Variation in Age and Physical Activity on Selected Biochemical Profiles of Indian Female Volleyball & Table Tennis Players

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ABSTRACT

The present study was aimed to find out the variation of age and physical activity levels on different biochemical variables of Indian female Table Tennis and Volleyball players. A total of 172 Indian female players (92 Table Tennis and 80 Volleyball players) who volunteered for the present study, were divided into four different age groups: 12-14 years, 14-16 years, 16-18 years and above 18 years (where n= 23 and 20 of Table Tennis and Volleyball players, respectively, in each group). Selected biochemical parameters were measured and data were analyzed by applying One-way ANOVA, Post hoc and correlation coefficient tests. Volleyball players of all the age group, in the present study, were significantly (p<0.01& p<0.05 bigger in size compared to Table Tennis players with having significantly (p<0.01& p<0.05) low urea and uric acid level. However, blood hemoglobin and creatinine levels did not show any significant changes when comparing Volleyball players with Table Tennis players, of all age groups. Table Tennis players showed a significantly higher (p<0.05) body fat level compared to the Volleyball players at the age group of >18 yrs. With the increase of age, both Table Tennis and Volleyball players were found to be have an improved height and endurance level. However, serum creatinine was only found to be, significantly (p<0.01) increased in case of Volleyball players, with reference to maturity. As the studies on Table Tennis and Volleyball players are limited in India, the data of the present study can be a handy tool and can act as a frame of reference for monitoring of training players of different age groups, of both disciplines.

Key words

Female players, Physical activity, Haemoglobin, Urea, Uric acid, Creatinine.

INTRODUCTION

Women's sports include amateur and professional competitions in virtually all sports, Female participation in sports rose dramatically in the twentieth century, especially in the last quarter, reflecting changes in modern societies that emphasized gender parity. Although, the level of participation and performance still varies greatly by country and by sport, women's sports have broad acceptance throughout the world (Jinxia, 2002).

The female athletes in different sports exhibit characteristics of body

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composition and shape that are related to the sport in question. Relative body fat varies with physical activity level as well as with age (Leake & Carter, 1991). Biochemical parameters like haemoglobin, urea and uric acid are of advantage in regulating the training load (Suhr et al, 2009; Andersson et al, 2008; Kelley & Kelley. 2009). Haemoglobin represents the iron status of the body (Suhr et al, 2009: Nielsen & Weber, 2007). Therefore, the athlete needs to maintain normal haemoglobin level to optimise performance. The serum level of urea and uric acid indicates the training load imposed on the athletes. In addition, the urea and uric acid accumulation is most frequently used as a measure of protein catabolism and degradation of adenonucleotides (Andersson et al, 2008; Degoutte et al, 2007; Kargotich et al, 2007). The serum creatinine concentration is widely interpreted as a measure of the glomerular filtration rate (GFR) and is used as an index of renal function in clinical practice (Soleimani et al, 2009). Creatinine is a break down product of creatine phosphate in muscle and is usually produced at a fairly constant rate by the body (depending on muscle mass). During the reaction creatine to phosphocreatine. catalyzed by creatine kinase, spontaneous conversion to creatinine may occur.

Volleyball is very popular game worldwide. There is a need of high level of physical and physiological fitness to participate at the elite level (Marques et al, 2009). Training can improve the performance of the players (Bompa, 1999). The training induced changes observed in various anthropometric, physiological and biochemical variables can be attributed to appropriate load dynamics. The elite Volleyball players do not possess VO_2 max values as high as typical endurance trained athletes; but, an outran optimum level of aerobic capacity is required for playing Volleyball since the game may continue for longer time (Lidor & Ziv, 2010; Sheppard et al, 2009). Performance of the Volleyball players, during longer match play, depends on the aerobic component; so, the players need to maintain an optimum level of haemoglobin to optimise performance (Ostojic & Ahmetovic, 2008). Moreover, the serum level of urea and uric acid may be used as indicates of over training (Urhausen & Kindermann, 2002). On the other hand, Table Tennis is one of the most demanding games, which include very fast analyses of changes in the tactics and techniques of the opponent. Mitchell et al, (1994) classified sports activities based on the static component, dynamic component and energy system involved, and placed Table Tennis into the low, moderate group of sports, along with Baseball, Softball, Volleyball and Tennis (doubles).

As per literature, studies on different biochemical parameters of Indian female athletes, in particular Table Tennis and Volleyball, are found to be very scanty. Hence, this is insufficient to conclude the variations in specific biochemical parameters in different age groups of the different games. Therefore, the present study was conducted to:

1. Evaluate the biochemical profiles of the Indian female Volleyball and Table Tennis players of different age groups with reference to growth and development.

2. Establish the standard norms of above parameters of the female athletes according to their age and games.

METHODOLOGY

Selection of subjects

The present study was carried out on 92 female TableTennis players and 80 Volleyball players of four different age groups (12-14 yrs. 14-16 yrs, 16-18 yrs, Above 18 yrs; n= 23 & 20 in each group of Table Tennis and Volleyball players, respectively). All the players were selected from various Sub Centers of Sports Authority of India (SAI). Eastern Region, including the players who trained in SAI, Eastern Center, Kolkata. The girls, who played at least in the district level (in their respective category and games),were taken for the study. All the players were evaluated for various biochemical variables at Human Performance Laboratory of Sports Authority of India, Kolkata. They belonged to almost same socio-economic status and were having similar dietary habits, and were having training in same kind of climatic condition. Hence, the subjects were considered as homogeneous. Before the commencement of test all the players were clinically examined by the physicians of SAI Kolkata. Who are specialized in Sports Medicine, following standard procedure (SAI 1992). Prior to initial testing, complete explanation of the purposes, procedures and potential risks and benefits of the tests were explained to all the players and signed consents were obtained from them. The players who were found to be medically fit, healthy and with no history of any hereditary and cardio respiratory diseases, were finally selected for the present study.

Training Regimen

The formulation and implementation of systematic training programme was made by the qualified coaches, with the guidance of the scientific expert from the Sport Science Department, SA1, Kolkata. The training regimen was almost common to both the games, of the present study, except the skill training and was used to apply on an average 4 to 5 hours every day, except Sunday; and which Comes about 30 hours in a week. There were two sessions in a day i. e. morning session and evening session and both of which comprised of physical training for one hour and skill training for about two hours. The physical training schedule include different strength and endurance training programme along with flexibility exercises. Strength and endurance training was also applied according to their sports specific requirement. Warm up and cool down session, after and before starting of the main practice, were also included in the programme. Besides the technical and tactical training, the players were also provided psychological or mental training session.

Measurement procedure

Measurement of Anthropometrical Variables

The physical characteristics of the subjects including height (cm) and weight (kg) were measured by anthropometric rod and digital weighing machine, respectively, followed by standard procedure (Sodhi, 1991). The decimal age of all the subjects were calculated from their date of birth recorded from original birth certificate, produced by them at the time of testing. Skinfold thickness was recorded using Harpenden Skinfold Caliper at the site of biceps, triceps, subscapular and suprailliac (Eston et al, 1995). Body density was calculated by the equation of Siri (1961) and % Body fat (% BF) was calculated using the formula of Durnin and Womersley (1974).

Measurement of Physiological Variable

Maximum aerobic power (VO_2 max) was assessed using an indirect method of multistage fitness test, the Bleep test (Leger et al, 1988), from where VO_2 max, was predicted. It is a progressive shuttle run test for the prediction of aerobic fitness as well as to estimate a person's maximum oxygen uptake capacity (VO_2 max), from the standard chart. The procedures and purpose of the above test were elaborately explained to all the players. Briefly, players ran back and forth between two lines, spaced 20 m apart, in time with the "beep." sounds from a compact disc (20m Shuttle Run test CD). Each successful run of the 20m distance was a completion of a shuttle. The "beep' was sounded at a progressively increasing pace with every minute of the test and correspondingly the player was to increase his running speed accordingly. The player was warned if he did not reach the end line in time once. The test was terminated when he (i) could not follow the set pace of the "beeps" for two successfully shuttles and/or (ii) stopped voluntarily. Typically, the scores in the test are expressed as levels and shuttles, which estimate a person's maximum oxygen uptake capacity (VO_2 max) from the standard chart.

Measurement of Biochemical Variables

A 5 ml of venous blood was drawn from an antecubital vein ,after a 12-hours fast and 24 hours after the last bout of exercise, for the subsequent determination of selected biochemical parameters. The biochemical parameters were measured using UV Spectro-Photometer (Manufactured by Hitachi Co.. Japan) followed by the standard procedure. Haemoglobin was measured using Cyanmethaemoglobin method (Drabkin and Austin.,1932). Blood urea (Enzymatic UV- Kinetic initial rate method) (Tietz, 1995), serum uric acid (Enzymatic method using uricase and Peroxides) (Fossati et al, 1980) and blood creatinine (Initial rate method using Alkaline Picrate) (Larsen, 1972) were determined calorimetrically.

Statistical Analysis

Differences between female Table Tennis and Volleyball players, for all variables, according to their different age groups, were calculated using a one-way analysis of variance (ANOVA). The data were analyzed using the Statistical Programme for the Social Sciences (SPSS) version 21.0 for Windows (SPSS Inc., Chicago, Il, USA). All values are expressed as means ± Standard Deviation (SD). A confidence level at 5% ($p < 0.05$) was considered as significant. Matrix of correlation coefficient of various physical and physiological parameters of women Table Tennis and Volleyball players of different age groups were also applied to analyze the collected data.

RESULTS & DISCUSSION

The comparison of various physiological and biochemical parameters between woman Table Tennis and Volleyball players of different age groups are presented in Table1. It is evident from the Table that height ($p<0.01$& $p<0.05$) showed a significantly higher mean values in Volleyball players than Table Tennis counterparts, in all age groups. But, body weight have no such significant difference when compared between the different age groups, except age group 12-14 years. Body fat was found to be significantly lower ($p<0.05$) in Volleyball players when compared with Table Tennis players, only in age group >I8 years. However, blood haemoglobin and creatinine levels did not show any significant changes in both Volleyball players and Table Tennis players, of all age groups. Whereas, blood urea level was found to be significantly higher ($p<0.01$ & $p<0.05$ respectively) in Table Tennis players, than the Volleyball players, in age groups 12-14 and 16-18 years. Similar change was observed in serum uric acid level which was found to be significantly higher ($p<0.01$) in Table Tennis players, when compared with Volleyball players in all age groups 12-14 and 14-16 years. On the other hand VO_2 max did not show any such significant changes while comparing both Volleyball and Table Tennis players, all age groups, though the Volleyball players had higher mean values than Table Tennis players, in all age groups.

Table 1 also represented the various physical and physiological parameters of woman Table Tennis players of different age groups. The difference in height and weight was found to be gradually and significantly ($p<0.01$) increased with the increase in age when compared among the groups. But, no such gradual and significant change was observed in case of body fat percent when compared among the different age groups. However, none of the biochemical parameters, like blood haemoglobin, urea, uric acid and creatinine showed significant changes in Table Tennis players, with the increase in age when compared among the groups. On the other hand, significant difference in VO_2 max ($p<0.05$) was observed when compared among the groups. It has also evident from the Table that a gradual improvement was observed in VO_2 max.

The various physical and physiological parameters of woman Volleyball players of different age groups are also depicted in Table 1. The difference in height (and not weight) was found to be gradually and significantly ($p<0.05$) increased with the increments in age when compared among the groups. But, no such gradual and significant change was observed in case of body fat percent when compared among the different age groups. On the other hand, none of the biochemical parameters, like blood haemoglobin, urea and uric acid showed significant changes in Volleyball players with the increase in age when compared among the groups. However, blood creatinine level in Volleyball players showed a significant increase ($P< 0.01$) with the increase in age when compared among the groups. Similarly, a gradual and significant difference ($p<0.01$) in VO_2 max was observed in Volleyball players when compared among the different age groups.

Table 2 demonstrated the correlation coefficient of various biochemical and physiological parameters of women Table Tennis and Volleyball players of 12 - 14 years age group. It is evident from the Table that age is positively and significantly related with haemoglobin level of Table Tennis players of 12-14 years age group. But, blood urea and creatinine levels were not found to be correlated with age, significantly ; though, the relation was positive except serum uric acid. A significant positive relation of VO_2 max was noted with blood urea level in Table Tennis players of 12-14 years age group. For the women Volleyball players of same age group, it has been observed that body weight is positively and significantly related with serum uric acid and creatinine levels. Similarly, a significant positive relation of VO_2 max was noted with blood haemoglobin level in Volleyball players of 12-14 years age group.

Table 3 demonstrated the correlation coefficient of various biochemical and physiological parameters of women TableTennis and Volleyball players of 14 - 16 years age group. It is evident from the Table that body weight is positively and significantly related with blood urea level of Table Tennis players of 14-16 years age group. Similarly, a significant positive relation of body fat was noted with blood urea level in Table Tennis players of 12-14 years age group. For the women Volleyball players of same age group, it has been observed that VO_2 max is positively and significantly related with haemoglobin level.

Table 4 demonstrated the correlation coefficient of various biochemical and physiological parameters of women Table Tennis and Volleyball players of 16-18 years age group. It is evident from the Table that age is positively and

Table-1: Comparison of various biochemical and physiological parameters of women Table Tennis (T) and Volleyball players (V) of different age groups

Variables	12 14 years age group			14-16 years age group			16 18 years age group			>18 years age group			Level of significance$^{\psi}$
	Table Tennis (n = 23)	Volleyball (n = 20)	Level of Significance$^{\varphi}$	Table Tennis (n = 23)	Volleyball (n = 20)	Level of Significance$^{\varphi}$	Table Tennis (n = 23)	Volleyball (n = 20)	Level of Significance$^{\varphi}$	Table Tennis (n = 23)	Volleyball (n = 20)	Level of Significance$^{\varphi}$	
Age (yrs)	12.3 ± 0.51	13.4 ± 0.43	NS	14.5 ± 0.51	15.1± 0.63	NS	16.4 ± 0.52	17.3± 0.55	NS	21.3± 2.79	19.4± 1.35	*	T^{**}, V^{**}
Hieght (cm)	142.9 ± 3.91	147.5 7.08	**	148.1 ± 3.35	154.4 ± 4.30	*	150.2± 10.14	157.7± 5.25	**	151.5± 3.36	157.5± 5.51	**	T^{**}, V^{*}
Weight (kg)	43.4 ± 9.01	49.3 ± 5.50	*	52.2 ± 8.12	50.3± 6.14	NS	53.3± 7.01	52.5± 5.37	NS	54.3± 7.81	55.5± 6.01	NS	T^{**}, V^{NS}
Body fat %	16.4 ± 4.02	15.2 ± 3.27	NS	20.4 ± 5.25	19.3± 4.05	NS	20.5 ± 5.70	19.9± 8.01	NS	22.5± 6.33	19.8± 6.71	*	T^{NS}, V^{NS}
Hemoglobin%	12.2 ± 0.88	11.8 ± 0.81	NS	11.9 ± 8.89	11.7± 0.96	NS	11.6 ± 1.05	11.9± 0.85	NS	11.6 ± 0.9	11.9 ± 0.07	NS	T^{NS}, V^{NS}
Urea (mg/dl)	26.9 ± 3.53	22.9 ± 3.99	**	24.3 ± 2.05	22.4 5.07	NS	26.3± 2.99	22.1± 5.46	*	24.3± 4.08	24.6± 8.24	NS	T^{NS}, V^{NS}
Uric acid(mg/dl)	4.9 ± 0.77	4.2 ± 0.99	**	5.0 ± 0.45	3.7± 0.7	**	4.8± 0.53	3.9 ± 0.35	NS	4.9± 0.76	4.1± 0.75	NS	T^{NS}, V^{NS}
Creatinie (mg/dl)	0.6 ± 0.07	0.58 ± 0.09	NS	0.7 ± 0.08	0.62± 0.09	NS	0.6 ± 0.06	0.64± 0.07	NS	0.7± 0.08	0.72± 0.06	NS	T^{NS}, V^{**}
VO2 mad (ml/kg/min)	37.0 ± 3.44	39.2 ± 3.71	NS	42.5± 3.65	43.5 ± 3.80	NS	43.7± 4.45	44.2± 5.41	NS	46.4 ± 3.62	47.3 ± 4.51	NS	T^{*}, V^{**}

Values are (mean ± sd); **P< 0.01,* P< 0.05, NS= Not Significant.

φ comparisons between Female Table Tennis and Volleyball players of different age groups by one way ANOVA

ψ comparisons among different age groups of female Table Tennis players (T) and female Volleyball players (V) by one way ANOV A

Table-2: Correlation Coefficient of various biochemical parameter of women Table Tennis players (T) and Volleyball players (V) of 12-14 year age group.

	Hb	Urea	Uric a	Crea
age	T 0.429* V -0.409(NS)	T 0.123(NS) V 0.347(NS)	T -0.358(NS) V -0.254(NS)	T 0.164(NS) V 0.176(NS)
ht	T 0.151(NS) V 0.25 (NS)	T -0.219(NS) V -0.240(NS)	T 0.278(NS) V 0.047(NS)	T 0.287(NS) V -0.118(NS)
wt	T -0.009(NS) V -0.251 (NS)	T -0.234(NS) V -0.242 (NS)	T -0.369(NS) V 0.512*	T 0.192(NS) V 0.518*
fat%	T -0.092(NS) V 0.177 (NS)	T -0.075(NS) V 0.028 (NS)	T -0.152(NS) V -0.164 (NS)	T 0.174(NS) V -0.300(NS)
VO_2	T -0.224(NS) V 0.464*	T -0.571* V 0.349 (NS)	T -0.385 (NS) V 0.415 (NS)	T -0.126(NS) V 0.131(NS)

**P<0.01, *P<0.05, NS=Not Significant.

Table-3: Correlation Coefficient of various biochemical parameter of women Table Tennis players (T) and Volleyball players (V) of 12-14 year age group.

	Hb	Urea	Uric a	Crea
age	T 0.120(NS) V -0.050(NS)	T -0.219(NS) V 0.007(NS)	T 0.229(NS) V 0.143(NS)	T -0.273(NS) V -0.026(NS)
ht	T -0.239(NS) V 0.168 (NS)	T 0.329(NS) V 0.007(NS)	T 0.368(NS) V -0.197(NS)	T -0.350(NS) V -0.201(NS)
wt	T -0.277(NS) V -0.175 (NS)	T 0.470* V -0.236(NS)	T 0.239(NS) V -0.072(NS)	T -0.349(NS) V -0.370(NS)
fat%	T -0.018(NS) V 0.110 (NS)	T 0.463* V -0.262 (NS)	T 0.055(NS) V 0.125(NS)	T -0.086(NS) V -0.338(NS)
VO_2	T 0.075(NS) V 0.524*	T -0.186(NS) V 0.059 (NS)	T 0.105 (NS) V 0.313 (NS)	T 0.049(NS) V 0.121(NS)

**P<0.01, *P<0.05, NS=Not Significant.

significantly related with haemoglobin level of Table Tennis players of 16-18 years age group. Whereas, for the women Volleyball players of same age group, it has been observed that VO_2 max is positively and significantly related with serum uric acid level.

Table 5 demonstrated the correlation coefficient of various biochemical and physiological parameters of women Table Tennis and Volleyball players of >18 years age group. It is evident from the Table that height is significantly but negatively related with blood urea level of both Table Tennis and Volleyball players of >18 years age group. Whereas, for the women Volleyball players of same age group, it has been

Table-4: Correlation Coefficient of various biochemical parameter of women Table Tennis players (T) and Volleyball players (V) of 12-14 year age group.

	Hb	Urea	Uric a	Crea
age	T 0.519* V -0.340(NS)	T -0.393(NS) V -0.026(NS)	T -0.399(NS) V 0.195(NS)	T -0.023(NS) V 0.039(NS)
ht	T 0.116(NS) V -0.285 (NS)	T 0.332(NS) V -0.000(NS)	T 0.125(NS) V -0.053(NS)	T -0.059(NS) V 0.340(NS)
wt	T -0.339(NS) V -0.125 (NS)	T -0.323(NS) V -0.159 (NS)	T -0.150(NS) V -0.019(NS)	T -0.035(NS) V -0.091(NS)
fat%	T -0.342(NS) V 0.035 (NS)	T -0.378(NS) V -0.228 (NS)	T -0.049(NS) V -0.077 (NS)	T 0.048(NS) V -0.142(NS)
VO_2	T -0.110(NS) V -0.042(NS)	T 0.154(NS) V -0.179 (NS)	T -0.553* V 0.075 (NS)	T -0.031(NS) V -0.158(NS)

**P<0.01, *P<0.05, NS=Not Singnificant.

Table-5: Correlation Coefficient of various biochemical parameter of women Table Tennis players (T) and Volleyball players (V) of 12-14 year age group.

	Hb	Urea	Uric a	Crea
age	T 0.198(NS) V 0.091(NS)	T 0.120(NS) V -0.416(NS)	T -0.411(NS) V -0.224(NS)	T 0.415(NS) V 0.227(NS)
ht	T 0.388(NS) V 0.025 (NS)	T -0.447* V -0.608*	T -0.294(NS) V -0.235(NS)	T -0.030(NS) V -0.275(NS)
wt	T 0.223(NS) V -0.258 (NS)	T -0.102(NS) V -0.087 (NS)	T 0.146(NS) V 0.027(NS)	T -0.150(NS) V -0.310(NS)
fat%	T -0.071(NS) V 0.312 (NS)	T -0.071(NS) V -0.312 (NS)	T 0.180(NS) V 0.226 (NS)	T -0.163(NS) V 0.099(NS)
VO_2	T -0.473*(NS) V -0.189(NS)	T 0.473*(NS) V -0.189 (NS)	T -0.015(NS) V 0.105 (NS)	T -0.266(NS) V -0.055(NS)

**P<0.01, *P<0.05, NS=Not Singnificant.

observed that VO_2 max is positively and significantly related with serum urea level.

In the present study, the height of the Volleyball girls was more as compared to the Table Tennis girls of all age groups. Recent research on elite male Volleyball players has illustrated the development of the trend towards an increase in height. The obvious advantage of possessing such an impressive height arises from the fact that Volleyball is played over a net at height of 2.43m for men and 2.24 m for women. The higher above the net a player can reach, the more likely he or she is to successfully block or spike past an opponent. The shorter the player, the higher he has to jump in order to play successfully, in this aerial zone. Indeed, if the players were too short he might then not be physically able to reach the necessary heights despite a good vertical jumping ability (Reilly et al., 1990). The present study also revealed that the body weight of female Volleyball players of 12-14 years and >18 years groups were significantly more in comparison to the TableTennis players of the same age groups which might be disadvantageous for them in attaining a good jumping height as they have to lift a greater weight. Elite Volleyball players, in keeping with many other elite athletes, tend to be lean and muscular (Lidor & Ziv, 2010: Portal et al, 2010; Sheppard et al, 2009); In the present study, a significant ($P<0.05$) reduction in percent body fat was noted among the Volleyball players when comparing with the TableTennis players of>18 years age group. The reduction in body fat might be due to the fact that the sportsmen underwent high intensity and volume of training over a period of time, which resulted in lowering of body fat percentage. The possible reason of reduction of body-fat was endurance training which increased greater utilization of fat for energetics (Carbuhn et al, 2010; Malousaris et al, 2008).

Maximal oxygen uptake (VO_2 max) is regarded as the best determinant of aerobic capacity (Lidor & Ziv, 2010; Rankovic et al, 2010). An improvement in VO_2 max improves running economy, increased both the distance covered in a game and the average exercise game intensity after the training. Thus, aerobic capacity certainly plays an important role in Volleyball and has a major influence on technical performance and tactical choices. In the present study, maximum oxygen consumption (VO_2 max) was found to be more although insignificant in Volleyball players in all the ages as compared to their Table Tennis counterpart and also increased linearly with increase in age in both the sports discipline.

Haemoglobin level of the players of both the groups of the present study was found to be less as compared to the normal sedentary level. This has also been observed from the result that no such significant improvement occurred with the increase of age in both the groups. This may be due to the lack of iron in their daily diet. In addition, the biochemical changes which result from strenuous physical exercise leads to increased red blood cell destruction and it is compensated by the increased production of red cells. Therefore, the haemoglobin level is not significantly reduced (Hallberg & Magnusson, 1988).

Iron plays a central role in the production of haemoglobin, the molecule in the red blood cells that tranports oxygen from the lungs to the working cells. It is also an important component of haemoglobin, the molecule that stores oxygen in the muscle. Many biochemieal reactions, including many of those involved in energy metabolism, require iron. Iron consumed in the diet is used to meet current needs or stored as ferritin. Inadequate iron intake in the diet in combination with iron losses from urine, sweat, stool, gastrointestinal bleeding, and haemolysis resulting from intense exercise can deplete iron stores and leave an athlete at risk for iron deficiency. Female athletes are at further increased risk due to blood losses with menstruation. While iron deficiency is not common, depleted iron stores (as measured by low serum ferritin levels) is common, occurring in up to half of female adolescent athletes (Muth,2014). Endurance runners, swimmers, gymnasts. Volleyball players. Basketball players and tennis players of both genders are at highest risk (Muth, 2014).

The present study shows that the hemoglobin level and age are significantly and positively correlated in 12-14 years and 16-18 years age groups in Table Tennis players. This might be due to the higher body mass of the senior players than the juniors. Further, oxidative potentiality of an athlete is dependent on his/her haemoglobin level. In Volleyball players, the haemoglobin level and VO_2 max are significantly and positively correlated in 12-14 years and 14-16 years groups. It can be stated that body mass and VO_2 max increases as the age of the players' increases. Therefore, the increase in VO_2 max ensures higher rate of oxygen supply. Oxygen is transported to muscle primarily by haemoglobin (Hb). and it is suggested that haemoglobin mass and / or concentration is related to VO_2 max. The variable that seems important in a women's capacity for endurance performance is her haemoglobin level. Since each gram of haemoglobin can carry 1.34 ml of oxygen, a lower haemoglobin concentration means that a less oxygen can be carried in the blood. At a [Hb] of 15g 100 ml 1, the arterial blood contains 19 to 20 volumes percent oxygen. At lesser haemoglobin concentrations, the oxygen- carrying capacity of the blood declines. Since the venous blood oxygen content during exercise is approximately the same for both men and women despite differences in [Hb]. the a-VO_2 difference is lower in the individual with the lower oxygen- carrying capacity. A lower a- VO_2 difference would result in a lower VO_2 max (Astrand ft RodahL 1970).

The serum Creatinine level of the present players was found to be within normal level and ahnost similar in both the sports groups. There is no such increase in Creatinine level while increasing in age as well. This may due to no such creatine supplementation or rigorous was applied to them. In sports medicine, creatinine is widely used for evaluating the general health status of athletes, particularly in events where hydroelectrolytic balance is crucial. The reference values commonly used for athletes are those defined for normal, sedentary people. Athletes are usually thought to be physically normal and healthy by definition, but the high training workload and psychophysical stress from competitions may modify their homoeostasis inducing apparently pathological biochemical and haematological values. Therefore, definition of the behaviour of creatinine and its reference ranges in athletes is important to prevent misinterpretation of laboratory data in sportsmen. Furthermore, athletes from different sports disciplines are characterised by different aerobic/anaerobic metabolism, competition season, training, and anthropometric values (Banfi, G. & Del Fabbro, M., 2006).

The serum urea and uric acid level has been considered as an indicator of overtraining. In the present study, levels of serum urea in age groups 12-14 years and 16-18 years age groups and uric acid in age groups 12-14 years and 14-16 age groups have been found to be significantly more in Table Tennis players than Volleyball players. Although, increased level of serum urea and uric acid has been observed in Table Tennis players, the urea and uric acid level is found to be within the normal range. However, there are no significant changes observed in serum urea and uric acid level with the advancement of ages in both groups of players. The increasing serum concentrations of urea indicate the enhanced protein catabolism and stimulated gluconeogenesis probably as a result of the cumulative influence of training (Gleeson, 2002). The positive and significant correlation of urea with body weight and fat% in Table Tennis players of 14-16 years age group suggested that the sites of increased protein catabolism were skeletal muscle and other lean body compartments. However, it was also revealed that height is significantly but negatively related with blood urea level of bothTableTennis and Volleyball players of>18 years age group; but, the reason is still unclear. Therefore, monitoring of exercise stress through different biochemical parameters riring serum urea and uric acid become common practice (Fry et al, 1991). The uric acid is responsible for most of the antioxidant capacity of human plasma because it reacts with free radicals and neutralizes them. It is likely that these values of uric acid offer an important protection for exercise induced oxidative stress and perhaps its accumulation should not be considered harmful, provided that it is within the normal limits. In TableTennis players, the urea level and VO_2 max in 12-I4 years and >18 years age groups and the uric acid and VO_2 max in 16-18 years age group are significantly and positively correlated. This might be due to increased intensity of training and or excessive intake of proteins and reduced excretion of urinary urea and uric acid.

CONCLUSION

In the present study, an attempt was made to indentify biochemical demand of both Indian female Table Tennis and Volleyball players of different age categories. The training and age wise changes were reflected on various parameters like haemoglobin, urea, uric acid, and creatining. Regular monitoring of the biochemical variables of the Table Tennis and Volleyball players is essential to optimize their general health, metabolic and cardiovascular status which has direct relation with their performance. This would enable coaches to assess the current status of an athlete and the degree of training adaptability and to provide an opportunity to modify the training schedule accordingly, to achieve the desired performance. Selected physiological and biochemical variables were considered in the present study; however, with the advancement of science and technology some more varibles may be considered as well as new equipment can be used for assessment of variable.

ACKNOWLEDGEMENTS

The authors express their sincere gratitude to the SAI, Eastern center, Kolkata for providing facilities and expertise. The authors are extremely grateful to the Scheme inmates players who were volunteered for this study.

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