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Evaluation of Plasma Levels of Interleukin 6 and Iron Status of Volleyball Players in a Nigerian University

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

To determine the levels of interleukin 6 (IL-6) and iron status of volleyball players in Madonna University, Elele, Rivers State, Nigeria. A total number of 80 subjects were recruited for the study, comprising of 40 subjects before playing volleyball (20 males and 20 females) and 40 subjects after playing volleyball (20 males, 20 females) from Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. The data obtained from the study were presented as Mean ± SD in tables and analysed using student t-test for parametric data using SPSS version 20. The level of significance

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was set at p<0.05. The results of Table 1 showed that there was increase (p=0.003) in interleukin 6 (IL-6) after playing volleyball compared to before playing volleyball and no significant change (0.079) in iron after playing volleyball compared to before playing volleyball. Table 2 showed that there was no significant increase (p=0.164) in interleukin 6 (IL-6) of males compared to females and no significant change (p=0.589) in iron of males compared to females. Table 3 showed that there was no significant increase (p=0.921) in interleukin 6 (IL-6) of volleyball players aged 15-25 Years compared to volleyball players aged 26-35 Years and no significant change (p=0.503) in iron of volleyball players aged 15-25 Years compared to volleyball players aged 26-35 Years respectively. The study found an increase in interleukin 6 (IL-6) levels in volleyball players after games as opposed to levels before games, demonstrating that physical exercise raises interleukin 6 levels while having no impact on iron levels.

Keywords: Interleukin 6; iron; volleyball; inflammation.

1. INTRODUCTION

It has been reported that there is less muscle tension due to contractions during physical activity such as volleyball [1]. Muscles adapted to exercise by secreting interleukin-6 into the bloodstream. Interleukin-6 is an important myokine for sports, especially volleyball muscle adaptation (Chowdhury et al., 2020). It is responsible for inflammation regulation, protein synthesis, lipid deposition, metabolism and muscle building. It was also associated with iron deposits such as ferritin, hepcidin, and hemoglobin [2]. Interleukin-6 has been shown to be an inflammatory cytokine that may increase after exercise [3]. High levels of interleukin-6 are associated with a strong response to inflammation from systemic sports such as volleyball [4]. Interleukin-6 stimulates hepcidin synthesis, resulting in elevated blood hepcidin levels during inflammation [5,6]. It is used by Karen et al. (2016) who found that the effects of exercise intensity and amount on the interleukin-6 reaction were increased in the high intensity group compared to the low intensity group.

Interleukin 6 (IL-6) is a cytokine involved in specific antigenic immune and acute inflammatory responses [7-9]. It is produced in several cell types and can act in numerous tissues [10]. IL-6 plays an important role in the defense response and has pleiotropic properties that can characterize multiple phenotypes [10,11]. At moderate to extreme intensity (> 85-90% of maximum heart rate), IL-6 circulation levels increase. Skeletal muscle contraction is a stimulus for its release. Therefore, it is considered myokine because it is produced, expressed and released by muscles and has paracrine and endocrine effects [12,13]. Reducing the availability of carbohydrates for exercise stimulates the release of IL-6, as it can help maintain serum glucose levels during exercise [13].

IL-6 is associated with increased levels of inflammatory proteins in the acute phase, such as C-reactive proteins [14], which are at risk for cardiovascular events. It is an important marker. And the rupture process [15].

Hepcidin plays an important role in ferroportin opening and iron transport through membrane regulation [16]. Hepcidin blocks the opening of ferroportin and prevents iron from being transported across the membrane of red blood cells and macrophages [17].

The role of heme and non-heme iron in biological function and movement has been elucidated by human and animal studies, and several classic reviews have been published [18,19] and updated. [20]. .. Not surprisingly, the absence of hemoglobin iron can significantly impair exercise by reducing oxygen transport to the muscles during exercise. However, because there is a strong association between the ability to maintain long-term submaximal exercise and the activity of iron-dependent oxidases, endurance performance at reduced exercise intensity is more closely associated with tissue iron concentration. Is related to tress on muscles and lymphocytes along with monocytes can change in interleukin 6 and iron levels after a volleyball game, and this study needs to be done to determine what is happening in the players [21,22].

The study was done to the levels of interleukin 6 (IL-6) and iron status of volleyball players in Madonna University, Elele, Rivers State, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Design

The project is a cross-sectional study involving subjects recruited from volleyball players of Madonna University Nigeria, Elele Campus. The subjects encompass males and females football players age and sex-matched as the controls. The study is a quantitative research to assess the levels of interleukin 6 and iron status of the football players among the students of the University.

2.2 Study Area

The research was carried out on volleyball players in Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. It is located in the South-South part of Nigeria.

2.3 Study Population

A total number of 80 subjects were recruited for the study, comprising of 40 subjects before playing volleyball (20 males and 20 females) and 40 subjects after playing volleyball (20 males, 20 females) from Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. They all gave consent to participate in this study.

2.3.1 Inclusion criteria

Students of Madonna University Nigeria, Elele Campus that are volleyball players without any sign of disease and apparently healthy individuals were selected for the study.

2.3.2 Exclusion criteria

Any Student of Madonna University Nigeria, Elele Campus that is sick or showed s any sign of disease, pregnant, smoker, alcoholics or aged were excluded for the study.

2.4 Procurement of Iron

A commercially prepared serum iron test kit product of BioSystems reagents and instruments company limited were used to assay the iron level.

2.5 Laboratory Investigations

Interleukin 6 (IL-6) determination using Elabscience (Catalog No: E-EL-H0102).

2.6 Assay Procedure

100µL standard or sample was added to the wells and incubated for 90 min at 37°C
The liquid was discarded, immediately added 100µL Biotinylated Detection Ab working solution to each well and incubated for 60 min at 37°C. The plate was aspirated and washed for 3 times. 100µL HRP conjugate working solution was added, incubated for 30 min at 37°C and aspirate d and washed the plate for 5 times. 90µL Substrate Reagent was added and incubated for 15 min at 37°C. 50µL Stop Solution was added. The plate was read at 450nm immediately and the results calculated.

2.7 Statistical Analysis

The data obtained from the study were presented as Mean ± SD in tables and analysed using student t-test for parametric data using SPSS version 20. The level of significance was set at $p<0.05$.

3. RESULTS

Table 1 showed that there was significant increase (p=0.003) in interleukin 6 (IL-6) after playing volleyball (23.76±4.40 pg/ml) compared to before playing volleyball (14.32±2.12 pg/ml) and no significant change (0.079) in iron after playing volleyball (92.32±16.90 ug/dl) compared to before playing volleyball (75.04±9.10 ug/dl)

Table 1. Mean ± SD values of interleukin 6 (IL-6) and Iron status of the subjects before and after playing volleyball

Parameters	Before	After	t-value	*P-value*
IL-6 (**pg/ml**)	14.32±2.12	23.76±4.40	-4.321	0.003*
Iron (**ug/dl**)	75.04±9.10	92.32±16.90	-2.014	0.079

Table 2. Mean ± SD values of interleukin 6 (IL-6) and Iron status of volleyball players based on sex

Parameters	Male	Female	t-value	P-value
IL-6 (**pg/ml**)	20.26±3.26	26.10±3.60	-1.833	0.164
Iron (**ug/dl**)	98.40±2.97	88.27±22.47	0.602	0.589

Table 3. Mean ± SD values of interleukin 6 (IL-6) and Iron status of volleyball players based on age brackets

Parameters	15-25 Years	26-35 Years	t-value	P-value
IL-6 (**pg/ml**)	23.56±6.17	24.06±1.03	-0.108	0.921
Iron (**ug/dl**)	87.37±19.23	99.75±14.78	-0.759	0.503

Table 2 showed that there was no significant increase (p=0.164) in interleukin 6 (IL-6) of males (20.26±3.26 pg/ml) compared to females (26.10±3.60 pg/ml) and no significant change in iron (p=0.589) of males (98.40±2.97 ug/dl) compared to females (88.27±22.47 ug/dl) respectively.

Table 3 showed that there was no significant increase (p=0.921) in interleukin 6 (IL-6) of volleyball players aged 15-25 Years (23.56±6.17 pg/ml) compared to volleyball players aged 26-35 Years (24.06±1.03 pg/ml) and no significant change in iron (p=0.503) of volleyball players aged 15-25 Years (87.37±19.23 ug/dl) compared to volleyball players aged 26-35 Years (99.75±14.78 ug/dl) respectively.

4. DISCUSSION

The results in Table 1 show that interleukin 6 (IL-6) increased after the volleyball game compared to before the volleyball game, and there was a significant change in iron after the volleyball game compared to before the volleyball game. Indicates that it was not. Table 2 shows that there is no significant increase in male interleukin 6 (IL-6) compared to females and no significant change in male iron compared to females. This study showed a statistically significant increase in interleukin 6 (IL-6) levels after volleyball players played. Strength training is also known to increase plasma levels of some cytokines [23]. Several studies have shown that tired exercise is associated with an increase in circulating inflammatory reactive cytokines, along with other bioactive stress molecules that have some similarities in their response to sepsis and trauma Hoffman-Goetz and Pedersen [24]; Pedersen et al. [25].

Physical activity, such as muscle exercise, has been shown to increase the secretion and release of interleukin 6 from muscles as well as lymphocytes. Despite the inherent difficulties in measuring plasma cytokine levels [26], studies of subjects with strenuous exercise have reported conflicting results. Some authors report increased IL-6 production after strenuous exercise [27] and no change [28]. Stress and oxidation can increase interleukin-6 levels and increase the inflammatory process that regulates iron production through hepcidin regulation. This study also shows a significant increase in IL-6 levels for volleyball players after play [29-31]. Plasma levels of IL-6 have been shown to increase more than 100-fold during prolonged muscle exercise [32]. Elevated IL-6 plasma levels after soccer were associated with muscle damage in a previous study [33], but today there is significant production of IL-6 even with training without muscle damage. Is clear that was brought about. IL induction-6 is produced as a direct result of contraction itself [27,34].

Table 3 showed that there was no significant increase in interleukin 6 (IL-6) of volleyball players aged 15-25 years compared to volleyball players aged 26-35 Years and no significant change in iron of volleyball players aged 15-25 Years compared to volleyball players aged 26-35 years respectively.

5. CONCLUSION

The results of the study showed that volleyball players' levels of interleukin 6 (IL-6) increased after playing compared to those before playing, indicating that physical exercise raises interleukin 6 levels while having no impact on iron levels after a volleyball game.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The approval for the study was obtained from the Department of Medical Laboratory Science, Madonna University Nigeria, Elele Campus, Rivers State.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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