кореляції між трьома видами спорту окремо немає, оскільки їх p > 0,05.

Ключові слова: кількість тромбоцитів, футболісти, волейболісти та дзюдоїсти

Аннотация

Дилприт Каур, Арвинд Малик, Каруппасами Говиндасами, Биной К, Атул Митал, Тушар Дхар Шукла, Шайлеш Кумар, Моу Праманик, Чандрабабу Суреш, Уша Тивари, Ирина Скрипченко. Анализ количества тромбоцитов у спортсменок, занимающихся волейболом, дзюдо и футболом: сравнительное исследование

Цель: анализ количества тромбоцитов у спортсменок университетского уровня, играющих в волейбол, футбол и занимающихся дзюдо соответственно.

Материал и методы. Для исследования были отобраны 54 спортсменки (по 18 из каждого вида спорта). Взаимосвязь количества тромбоцитов была критерием для настоящего исследования, позволяющего различать физические стандарты спортсменок в трех разных видах спорта. Для получения статистического анализа использовали односторонний ANOVA и апостериорный критерий HSD Тьюки, чтобы установить уровень значимости p < 0,05.

Полученные результаты. Мы обнаружили, что настоящие результаты показывают, что количество тромбоцитов у спортсменок, занимающихся дзюдо, сравнительно выше, чем у занимающихся футболом и волейболом.

Выводы. Было замечено, что не было корреляции между количеством тромбоцитов между спортсменками, занимающимися тремя видами спорта. Между спортсменками из разных видов спорта не существует никакой связи относительно количества тромбоцитов. Для сравнительного статистического анализа значимой корреляции между тремя видами спорта по отдельности не существовало, поскольку их p > 0,05.

Ключевые слова: количество тромбоцитов, футболисты, волейболисты и дзюдоисты
Introduction

Physical activity has substantial impacts on physiology and health, and there is empirical evidence to support the chronic and precise effects of regular exercise on numerous physiological systems [1]. It has shown that physical activities and games minimize the incidence of muscle strains and stress [2]. Blood is used to evaluate the physiological systems, including the cardiovascular, immunological, and endocrine systems of athletes [3]. Significant effects may occur in blood cell regulatory oversight and activity [4, 5]. When playing games or engaging in regular exercise various researches support the association between blood flow and hematologic parameters during and after physical activity, and their relationship has been found the same [6]. Red blood, White blood cell, and plasma are the blood type components that are categorized in sports physiology even though they transport oxygen, carbon dioxide (CO₂), and other essential nutrients [7, 8, 9]. According to reports, a higher performance level in games can only be attained through rigorous training in methodology, coordination, tactical thinking, physical conditioning, and psychological attributes, which should be improved. Blood is a vital liquid organ required for life [10]. Total blood is a complex mixture of cell components, colloids, and crystalloids. It is feasible to separate components of blood with highly variable relative concentration, size, and sedimentation rate using centrifugal force [11].

Platelets are indispensable for the formation of atheromatous plaques and clots [12]. Atherosclerosis is caused by the hyper aggregation and stimulation of platelets, which can lead to cardiovascular disease, myocardial infarction, and stroke. Hemostasis is often associated with many advantages of regular exercise and physical. Regular practices can inhibit platelet aggregation, thereby promoting fibrinolysis by reducing clotting factors. According to reports, athletes need an excessive quantity of oxygen for bodily function, as well as appropriate amounts of haemosiderin inside muscle tissues to perform effectively [13]. Erythrocytes (red blood cells) are essential for oxygen transformation from the lungs to the tissues. In addition, the size and number of erythrocytes impact hematocrit levels [14]. Brunet al. [15] found that 177 male footballers were in good health. Three categories of 42 male players were selected for the study the least (n = 8), the greatest (n = 5), in addition to the 3 at centre (n = 29) quintiles mixed (n = 42). Research conducted by Wang et al. investigated the threat of severe workouts as well as the governing mechanisms. Forty minutes of vigorous workouts on the bicycle rowing machine were restricted to 18 fit sedentary men. Serum level of VWF antigen and exercise, and shear- or ristocetin-induced platelet accumulation increased as determined by the analysis. We investigated the impact of hard exercise on SIPA and its mechanisms. Forty minutes of vigorous exertion on the bicycle ergometer were restricted to 18 fit inactive men. According to the research Serum level of VWF antigen and exercise are increased, while shear- or ristocetin-induced platelet concentration has also increased, [17]. Observing the effects of a severe bout of submaximal out on plasma volume and the variance reaction of platelet aggregation in trained idle adults and determined regardless of whether cocoa polyphenols counter the effects of workout on platelet task. The realistic implication of the research is that several sedentary individuals engage in sports or intense exercise may use their risk of heart disease. McLean et al. [18] studied the performance and physiological effects of physical training on team-sport athletes. Only 30 athletes and top AF players survived in nineteen days of living and training at sea level at a modest altitude (2130 meters; CON, n = 9).

There was no variation in TT performance hemoglobin mass between both the two groups during the pre-intervention and post-intervention periods. According to them, altitude training could be advantageous in preparing for the competition phase. They examined the yearly variability in altitude-and hemoglobin mass change [Hb (mass)] in sports participants. Researchers have used near-IR spectroscopy to assess oxyhemoglobin and myoglobin in tissues, as well as deoxyhemoglobin and myoglobin in tissues (TSI percent). Among the top athletes in the world, [19], the relationship between the hematological factors and specific fitness used by them. Using the CO-rebreathing approach, the Hb mass of 25 professional hockey players was determined. Haematocrit and Haemoglobin (Hb) levant here were measured in venous blood. Due to this, it was determined that these two physical fitness tests should not be administered concurrently. Varlet-Marie et al. [20] measured the "conceptual appropriate hematocrit" (h) ratio both during pre-and post-exercise to better understand the "dilemma of hematocrit in athletes." For 30 minutes, fourteen rugby players trained on a cycle ergometer set to 225 kJ/m². By repeating the theoretical results of h and hematocrit, it must be demonstrated that h and hematocrit might be accurately predicted, which could aid in the comprehension of their actual values. Slangerup et al. [21] studied the impacts of donating blood on the
Physical performance of women during menstruation. Examined were time trial (TT) achievement, VO₂ peak, and hematological characteristics. At the beginning of the testing, 3, 7, 14, 21, and 28 days following blood samples were taken from 18 iron-sufficient females. On Day 3, the blood hemoglobin (B-Hb) level declined by 7.6%. B-Hb levels and VO₂ peak returned to normal after 28 days, whereas TT performance revisited to normal after 14 days.

According to the preceding discussion, the hematological examination of athletes is the most important component in determining the effect of training and sports on the performance and healthiness of the player, and physical fitness. In this research, female athletes from three sports, namely football, volleyball, and judo, were selected to analyze hematological characteristics to conduct a comparative analysis.

**Materials and Methods**

**Sample Selection**

The population of the study is female athletes playing three games viz. volleyball, judo, and football (conducted at the university level throughout India) with age groups ranging from 18 to 25 years in the sample. The sample size is 54 with 18 sportspeople from each sport (Volleyball, judo, and football) chosen.

**Sample Size**

Table 1

<table>
<thead>
<tr>
<th>Games</th>
<th>54- Total female players</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Football</td>
</tr>
<tr>
<td>Three (3)</td>
<td>Eighteen (18)</td>
</tr>
</tbody>
</table>

**Research Design**

- SGCD (Static Group Comparison) has been applied:
- To investigate the mean platelet density of female football, judo, and volleyball players.
- There is no significant correlation between platelet concentration and chosen female athletes' platelet counts.
- In respect of platelet counts, all individual athletes from sports activities are independent of each other.

**Sample Collection**

A trained medical technician has placed a middle cubital vein utilizing vein puncture. The bronchial region of the bicep of the upper arm was disinfected with antiseptic-soaked cotton before the application of a tourniquet. Blood samples were collected by using IV syringes, and the spent syringes were discarded with care. Blood samples were collected by using IV syringes, and the spent syringes were discarded with care. Blood samples are analyzed in incubators that are used in this analyzer. When blood is maintained in these incubators for one hour, it is preserved with a special serum. When blood is maintained in these incubators for one hour, it is preserved with a special serum.

**Platelet Measuring Mechanism**

A hematological analyzer was used to determine the mean percentage of several different variables that were presented in the blood of the people who took part in the study.

**Hematological Analysis**

It is feasible to count Erythrocytes (Red Blood cells), leukocytes (White Blood cells), and Thrombocytes (platelets) utilizing automated specialist hematology analyzers. Over the last many years, hematological technology has advanced dramatically. Modern analyzers are capable of processing hundreds of samples in each hour. Systems that can handle many analyzers, slide producers, and archiving facilities have been made practical by modular designs and advancements in automation. Patients and researchers use hematology analyzer to count and categorize blood cells to monitor and diagnose disease. Two kinds of analyzers for blood counts facilitate the entire blood count and generate a 3 part divergent white blood cell count (WBC). Advanced analyzer identifies the cell morphologies and microscopic cell populations and may assist in the diagnosis of unusual diseases related to blood. Horiba’s Yumi Zen H500 is intended to test 27 different features, including the whole WBC. Examples include flow cytometry and cytochemistry.
Normal Range

The normal range is $150-400 \times 10^9/L \text{ platelet/mcL}$ [23].

Statistical Technique

Normality test was done using Shapiro wilk test. The gathered data were investigated and adopted descriptive statistical tools, in which a mean and SD have been used to determine the trend and variance in platelet concentrations between the chosen samples. Posthoc Tukey Honest and ANOVA (at 5% basis of significance) significant difference (HSD) at an individual-to-individual level were used to examine the connection between these variables to assess the trend in the acquired information about athletes' platelets [22].

Results

Hematological analysis of blood samples collected from the female players, and platelet count data was extracted. Figure 1 shows the variation of platelet counts among female players of three different games viz. volleyball, judo, and football respectively. It can be visualized from the figure that the platelet count of the players playing judo is quite higher than that of football and volleyball. The statistical analysis of the platelet counts is illustrated in Table 2.

![Platelet counts graph](image)

Fig. 1. Plot between number of platelets depending on the numbers of the players respectively

<table>
<thead>
<tr>
<th>Statistical data</th>
<th>Volleyball</th>
<th>Judo</th>
<th>Football</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>244.27</td>
<td>302.3</td>
<td>280</td>
</tr>
<tr>
<td>Standard Error</td>
<td>18.89</td>
<td>16.58</td>
<td>18.54</td>
</tr>
<tr>
<td>Median</td>
<td>246</td>
<td>292</td>
<td>281.5</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>80.17</td>
<td>70.34</td>
<td>78.68</td>
</tr>
<tr>
<td>Sample Variance</td>
<td>6428.09</td>
<td>4948.95</td>
<td>6191.17</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-1.22</td>
<td>0.13</td>
<td>1.23</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.12</td>
<td>0.70</td>
<td>0.08</td>
</tr>
<tr>
<td>Range</td>
<td>264</td>
<td>262</td>
<td>351</td>
</tr>
<tr>
<td>Minimum</td>
<td>111</td>
<td>200</td>
<td>111</td>
</tr>
<tr>
<td>Maximum</td>
<td>375</td>
<td>462</td>
<td>462</td>
</tr>
<tr>
<td>Sum</td>
<td>4397</td>
<td>5443</td>
<td>5040</td>
</tr>
</tbody>
</table>

Table 2

Descriptive statistics of a platelet count of female players for three different games.
Table 2 demonstrates statistical analysis data of platelet counts of female players of volleyball, judo, and football—respectively. The mean, median, SD, sample variance, standard error, skewness, kurtosis, range, sample variance of platelet count among different games, and algebraic sum of all the platelet counts corresponding to each game, describes respectively.

The descriptive statistic of the obtained information about platelet counts amongst chosen judo, volleyball, and football players is shown in Table 3. The arithmetic mean of their responses falls between 244 and 302. It indicates that they are not dependent on each other. However, based on average, they are not independent. SD is also used to quantify variance, which demonstrates that the variation across athletes is not significantly different.

ANOVA was performed on a platelet count of female athletes of various categories.

The value of the ratio (F) is 2.64046. The value of P is 0.081. The not significant result has been reported at p < 0.05. The findings revealing significant differences among the groups are shown in Table 4. The determined statistical value (2.64), which is bigger than the significance threshold (0.05), indicates that there is no significance between football, volleyball, and Judo players. Their relative platelet counts are independent of one another. The null hypothesis is thus being rejected in this investigation.

Table 5 displays correlational mean values among different games viz. volleyball, judo, and football—respectively, and a comparative statistical analysis of mean platelet count between pairs of games based on correlational mean values by using posthoc Tukey’s HSD test.

### Table 3

Descriptive statistics of a platelet count of female players for three different games

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Judo</th>
<th>Volleyball</th>
<th>Football</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>∑X</td>
<td>5443</td>
<td>4397</td>
<td>5040</td>
</tr>
<tr>
<td>Mean</td>
<td>302.28</td>
<td>244.27</td>
<td>280</td>
</tr>
<tr>
<td>∑X²</td>
<td>1730035</td>
<td>1183367</td>
<td>1516450</td>
</tr>
</tbody>
</table>

### Table 4

ANOVA was performed on a platelet count of female athletes of various categories.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square Variance</th>
<th>F- Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WG</td>
<td>298659.9</td>
<td>51</td>
<td>5856.0763</td>
<td>2.64046*</td>
</tr>
<tr>
<td>BG</td>
<td>30925.5</td>
<td>2</td>
<td>15462.8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>329585.33</td>
<td>53</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Insignificant at p < 0.05 level.

### Table 5

Post-hoc Tukey’s HSD test analysis platelet count of female players among three different games

<table>
<thead>
<tr>
<th>Pairwise Comparisons</th>
<th>HSD.05 = 61.5769</th>
<th>HSD.01 = 77.7742</th>
<th>Q.05 = 3.4139</th>
<th>Q.01 = 4.3119</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁:T₂</td>
<td>M₁ = 244.28</td>
<td>M₂ = 302.39</td>
<td>58.11</td>
<td>Q = 3.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(p = 0.06)</td>
</tr>
<tr>
<td>T₁:T₃</td>
<td>M₁ = 244.28</td>
<td>M₂ = 280.00</td>
<td>35.72</td>
<td>Q = 1.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(p = 0.34)</td>
</tr>
<tr>
<td>T₂:T₃</td>
<td>M₂ = 302.39</td>
<td>M₃ = 280.00</td>
<td>22.39</td>
<td>Q = 1.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(p = 0.65)</td>
</tr>
</tbody>
</table>
Discussion

This research investigated the number of platelets in female players of judo, football, and volleyball games. To achieve this objective, a questionnaire was administered to 54 female judo, volleyball, and football players who competed in the All-India inter-university championships. A descriptive analysis was undertaken to determine the association between the participant variables. After analyzing the data to examine the hypothesis regarding the link between the post-Tukey Post hoc test method and ANOVA, it has been concluded there is no correlation between the platelet counts of players from various games. As their p values are more than 0.05, there is no association between the games matched separately for comparative statistical analysis. It indicates their independence from one another. It may be concluded that platelet behavior is independent of and unaffected by external factors. However, in respect of platelet counts, the research reveals that their respective mean averages and standard deviations are rather similar.

Comparative analysis was undertaken to determine the descriptive analysis was undertaken to determine the various hematological parameters in well-trained athletes and untrained men. Pedagogics, psychology, medical-biological problems of physical training and sports. 2018;22(5):260-264. https://doi.org/10.15561/18189172.2018.0506


Conclusions

The present manuscript displays a comparative description of female players playing volleyball, judo, and football respectively. 54 female athletes ages ranges from 17 to 25 years, were selected for blood sample collection to carry out platelet count relation between the three games. It was observed that there is no drastic variation in the platelet count based on their selection of games.

Acknowledgement

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Conflict of interest

None of the authors have any competing interests concerning the research work.

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