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The effect of one over heavy exercise session in serum level of immunoglobins (IgG, IgA and IgM) in SepakTakraw athletes

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ABSTRACT

One of the important functions of defense system is the production of immune components that protects body against many invasive agents. The purpose of the recent research was to investigate the effect of one over heavy exercise session in serum level of immunoglobins (IgG, IgA and IgM) in SepakTakraw athletes. 35 professional SepakTakraw athletes by average age 27 ± 8 who have participated in best league of country and invited to cooperate purposefully, were selected. In this research 30 seconds wingate test was used to evaluate aerobic ability. Blood samples collected before, immediately after and 2 hours after exercise and immunoglobins measured by Neflometric method. The results of this study indicated that, serum levels of IgA and IgM before, after and two hours after exercise did not meaningfully change whereas the amount of IgG during exercise changed significantly ($p < 0.05$). The results showed that short time aerobic exercise has meaningful effect on serum IgG level of SepakTakraw athletes, but hasn't meaningful effect on their serum levels of IgA and IgM.

Key words: over heavy exercise, IgA, IgM, IgG, SepakTakraw.

INTRODUCTION

Human body always is affected by environment full of infection of microbe factors. These micro organisms have potential abilities for uncontrollable multiplication, creating pathologic damages and finally destroying their host (1). Most infections have limited time period that this resulted from performance of immune system in fighting with infection agents. In recent years, evident studies have shown with respect to the function of physical pressures on immune system. Among of them researches have studied the effect of sport activities on immune performance (2). Some of them have shown that regular exercise by medium severity has important role in the prevention and treatment of many diseases such as cardiac vascular, diabetes type 2, blood pressure and osteoporosis (3). The study of the effects of exercise on immunity performance covers broad spectrum of exercise, activity and regular light exercises. The study of long time effects of regular exercises on performance of immune system has wide application in the development of public health and the prevention between nations that their active aged population is increasing (4).

One of the popular sport with variety activities is SepakTakraw of eastern south of Asia, Thailand, Malaysia, Indonesia, Philippines, Vietnam, and so on consider pioneering in this sport and have athletic titles of men and women in the world. Each sport has special principles and SepakTakraw isn't excluded. The best ability in this sport is kicking with foot, good view, good kicking, skill in play with ball, control of strokes and concentration also are the necessary capabilities for the success in this field (5, 6 and 7).

During these activities some immunological and hematological materials may affect the immune system of athletes. We have already reported the effect of one session of intense anaerobic exercise on immunohematological values of voleyballist athletes and results showed that during exercise some paraclinical materials apart from immunoglobulins have been significantly changed (8, 9).

Most of studies have been made on the adaptive response of salivary and serum immunoglobulins (10, 11). The major Ig in the serum is IgG and most of immunoglobulin in the saliva is IgA. These materials play an important role in protecting the body against infectious diseases (12).

Exercise has two positive and negative effects on immune function and susceptibility to infection and has two effects. Evidence suggests that exercise induces changes in salivary IgA concentration that the rise and fall of its value strongly depends on the duration and frequency of exercise (13, 14, and 15).

Some researchers reported decrease secretion of IgA (16, 17) and some reported lack of change in increase concentration of IgA (18).

On the other hand exhaustive training exercise refers to the intensity of exercise at the highest level and after this athletes cannot perform. In other words, this activity is causing the stalling athlete (19).

The amount of Ig changes in short severe exercise has been different and there is conflicting results regarding the effect of intense exercise on immunoglobulin levels. Hanns and colleagues (2002), showed increased concentrations of immunoglobulins IgA, IgG, IgM in the first hours after marathon race, and at the recovery period time returned to normal (16). Amanifar et al (2009) showed by performing research on active men who had fourteen weeks running exercise creates meaningful differences in serum level of IgM and IgA. In this research serum IgG didn't change significantly (17). In contrast Verde et al (2007) reported IgM, IgG serum level had meaningful decrease in ten elite and runner men that faced with increasing average 38 percent of severity in exercise for three weeks (20). Andru et al (2009) by performing research on fifteen active men, who have performed one hour exercise by 75 percent VO_2 max, resulted that IgG, IgA, IgG and IgG_3 increased significantly (21, 22).

Contradictory results about the influence of immunoglobulin levels in various sports programs and exciting numerous variables factors involved in this field, will indicate the need for further research. Given the contradictory research on the effects of exercise on immunoglobulin concentration and unilateral attention to a comprehensive long-term impact on these organisms and the lack of studies about the effects of short-term aerobic training on various athletes and also a lack of research and information about the physiological and immunological characteristics of SepakTakraw athletes, among the issues that led us to determine the effect of one intense exhaustive exercise on serum levels of immunoglobulin (IgG, IgM, IGA) of SepakTakraw athletes.

MATERIALS AND METHODS

The method of present study was semi-experimental and population study were SepakTakraw athletes male who invited to the major league of Zahedan city. Among of them, 35 persons with mean age of 27 ± 8 were chosen.

Training program:

In this study an anaerobic exercise session (Wingate test) were used through a bicycle Monark ergometer. Session lasted two hours and includes a warm-up first, then do some exercise and cool at the end of programme in every session. 30 second wingate test on a bicycle ergometer is the best aerobic function that calculates the lower limbs. Each athlete before starting test, exercised for 5 minutes on a bike without heating and after testing for 1 to 2 minutes, cooled. Blood sampling was carried out using specialized instruments. Immunoglobulins were measured by nephelometry using kits manufactured by Binding Site-England.

Statistical Analysis:

Results from blood samples were analyzed using SPSS version 18 software. To determine data classification and regulation of the central parameters (mean and standard deviation of the distribution index), descriptive statistics method was used. For normal data distribution, Kolmogorov-Smirnov (KS) test was also used. To compare pre-test and post-test within the group, repeated measures test was used. For comparing IgG athletes mean after the ANOVA test, Fisher's least significant difference (LSD) tests were also used.

RESULTS

General and anthropometric characteristics of the athletes such as height, weight, age and BMI are given as 186 ± 3 , 72 ± 4 , 27 ± 8 and 23 ± 6 respectively. The results of repeated measurements test showed that serum level of IgG in SepakTakraw athletes before, after and 2 h after exercise, there was a significant change ($p < 0.05$) but the level of serum IgM and IgA athletes before, after and 2 h after exercise was not statistically different ($p < 0.05$) (table 1).

Table 1: The results of repeated measurements test of immunoglobulins (pg/mm) before, after and two hours after exercise.

Time Immunoglobulins	Before training	After the training	Two hours after exercise	P value
IgG	2.44842±12.4143	2.27575±14.2714	2.39474±12.8143	*0.023
IgM	0.75988±0.8971	0.61348±0.9129	0.71740±0.9829	0.819
IgA	0.84628±1.9429	0.81467±0.7929	94635±1.6686	0.799

Note: * mark is a statistically significant

On the other hand Fisher's least significant difference (LSD) tests specific IgG at various stages of SepakTakraw athletes as a method for comparing IgG athletes mean after the ANOVA test, was used and the results shown by table no 2.

Table 2: Fisher's least significant difference (LSD) tests specific IgG (pg/ml) at various stages of Sepak Takraw athletes

LSD test Steps	Standard error	Differences between mean	P value
Before After	0.652	-1.857	*0.029
Two hours after	0.741	-0.400	0.609
After Before	0.652	1.857	*0.029
Two hours after	0.354	1.457	*0.006
Two hours after Before	0.741	0.400	0.609
After	0.354	-1.457	*0.006

Note: * mark is a statistically significant

The results of changes in serum immunoglobulins of 35 athletes in various stages of research.

DISCUSSION

Physical activities like sport has a variety effects on immune performance so sport immunology is a relatively new field that in this study we examine the interaction between exercise and immune function of SepakTakraw athletes. Over the last years since 1990, some investigators believed that there is no clinical evidence that exercise will alter the immune responses of athletes. Recently, clinicians and scientists have begun to examine the interaction between exercises especially one over heavy exercise session and immune system especially on serum level of immunoglobulins (IgG, IgA and IgM). For these purposes, 35 athletes in the field of SepakTakraw were selected and results indicated that an aerobic exhaustive exercise had a significant effect on serum IgG levels of athletes ($P < 0.05$) whereas IgM and IgA levels before and two hours after exercise did not significantly change.

Since the late 1970s, researchers have demonstrated a role of immunoglobulins in athletes and their findings have led us to do further investigation not only in the concentration of immunoglobulins but also in the function of innate and adaptive immunity. It has been demonstrated more clinically relevant searching for a direct relationship between

concentration of immunoglobulins and intense exercise. It must be noted that these previous studies examined intensive activity as the important factor in affecting the concentration and the secretory rate of Igs whereas recent studies have examined the effects of moderate exercise on immunoglobulin production, with the hypothesis that moderate activity would improve the body's immune function (23).

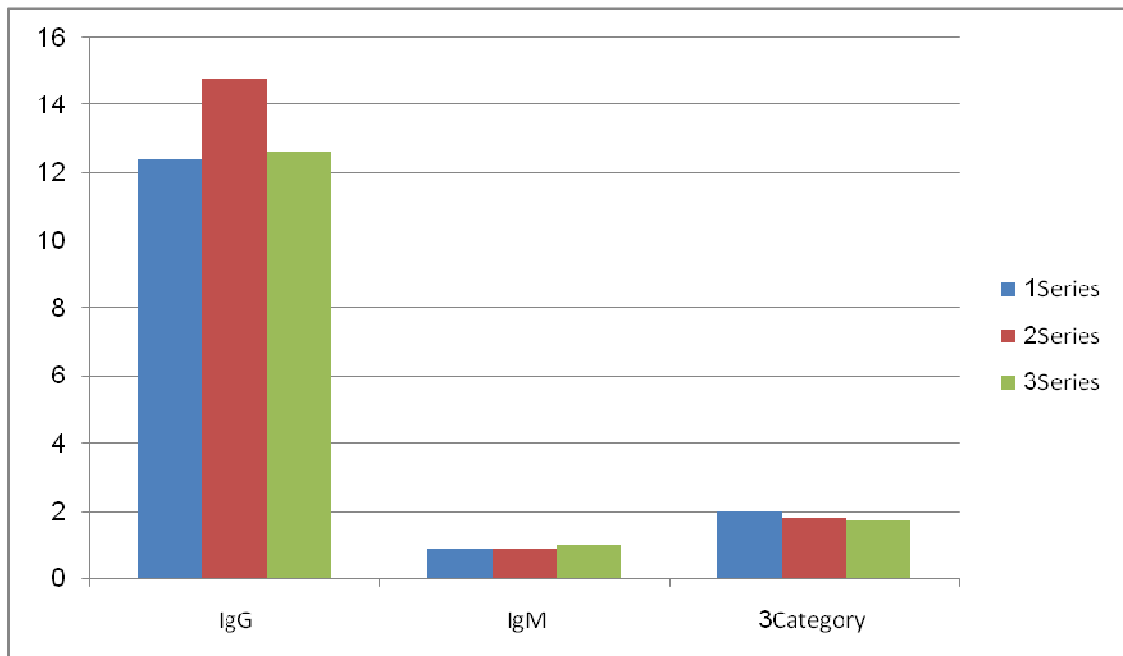


Figure 1: Changes in serum immunoglobulins of athletes in various stages of research.

Some other studies have pointed to lower serum immunoglobulins like the study done by David et al (2007) reported that the levels of IgG, IgM serum of ten male elite runners that were facing to three weeks activities with a 38 percent average increase in exercise intensity were significantly lower (24). Daly et al (1998) (25), Gleeson and colleagues (1995) (26), Dimitriou et al (2002) (27) also reported reduced secretion of IgA.

On the other hand, many studies have reported no change in immunoglobulin concentration like Crdova et.al (2012) reported one season of volleyball matches hasn't effect on IgA serum immunoglobulin amount (28). Mashik et.al (2004) didn't observed meaningful changes in serum concentration IgM and IgG of athlete men after 20 days of sever rugby exercises (29).

Part of our research results (IgA and IgM) are consistent with studies done by Mashiko and colleagues (2004) (29) and Crdova et al (2012) (28) and are inconsistent with the results of Allgrove and colleagues (2008) (30), Daly and colleagues (1998) (25), Gleeson and colleagues (1995) (26), Dimitriou and colleagues (2002) (27). The amount of IgG in these researches did not significantly change. The reason for the significant variation of serum IgG levels in these studies results could be due to high levels of this immunoglobulin in the serum and having different biological and physiological properties on athlete's immunity. Sepatackra sport is with properties involved lower extremity in anaerobic metabolism and it can be a major part of plyometric exercises and power accounts (5). Because IgG antibody is as the important immunoglobulin in primary humoral immune response, while activation of the complement system, facilitate phagocyte bacteria and release effective inflammation products on bacteria (19), therefore given the exhaustive nature of SepakTakraw sport, changes in the immunoglobulin levels of these athletes can be justified.

On the other hand it appears that exercise must be intensive and extensive to provide a demonstrable protective effect among exercise subjects. The results of the study findings in this aspect is in contrast with the results of Amanipoor M, et al (2009) (17), and is consistent with Andrews et al (2009) study (13). Klentrou and colleagues (2002) reported reducing in a number of immunoglobulins after extreme exercise and increasing after long and

moderate activity (31). Study of Pourvagher and colleagues (2008) (32) showed that training intensity especially incremental continuous running as well as morning vs evening-time training, has not significant influence on IgA amount, while the Allgrove and colleagues (2008) demonstrated increased IgA concentration after intensity and increasing activities (30). Klentrou and colleagues also used an aerobic exercise program comprising three 30-minute sessions per week at 75% maximal heart rate. Salivary IgA concentration and secretion rates at rest were significantly increased in the group undergoing regular, moderate exercise (31). Even if a longitudinal study by Fahlman and Engels reported that one year of American football resulted in a significant decrease in secretory IgA and the secretion rate of IgA (15).

In general, researchers believe that changes in immunoglobulin concentration is dependent on several factors, so that a different mechanism to account for changes in serum immunoglobulins have suggested. Response of serum immunoglobulins to the sport especially with athlete's illness is one of mechanisms affects that have been neglected (19).

Changes in plasma concentration is the other point and should be considered. A slight increase (less than 20%) in serum after acute exercise, appears to be mainly attributable to changes in plasma volume.

Increase of less than 10% concentration of serum immunoglobulins is attributed to usually daily changes in the vascular and lymphatic vessels circulation (20, 33,34).

In the regulation of Ig production by B-cells many cells and soluble factors such as the number and proportion of circulating lymphoid cells and release of immune regulatory factors such as cytokines or receptor number and sensitivity of lymphocytes for these molecules, neurological changes, levels of circulating hormone receptor sensitivity and the effects of stress are involved. These factors may act in parallel to each other. Moreover the acute effects of exercise may be have overlapping or conflicting effects on prolonged and chronic effects of exercise (19) as Hanns and colleagues (2002) reported that plasma levels of IgA, IgG and IgM in the first hours after matron race increases and in recovery returns to normal (16). Because monocytes are increased during exercise and prostaglandins are produced by these cells, the findings indicate that soluble factors such as prostaglandins released during exercise, has indirect influence on the production of immunoglobulins (18).

CONCLUSION

According to the results of this study and many others, as severity and duration of some parameters in immune responses of athletes to exercise have been introduced, it can be concluded that short-term exhaustive exercise due to the appropriate extremely and time of low activity, did not have a significant effect on the immunity of the study group (IgM, IgA) but IgG had more reactive to intensity exercise.

Because the evaluation of immune system based on its relationship between its components and also linked of this system to other organ are complex, so the results of this study should be revised in future research and the role of short term intense exercise or longer aerobic training on serum levels of immunoglobulins and other parameters of the immune system and also the role of created these factors on skeletal muscle after exhaustive exercise needs more precisely to be investigated.

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