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Original article

IRON STATUS FOR THE EGYPTIAN FEMALE PLAYERS IN RUNNING COMPETITION (SHORT-MIDDLE-LONG DISTANCES) – COMPARATIVE STUDY

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Abstract*

Aim: Iron is the most studied minerals in athletes. Approximately, 25% of female and 10% of male athletes have iron deficiency, a higher prevalence than in the general population, where it is around 8% among females, although in both athletes and non-athletes there is a rising tendency in suffering from iron deficiency. The prevalence of iron deficiency anemia among athletes has been estimated to be similar to the sedentary population, that is, around 3%. The aim of this study was to compare of Iron (mg/ml), Ferritin (ng/ml), Transferrin (mg/dl), Hemoglobin (g/dl), and Hematocrit (%) in three distance (middle , foil and long) for Egyptian female runners.

Methods: Fourteen female runners (high level) divided into three groups according to distance type. Short (n = 6), (middle n = 5) and long (n = 3). Parameters assessed the high, weight, power, and training age. The Blood Sample was collected from an antecubital vein into vacuum tubes to measure the iron status. All subjects were free of any disorders known to affect performance, such as bone fractures, osteoporosis, diabetes and cardiovascular disease. The participants did not report use of any anti-seizure drugs, and alcohol. In addition, all participants were fully informed about the aims of the study, and gave their voluntary consent before participation. The measurement procedures were in agreement with the ethical human experimentation. All statistical analyses were calculated by the SPSS statistical package.

Results: The results are reported as means and standard deviations (SD). Differences between the three groups were reported as mean difference ±95% confidence intervals (meandiff ± 95%). One way ANOVA for samples was used to determine the differences in the parameters between the three groups. The $p<0.05$ was considered as statistically significant. The results indicated that differed significantly between the three groups in accounting of iron status according the distance type.

Conclusion: In conclusions. Natural of athletics and the distance type could effect of the iron status in females.

Keywords: Ferritin- Iron - middle - short – long

Introduction

Athletics is an elegant, prestigious and traditional sport which reflects the success qualities that are important to contemporary people who seek a challenge to both body and mind through a competitive blend of patience and determination, discipline and competitiveness. It consists of three different distance: the Short, the Long and the Epée, each contested with different rules.

The physical demands of competitive athletics require a high level of aerobic and anaerobic conditioning (Williams & Walmsley, 2000). The requirements in aerobic and anaerobic capacity were differences between distance (Borysiuk, et al. 2004).

Decreased work capacity (ie, maximal oxygen use, VO2max) caused by iron deficiency anemia in human beings has been well documented (Celsing & Ekblom, 1986 ; Tufts, et al., 1985) and is attributed to insufficient oxygen transport by hemoglobin to peripheral tissues. Because , Hemoglobin carries O2 to the muscles and organs of the body and returns CO2 to the lungs to be released into the environment. Adding to , If too little iron is available, fewer and/or smaller RBC's are produced, leading to decreased oxygen carrying capacity of the blood. This is called iron deficiency anemia and can cause fatigue, poor work capacity, and decreased immunity.

Depletion of iron stores, as evidenced by low concentrations of ferritin in serum (i.e., _20 _g/L), adversely affects adaptations to aerobic training (Hinton, et al. 2000; Brownlie, et al. 2002), decreases energetic efficiency during submaximal exercise (Zhu & Haas, 1997; 1998), and increases muscle fatigability (Brutsaert, et al., 2003), even when hemoglobin concentrations are normal. Animal studies suggest that iron deficiency in the absence of anemia decreases the activity of iron-dependent enzymes and cytochromes that are needed for oxidative metabolism, thus impairing submaximal exercise performance (Davies, et al., 1984; Willis, et al., 1987).

The prevalence of iron deficiency anemia is

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estimated to be 3% to 5% in women and _1% in men in the United States.

Iron deficiency without anemia is more common, affecting 12% to 16% of premenopausal adult women and 21% of adult men (Looker, et al. 1997; Looker, et al. 2002). Athletes have unique risk factors for iron depletion compared with their sedentary counterparts.

Regular aerobic exercise results in depletion of body iron stores (Blum & Sherman, 1986; Lyle, et al., 1992) because of foot strike hemolysis, gastrointestinal blood loss, and iron loss via sweating.

Among athletes, the prevalence of iron depletion without anemia seems to be significantly higher than among the general population.

The prevalence of iron deficiency in adolescent and adult females was 25% to 35% for athletes competing in a variety of sports (Malczewska, et al. 2000; Dubnov & Constantini 2004). As expected, iron deficiency is less common among male athletes than among female athletes, but varies widely with sport affiliation.

Fifteen percent of male basketball players (Dubnov & Constantini, 2004) and 11% of males competing in a, variety of sports (Malczewska, et al., 2000) were iron deficient, compared with 36% of elite gymnasts (Constantini, et al., 2000). Because the athletes in these studies were adolescents and/or were competing on the elite (national) level, the results cannot be generalized to adult or recreational active populations.

Understanding the physiological and energy expenditure responses required during the unique nature of athletics is important for the development of training/nutritional programs for athletes involved in athletics (Bottoms, 2011).

Until now, less attention has been paid to individual ones than to team sport athletes. Hence, The main objective of the present study was to compare of Iron (mg/ml), Ferritin (ng/ml), Transferrin (mg/dl), Hemoglobin (g/dl), and Hematocrit (%) in the three distance (middle , short and long) for Egyptian female runners.

Methods

Participants

The sample was comprised of Fourteen female runners (high level) divided into three groups according to distance type. Short (n = 6), (middle n = 5) and long (n = 3). Parameters assessed the high, weight, power, and training age.

The Blood Sample was collected from an antecubital vein into vacuum tubes to measure the iron status. All subjects were free of any disorders known to affect performance, such as bone fractures, osteoporosis, diabetes and cardiovascular disease. The participants did not report use of any anti-seizure drugs, and alcohol.

And all participants were fully informed about the aims of the study, and gave their voluntary consent before participation. The measurement procedures were in agreement with the ethical human experimentation.

Anthropometric assessments

Body weight and height (in light clothing and without shoes) were measured using calibrated scales. Body mass index was calculated as the ratio of weight (kg) to height (m2) .

Biochemical analysis

A fasting blood sample (25 ml) was collected by venipuncture from each runners and analyzed for hematological, and iron status (Olympic center, Cairo, Egypt).

Statistical Analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD).

Differences between two groups were reported as mean difference ± 95% confidence intervals (mean difference ± 95% CI). ANOVA one way was used to determine the differences in biochemical parameters between the three groups. The $p<0.05$ was considered as statistically significant.

Results

Table 1. Age, anthropometric characteristics and training experience of the group (mean ± SD).

Variables	N	Age [years]	Weight [kg]	Height [cm]	Training experience
	14	20.76 ± 2.65	67.16 ± 8.14	175.88 ± 7.08	6.41 ± 2.34

Table 1 shows the age, anthropometric characteristics and training experience of the subjects. No significant differences were observed for the subjects**.**

Table 2. Biochemical variables for three groups

Variables	Group			F sign between groups
	Short	Middle	Long	
RBC (mill/mm3)	4.85±0.54	4.77±0.21	4.97±0.34	Not Sign
Haemoglobin (g/dl)	14.47±1.54	14.2±1.03	15.5±1	Not Sign
Haematocrit (%)	43.56±4.36	42.82±3.57	45±2.98	Not Sign
Iron (mg/ml)	96.28±26.9	89.1±24.76	101.9±26.84	Not Sign
Ferritin (ng/ml)	80.28±28.64	65.15±32.81	80.35±24.85	Not Sign
Transferrin (mg/dl)	315.8±35.75	311.6±30.99	309.64±46.87	Not Sign

Data in Table 2 shows that there is no significant difference in overall biochemical variables.

Discussion

The results of this study showed that the no significant difference in overall biochemical variables. Long group has a higher iron status but not significant when compare middle and short group.

This finding means the long performance need anaerobic ability and not need aerobic ability to compare the other two groups. Adding to, all iron status were less than normal , this finding revealed that nutrition habits.

The process of intencifying the differences between the three kinds of distance was caused by the factors such as: judge's rules of fight, various target areas and the ways of executing the touches. Therefore, the contemporary runners in three contests differ between each other not only with tactics and techniques of conducting the fight but also with somatic structure and biochemical predisposition.

The factors mentioned above influence the coaching process and selection of young runners to the particular distance. Scientific procedures conducted currently should have a compound character considering not only specific athletics conditions but also somatic and biochemical factors.

Furthermore, the intermittent nature of athletics puts demands on both the aerobic and anaerobic metabolic systems (Roi & Bianchedi, 2008). The duration of an international athletics competition can be between 9-11 hours.

However, of that time only 18% will be actual athletics bouts (Roi & Bianchedi, 2008). Unpublished data from our laboratory have shown a work:rest duration of 8s:10s for male runners during simulated competition.

This result agrees with the study of (Borysiuk, et al., 2004) which indicated that long runners express the more athletic type of body structure, therefore, it is probably connected to their dynamic style of fight which correlates with their predisposition to the anaerobic efforts.

Referring to the biochemical components we have noticed that only long runners reached higher values of peak power (PP) in Wingate test.

According to Nickerson et al (1990) iron deficiency in athletes is considered when the levels of ferritin are less or same to 12 ng/ml and transferritin saturation is less or same to 16% with a normal haemoglobin.

Iron deficiency anaemia goes joint with hemoglobin values <13 g/dl in males (Nickerson et al, 1990). These data are important to be checked before starting the sport term, because deficiency can be developed in these athletes who are in the limit values (Nickerson et al, 1990; Resina et al, 1991; Biacotti et al, 1992).

Athletes have several risk factors for anaemia and iron depletion due to poor nutritional intake of iron, haemolysis caused by repeated foot strikes, blood and iron loss through menstruation, gastrointestinal and urinary tracts and iron through sweating (Dubnov et al, 2004).

To be more concret, intermittent sports based in aerobic-anaerobic exercise, like football or field hockey, are seemed to have more iron lost (Resina et al, 1991). Exercise, above all jogging, causes a significant iron expense. Running has an essential role in football training (Ekblom, 1986).

Hence, a mechanism of anaemia usually related to running can also be expected in ball players (Dubnov et al, 2004). Serum ferritin decreases because of protein-energy malnutrition, liver diseases, nefrotic syndrome, neoplasia, while his hepatical synthesis increases thanks to iron deficiency.

On the other hand, serum ferritin concentration is reduced in case of an iron deficiency (Linder, 1988). Unless after three days of intense exercise, athletes can have a false ferritin increased levels (Resina et al, 1991).

Conclusion

On the basis of the research and analysis the following conclusions have been formulated:

1.Taking into consideration the full research we noticed significant differences between long, short, and middle runners in their biochemical components.

2. Reffering to the biochemical parameters the anaerobic predispositions play decisive role as factors which differentiate runners. In the case of iron status which reflect the aerobic efforts we haven't observed any differences.

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References

Blum S, Sherman A, 1986, The effects of fitness-type exercise on iron status in adult women. Am J ClinNutr. 43:456-463.

Bottoms L, 2011, Physiological responses and energy expenditure to simulated middle athletics in elite female runners, Serbian journal of sports sciences , (1) . p17-20

Brownlie T, Utermohlen V, Hinton PS, Giordano C, Haas JD, 2002, Marginal iron depletion without anemia reduces adaptation to physical training in previously untrained women. Am J ClinNutr. 75:734-742.

Brutsaert TD, Hernandez-Cordero S, Rivera J, Viola T, Hughes G, Haas JD, 2003, Iron supplementation improves progressive fatigue resistance during dynamic knee extensor exercise in iron-depleted, nonanemic women. Am J ClinNutr. 77:441-448.

Celsing F, Ekblom B, 1986, Anemia causes a relative decrease in blood lactate concentration during exercise. Eur J Appl Physiol.;55:74-78.

Constantini NW, Eliakim A, Zigel L, Yaaron M, Falk B, 2000, Iron status of highly active adolescents: Evidence of depleted iron stores in gymnasts. Int J Sport NutrExerc Metab.10:62-70.

Davies K, Donovan M, Refino C, Brook G, Packer L, Dallman P, 1984, Distinguishing effects of anemia and muscle iron deficiency on exercise bioenergetics in rats. Am J Physiol.;246:E535-E543.

Dubnov G, Constantini NW, 2004, Prevalence of iron depletion and anemia in top-level basketball players. Int J Sport NutrExercMetab. 14:30-37.

Ekblom B, 1986, Applied Physiology of soccer. Sports Med 3:50-60.

Hinton PS, Brownlie T, Giordano C, Haas JD, 2000, Iron supplementation improves endurance after training in iron-depleted, non-anemic women. J Appl Physiol. 88:1103-1111.

Liebman M, Kenney MA, Ercanli FG, Billon W, Clark AJ, Disney GW, Ercaney EG, Lover E, Lewis H, Mook SW, Mccoy JH, Schilling P, Thye F, Wakerfield T, 1983, The iron status of black and white females adolescents from eight southern states. Am J ClinNutr 38:109-114.

Looker A, Dallman P, Carroll M, Gunter E, Johnson C, 1997, Prevalence of iron deficiency in the United States. JAMA. 277:973-976.

Looker AD, Cogswell ME, Gunter EW, 2002, Iron deficiency —United States, 1999-2000. MMWR Morb Mortal Wkly Rep. 51:897-899.

Lovenbreg G WM, 1986, Biochemical Regulation of Brain Function. Nutr Rev Suppl.6-11.

Lyle R, Weaver C, Sedlock D, Rajaram S, Martin B, Melby C, 1992, Iron status in exercising women: The effect of oral iron therapy vs increased consumption of muscle foods. Am J ClinNutr. 56:1049-1055

Malczewska J, Raczynaki G, Stupnicki R, 2000, Iron status in female endurance athletes and in non-athletes. Int J Sport NutrExercMetab. 10:260-276.

Malczewska J, Szczepanska B, Stupnicki R, Sendecki W. (2001). The assessment of frequency of iron deficiency in athletes from the transferrin receptor-ferritin index. Int J Sport NutrExercMetab. 11:42-52.

Mayer K, Chin B, Baisley A, 1985, Evaluation of the S-Plus. IV. J ClinPathol 83: 40.3.Results of all procedures can be applied to create the individual coaching programs depending on a specific demands in different kinds of distance in athletics.

Nickerson HJ, Holubets MC, Weiler BR, Haas RG, Schwartz S, Ellefson ME, 1990, Etiology and incidence of iron deficiency in adolescent athletes. ColloqueInserm 197:291-298.

O'Neil FT, Hynak-Hankinson MT, Gorman J, 1986, Research and application of current topics in sports nutrition. Am J Diet Assoc 86:1007-1012.

Resina A, Gatteschi L, Giamberardino MA, Imreh F, Rubenni MG, Vecchiet L, 1991, Hematological comparison of iron status in trained top-level soccer players and control subjects. Int J Sports Med.;12(5):453-

Roi GS & Bianchedi D, 2008, The science of athletics: implications for performance and injury prevention. Sports Medicine, 38(6), 465-81.

Tufts D, Haas JD, Beard JL, Spielvogel H, 1985, Distribution of hemoglobin and functional consequences of anemia in adult males at high altitude. Am J ClinNutr. 42:1-11.

Willis W, Brooks G, Henderson S, Dallman P, 1987, Effects of iron deficiency and training on mitochondrial enzymes in skeletal muscle. J Appl Physiol. 62: 2442-2446.

Zhu YI, Haas JD, 1997, Iron depletion without anemia and physical performance in young women. Am J ClinNutr. 66:334-341.

Zhu YI, Haas JD, 1998, Altered metabolic response of iron depleted nonanemicwomen during a 15-km time trial. J Appl Physiol. 84:1768-1775.