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Evaluation of Plasma Levels of Interleukin 6 and Iron of Volleyball Players Based on Heights and Weight of a Nigerian University Students

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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

Sports is known to increase inflammation which may in turn affect the levels of interleukin 6 and iron in the players such as in volleyball. The study was done to determine the levels of interleukin 6 (IL-6) and iron levels of volleyball players based on heights and weights of a Nigerian University students. 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

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males, 20 females) from Madonna University Nigeria, Elele Campus, Rivers State, Nigeria. The level of significance was set at $p<0.05$. The results showed that there was significant increase ($p=0.032$) in interleukin 6 (IL-6) of volleyball players of 5.1-6.5M compared to volleyball players of 4.0-5.5M and no significant change ($p=0.663$) in iron of volleyball players 4.0-5.5M compared to volleyball players 5.1-6.5M respectively. The study showed that there was no significant increase ($p=0.978$) in interleukin 6 (IL-6) of volleyball players of 50-65Kg compared to volleyball players of 66-85Kg and no significant change ($p=0.294$) in iron of volleyball players 50-65Kg compared to volleyball players 66-85Kg respectively. During exercise, interleukin 6 (IL-6) but not the iron level increase significantly based upon the height of volleyball players. Both of these parameters do not change significantly based upon their weight.

Keywords: Interleukin 6; iron; inflammation; volleyball; sports; exercise; muscle.

1. INTRODUCTION

It has been reported that muscle tension due to contraction during physical activity such as volleyball is low [1]. A muscle adapted to exercise by secreting interleukin-6 into the bloodstream. Interleukin-6 is an important myokine for sports, especially volleyball muscle adaptation [2]. It is responsible for the regulation of inflammation, protein synthesis, lipid deposition, metabolism and muscle building. Interluekin-6 is also associated with iron deposition of ferritin, hepcidin, hemoglobin, etc. [3,4].

Interleukin-6 has been shown to be an inflammatory cytokine that may increase after exercise [5]. Higher interleukin-6 levels are associated with a strong inflammatory response from sports that affect the whole body, such as volleyball [6]. Interleukin-6 stimulates hepcidin synthesis, resulting in elevated blood hepcidin levels during inflammation [7,8]. It is used by Karen et al. (2016) We found that the effects of exercise intensity and amount on the interleukin-6 response were increased in high-intensity muscle groups compared to low-intensity muscle groups.

Interleukin 6 (IL-6) is a cytokine involved in certain antigenic immune and acute inflammatory responses [9,10,11]. It is produced in several cell types and can act in numerous tissues [12]. IL-6 plays an important role in the defense response and has pleiotropic properties that can characterize multiple phenotypes [12,13]. 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 [14,15]. Reducing the availability of carbohydrates for exercise stimulates the release of IL-6, as it can help maintain serum glucose levels during exercise [15].

IL-6 is important because its increased concentration is associated with increased levels of C-reactive protein [16], an acute phase of inflammatory protein such as risk of cardiovascular events. It is a marker. And the rupture process [17].

Hepcidin plays a key role of ferroportin opening and iron transport via membrane regulation [18]. Hepcidin inhibits ferroportin opening so that iron fail to export across membrane of erythrocyte and macrophage [19].

The role of haeme and nonhaeme iron in biological function and sports has been clarified via human and animal studies, and several classic reviews have been published [20,21] and updated [22]. Not surprisingly, haemoglobin iron, when lacking, can greatly affect sports through a reduction in oxygen transport to exercising muscle. Endurance performance at reduced exercise intensities, however, is more closely related to tissue iron concentrations because of the strong association between the ability to maintain prolonged submaximal exercise and the activity of iron-dependent oxidative enzymes. The stress on the muscles and lymphocytes together with monocytes may change the levels of interleukin 6 after volleyball game and becomes necessary to carry out this research to ascertain what happens in the players the variables will affect the quality of life and wellbeing of the volleyball players.

The study was done to evaluate the levels of interleukin 6 (IL-6) and iron in volleyball players based on their heights and weights 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 volleyball players before playing as the control and after playing as the test and were age and sex-matched as the controls.

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 [4].

2.3 Study Population

A total number of 80 subjects were recruited for the study, comprising of 40 subjects (control) before playing volleyball (20 males and 20 females) and 40 subjects (test) 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.

2.4 Inclusion Criteria

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

2.5 Exclusion Criteria

Any student of the volleyball team of Madonna University Nigeria, Elele Campus who was sick or showed any sign of disease, pregnant, smoker, alcoholics or aged were excluded for the study.

2.6 Procurement of Iron of Test Kit

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

2.7 Laboratory Investigations

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

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**.** 100 µL HRP conjugate working solution was added, incubated for 30 min at 37°C and aspirate d and washed the plate for 5 times**.** 90 µL Substrate Reagent was added and incubated for 15 min at 37°C**.** 50 µL Stop Solution was added. The plate was read at 450 nm immediately and the results calculated.

2.8 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 $p<0.05$ [4].

3. RESULTS

Table 1 showed that there was significant increase (p=0.032) in interleukin 6 (IL-6) of volleyball players of 5.1-6.5M (25.21±3.43 ug/dl) compared to volleyball players of 4.0-5.5M (16.24±2.42 pg/ml) and no significant change in iron (p=0.663) of volleyball players 4.0-5.5M (81.75±26.52 ug/dl) compared to volleyball players 5.1-6.5 M (90.28±18.78 ug/dl) respectively.

Table 2 showed that there was no significant increase (p=0.978) in interleukin 6 (IL-6) of volleyball players of 50-65 Kg (23.82±6.12 ug/dl) compared to volleyball players of 66-85Kg (23.68±1.58 pg/ml) and no significant change in iron (p=0.294) of volleyball players 50-65Kg (85.03±17.98 ug/dl) compared to volleyball players 66-85 Kg (103.25±9.83 ug/dl) respectively.

4. DISCUSSION

In this study, volleyball player with a height of 5.1 to 6.5 m had a significant increase in interleukin 6 (IL-6) and was 4.0 to 5.5 M in height compared to a volleyball player with a height of 5.1 to 6.5 M. It was shown that there was no significant change in iron in volleyball players. Each muscle 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 responsive cytokines, along with other bioactive stress molecules that have some similarities in response to sepsis and trauma [24,25]. Physical

Table 1. Mean ± SD values of interleukin 6 (IL-6) and iron status of volleyball players based on heights

Parameters	Heights		t-value	P-value
	4.0-5.5 M	5.1-6.5 M		
IL-6 (pg/ml)	16.24±2.42	25.21±3.43	-3.229	0.032*
Iron (ug/dl)	81.75±26.52	90.28±18.78	-0.469	0.663

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

Parameters	Heights		t-value	P-value
	50-65 Kg	66-85 Kg		
IL-6 (pg/ml)	23.82±6.12	23.68±1.58	0.031	0.978
Iron (ug/dl)	85.03±17.98	103.25±9.83	-1.268	0.294

activity, such as muscle exercise, has been shown to increase the secretion and release of interleukin 6 from both muscles and 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.

In this study, volleyball player with a height of 5.1 to 6.5 m had a significant increase in interleukin 6 (IL-6) and was 4.0 to 5.5 M in height compared to a volleyball player with a height of 5.1 to 6.5 M. It was shown that there was no significant change in iron in volleyball players. Each muscle 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 responsive cytokines, along with other bioactive stress molecules that have some similarities in response to sepsis and trauma [24,25]. Physical activity, such as muscle exercise, has been shown to increase the secretion and release of interleukin 6 from both muscles and 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 [29,30].

5. CONCLUSION

During exercise, interleukin 6 (IL-6) but not the iron level increase significantly based upon the height of volleyball players. Both of these parameters do not change significantly based upon their weight

CONSENT

As per international standard or university standard, patients' 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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