COMPARATIVE STUDIES OF BODY COMPOSITION AND CARDIORESPIRATORY FITNESS OF TRIBAL AND NON-TRIBAL CHILDREN OF 10-16 YEARS AGE GROUP

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Body composition and cardiorespiratory fitness reflect the overall capacity to carry out exercise. The present study was undertaken to investigate the body composition and cardiorespiratory fitness of the tribal and non-tribal children of 10-16 yrs age group, in order to identify sports talent. Three fifty (350) male children between 10-16 yrs volunteered for this study. The children were divided into 2 groups- (a) tribal (n=175) and (b) non-tribal (n=175); and again divided into 7 sub-groups (25 children in each group): (i) 10 yrs, (ii) 11 yrs, (iii) 12 yrs, (iv) 13 yrs, (v) 14 yrs, (vi) 15 yrs, (vii) 16 yrs. The anthropometric and physical fitness variables were measured for each group. ANOVA followed by multiple comparison tests were performed to find out the significant difference among the variables. A higher ($P<0.05$) body mass, waist hip ratio (WHR), mid upper arm circumference (MUAC), body fat and reaction time; and lower ($P<0.05$) VO_{2max}, FVC, FEV1 and PEFR were observed among the non-tribal children when compared to tribal children. No change was reported in height, BMI, BSA, LBM, resting heart rate and HRmax among the tribal and non-tribal children of either age group. It can be suggested that, as the tribal children have significantly better physical fitness than non-tribal children, therefore more emphasis should be given on the tribal children for identification of potentiality and talent in sports.

Sports talent may be identified among the children at their early childhood when they show interest in different sports. Body composition and cardiorespiratory fitness contribute to selection procedures in different sports disciplines Reilly (1990). Besides success in track and field discipline is based on the synthesis of anthropometric characteristics and motor abilities as well as optimal technique Hoare (2000). But overall characteristics are also influenced by genetic inheritance, morphology, personal interest and habitual activity [Hoarc (2000)]. Cardiorespiratory fitness variables such as maximal aerobic capacity (VO_{2max}), heart rate, blood pressure and pulmonary functions reflect the overall capacity of the cardiovascular and respiratory systems and the ability to carry out prolonged exercise Katch *et al* (2011). Hence, Cardiorespiratory fitness has been considered as a direct measure of the physiological status of the individual Katch *et al* (2011), Jonathan *et al* (2009). The gold standard for the measurement of cardiorespiratory fitness is the VO2max. The level of cardiorespiratory fitness is highly associated with the body composition and performance of other health-related fitness parameters such as strength and power output of the athletes Katch *et al* (2011), Jonathan *et al* (2009). To identify athletic potentiality, body composition and cardiorespiratory fitness have an importance because they represent the health and cardiovascular status of the athletes, which relates with the performance level of the athlete Katch *et al* (2011), Jonathan *et al* (2009).

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In India there are about 8.6% ethnic (tribal) sharing approximately 70% of rural population [Census of India (2011)]. Among the ethnic (tribal) races Santal, Lodha, Sabar etc. reside in West Midnapore district of West Bengal Cendus of India (2011), and are mostly below the poverty line. However, the non-tribal people shares urban and rural population. The significant changes that accompany the transition from rural to urban societies have greatly impacted the social and biological transformation. Because of this transformation, non-tribal population is getting more access to education, sport facilities, sanitation and health services, and opportunities for physical activities in comparison to tribal population Tsimeas *et al* (2005). Difference in socio-economic, nutritional and physical activity pattern of the tribal and non-tribal children may have some impact on the body composition and cardiorespiratory fitness. In India, limited studies have been reported on the body composition and cardiorespiratory fitness of the tribal and non-tribal children. In view of the above, a study was undertaken to investigate the body composition and cardiorespiratory fitness of the tribal and non-tribal children of 10-16 years age group in order to identify potentiality and sports talent in them.

METHODS

Subjects & Experimental Design

A total of three hundred and fifty (N= 350) male children between 10-16 years volunteered for this study. The children were selected after proper medical checkups from West Midnapore district, West Bengal, India, and were equally divided into 2 groups- (a) tribal (n= 175) and (b) non-tribal (n= 175). Further, in each group children were again divided into seven subgroups according to age viz. (i) 10 years, (ii) 11 years, (iii) 12 years, (iv) 13 years, (v) 14 years, (vi) 15 years and (vii) 16 years. Twenty five (25) children were selected from each age category. Selected body composition and cardiorespiratory fitness variables were measured for each group. The subjects were informed about the possible complications of the study and gave their consent. Parental consent was also taken from the participants. The institutional review board and ethical board approval was also obtained.

Measurement of body composition Variables

Height and body mass were measured using standard methodology Jonson *et al* (1986). Body mass index (BMI) and Body surface area (BSA) were derived from the height and body mass using standard equations Siri (1956). Measurements of waist and hips circumference of the subject was taken using a steel tape following standard procedure, and the waist- hip ratio (WHR) was determined by standard equation Jonson *et al* (1986). Mid upper arm circumference (MUAC) of the subject was taken by a steel tape using standard procedure Census of India (2011). A skin fold calliper (Mitutoyo, Japan) was used to assess the body fat percentage, from biceps, triceps, sub-scapular and suprailiac skin fold sites. Body density was calculated according to the formulae of Durnin and Womersley Durnin *et al* 1974). Body fat was derived using the standard equation of Siri (1956). Subsequently, lean body mass (LBM) was derived by subtracting fat mass from total body mass using the standard equation Jonson *et al* (1986).

Assessment of Cardiorespiratory fitness:

Subject was asked to take rest for 15 min; and heart rate and blood pressure were recorded. Then the subject was asked to perform a maximum exhaustive running exercise in the field; and the maximal heart rate (HRmax) and recovery heart rates were recorded following the maximal exhaustive exercise. To assessment of lung functions of the subjects forced vital capacity (FVC), forced expiratory volume in 1 sec (FEV1) and peak expiratory flow rate (PEFR) were performed using an electronic spirometer (Micro I, UK) following a standard procedure Mustajbegovic *et al* (2003). Maximal aerobic capacity VO_{2max} was measured indirectly using Queen's College step test following standard procedure (MeArdle *et al* 1972). The subject stepped up and down on a platform of 16.25 in or 41.3 cm for 3 min at a rate of 24 steps per min; a metronome was used to maintain the rhythm. The subject stopped immediately on completion of the test, and the heart beats were counted for 15 sec from 5-20 sec of recovery. Then this 15 sec reading was multiplied by 4 to get the beats per minute (bpm) value. An estimation of VO_{2max} was calculated from the test results, using the following formula. VO2max (ml/kg/min) = 111.33 - 0.42 x heart rate (bpm).

Statistical Analysis

All the values of body composition and cardiorespiratory fitness variables were expressed as mean and standard deviation (SD). To find out the inter group and intra group difference in selected body composition and cardiorespiratory fitness variables analysis of Variance (ANOVA) followed by multiple comparison tests was performed. In each case the significant level was chosen at 0.05 levels. Accordingly, a statistical software package (SPSS) was used.

Table 1
Height, body mass, BMI and BSA of Tribal and Non-Tribal children of 10-16 years Age Groups

Age Group (yr)	Height (cm)		Body mass (kg)		BMI (kg m^{-2})		BSA (m^{-2})	
	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal
10	134.4 ±4.1	133.2 ^{NS} ± 4.2	29.9 ±2.7	30.8 ^{NS} ±2.9	16.4 ±1.1	17.3 ^{NS} ±1.8	1.1 ±0.1	1.1 ^{NS} ±0.1
11	136.8 ±4.8	137.1 ^{NS} ± 4.5	33.0 ±2.9	34.6 ^{NS} ±3.5	17.5 ±1.7	18.5 ^{NS} ±1.1	1.1 ±0.2	1.2 ^{NS} ±0.2
12	147.6 ± 4.7	145.1 ^{NS} ± 4.7	36.6 ±3.1	39.1 * ±3.3	16.2 ±1.5	16.7 ^{NS} ±1.5	1.3 ±0.1	1.3 ^{NS} ±0.2
13	153.9 ±4.5	154.5 ^{NS} ± 4.1	42.4 ±2.5	46.2 * ±3.1	17.9 ±1.9	19.5 ^{NS} ±1.9	1.4 ±0.2	1.4 ^{NS} ±0.1
14	158.5 ± 4.7	157.6 ^{NS} ± 4.8	45.2 ±3.1	48.2 * ±3.3	18.2 ±1.5	19.6 ^{NS} ±1.7	1.4 ±0.1	1.5 ^{NS} ±0.1
15	161.5 ± 4.3	160.7 ^{NS} ± 4.3	46.3 ±3.0	49.1 * ±3.2	18.3 ±1.9	19.3 ^{NS} ±1.6	1.5 ±0.1	1.5 ^{NS} ±0.1
16	164.0 ±4.0	163.8 ^{NS} ± 4.8	47.7 ±2.9	50.8 * ±2.8	17.8 ±1.1	19.1 ^{NS} ±1.1	1.5 ±0.1	1.5 ^{NS} ±0.1

All the values were expressed as mean and standard deviation (SD), N=25; P<0.05; * when compare to Tribal children, NS= not significant; BMI= body mass index, BSA= body surface area.

Table 2
Body fat, WHR and MUAC of Tribal and Non-Tribal children of 10-16 years Age Groups

Age Group (yr)	Body fat (%)		LBM (kg)		WHR		MUAC (cm)	
	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal
10	18.7 ±3.1	21.3* ±3.1	24.2 ±3.4	24.3^{NS} ±2.6	0.9 ±0.1	1.1* ±0.1	18.7 ±1.4	18.4^{NS} ±1.8
11	16.6 ±3.3	20.9* ±2.6	27.6 ±3.3	27.3^{NS} ±2.4	0.8 ±0.2	0.9* ±0.1	20.0^{a} ±1.1	18.9* ±1.3
12	15.9 ±3.1	19.3* ±2.0	30.8 ±2.4	31.6^{NS} ±2.8	0.8 ±0.1	0.9* ±0.1	20.7 ±1.8	19.4* ±1.5
13	15.7 ±2.7	19.1* ±2.8	35.8 ±3.4	37.2^{NS} ±3.0	0.8 ±0.1	0.9* ±0.1	21.1 ±1.1	19.6* ±1.6
14	14.5 ±2.6	18.8* ±2.2	38.6 ±3.1	39.2^{NS} ±2.9	0.8 ±0.1	0.9* ±0.1	21.7 ±1.0	19.7* ±1.9
15	14.2 ±2.3	18.4* ±2.3	39.7 ±3.3	40.5^{NS} ±2.5	0.8 ±0.1	0.9* ±0.1	22.0 ±1.3	19.9* ±1.3
16	13.9 ±3.2	18.2* ±1.9	41.1 ±3.2	41.6^{NS} ±3.1	0.8 ±0.03	0.9* ±0.1	22.1 ±1.7	20.8* ±1.5

All the values were expressed as mean and standard deviation (SD), N=25; P<0.05; * when compare to Tribal children, NS= not significant; LBM= lean body mass, MUAC= mid upper arm circumference, WHR= waist- hip ratio.

RESULTS

Body composition Variables of tribal and non-tribal children:

A significantly higher (P<0.05) body mass, waist hip ratio (WHR) and percent body fat were observed among the non-tribal children when compared to tribal children of some age groups. However, significantly lower (P<0.05) mid upper arm circumference (MUAC) was observed among the non-tribal children when compared to tribal children of some age

Cardiorespiratory fitness Variables of tribal and non-tribal children:

Table 3
Heart rate response to rest, exercise and recovery of Tribal and Non-Tribal children of 10-16 years Age Groups

Age Group (yr)	RHR		HR max		Rec HR1		Rec HR2		Rec HR3	
	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal
10	65.4 ±4.4	67.5^{NS} ±4.9	194.0 ±7.5	196.4^{NS} ±9.3	156.0 ±6.9	164.3* ±5.7	131.0 ±5.3	135.6* ±5.2	108.4 ±6.6	119.5* ±6.6
11	63.2 ±4.0	63.7^{NS} ±4.3	189.9 ±6.3	191.2^{NS} ±8.3	148.9 ±6.1	158.9* ±5.2	125.1 ±6.7	133.1* ±5.9	107.4 ±5.6	116.3* ±5.6
12	63.3 ±4.5	65.2^{NS} ±4.1	189.2 ±7.9	190.1^{NS} ±8.6	144.7 ±6.6	153.6* ±4.7	123.8 ±5.6	132.6* ±5.9	105.2 ±5.4	115.2* ±6.2
13	63.2 ±5.5	65.2^{NS} ±3.6	188.2 ±8.1	191.3^{NS} ±8.7	142.6 ±7.9	151.8* ±7.9	122.7 ±5.1	130.1* ±6.9	104.1 ±7.5	114.8* ±5.1
14	62.9 ±6.4	65.6^{NS} ±5.5	188.7 ±8.8	189.3^{NS} ±9.4	141.3 ±7.4	150.2* ±5.5	121.9 ±6.7	128.0* ±6.2	104.2 ±7.6	112.7* ±4.6
15	62.1 ±6.1	65.1^{NS} ±5.8	186.5 ±9.2	189.5^{NS} ±7.7	140.8 ±8.6	148.4* ±6.8	122.6 ±5.2	127.1* ±5.8	105.9 ±6.1	111.4* ±5.9
16	61.8 ±5.7	64.0^{NS} ±4.4	185.6 ±9.0	189.5^{NS} ±8.2	140.3 ±8.0	147.9* ±7.4	123.2 ±6.8	126.2* ±6.1	104.2 ±5.1	110.0* ±6.4

All the values were expressed as mean and standard deviation (SD), N=25; P<0.05; * when compare to Tribal children, NS= not significant; RHR= resting heart rate, HRmax= maximal heart rate, RecHR1= recovery heart rate in 1st min, RecHR2= recovery heart rate in 2nd min, RecHR3= recovery heart rate in 3rd min.

Table 4
Blood pressure and VO_{2max} of Tribal and Non-Tribal children of 10-16 years Age Groups

Age Group (yr)	Rest SBP (mmHg)		Rest DBP (mmHg)		$V_{O2\,max}$ (ml/kg/min)	
	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal
10	89.8 ±1.8	90.0^{NS} ±1.5	58.1 ±2.7	60.2^{NS} ±4.0	39.5 ±4.5	36.2* ±3.9
11	93.6 ±3.9	97.5* ±3.9	59.6 ±5.2	62.4^{NS} ±3.1	41.6 ±3.9	37.8* ±4.6
12	99.6 ±1.8	103.0* ±4.47	62.8 ±5.4	67.4* ±6.3	42.7 ±2.8	38.5* ±2.4
13	98.7 ±4.9	104.4* ±4.22	61.0 ±4.8	63.3^{NS} ±5.1	43.9 ±3.5	39.7* ±3.4
14	102.9 ±6.9	107.0* ±4.1	66.0 ±3.2	67.8^{NS} ±5.9	45.9 ±3.6	39.9* ±4.3
15	100.7 ±5.1	107.6* ±5.61	68.5 ±4.9	71.3^{NS} ±6.3	46.1 ±4.4	40.9* ±4.77
16	104.1 ±4.8	109.3* ±2.2	66.4 ±3.2	71.1* ±3.7	46.3 ±4.1	41.2* ±3.5

All the values were expressed as mean and standard deviation (SD), N=25; $P<0.05$; *when compare to Tribal children, NS= not significant; RSBP= resting systolic blood pressure, RDBP= resting diastolic blood pressure, VO_{2max} = maximal aerobic capacity.

groups. But, no significant difference was reported in height, body mass index (BMI), body surface area (BSA) and lean body mass (LBM) among the tribal and non-tribal children of either age group.

A significantly ($P<0.05$) higher recovery heart rates (RecHR1, RecHR2 RecHR3) and blood pressure (systolic and diastolic blood pressure) were observed among the Non-Tribal children when compared to Tribal children of some age groups. On the other hand, signifi-

Table 5
Lung functions of Tribal and Non-Tribal children of 10-16 years Age Groups

Age Group (yr)	FVC (l)		FEV1 (l)		PEFR (l)	
	Tribal	Non-Tribal	Tribal	Non-Tribal	Tribal	Non-Tribal
10	1.7 ±0.2	1.6* ±0.1	1.6 ±0.1	1.4* ±0.1	192.5 ±20.8	178.6* ±21.4
11	2.1 ±0.2	1.9* ±0.2	1.8 ±0.1	1.7* ±0.1	208.0 ±26.2	188.0** ±17.8
12	2.2 ±0.2	2.1* ±0.1	1.9 ±0.1	1.8* ±0.1	259.8 ±21.0	223.0* ±19.1
13	2.2 ±0.2	2.1* ±0.1	1.9 ±0.1	1.9* ±0.1	279.8 ±27.5	248.8* ±21.9
14	2.4 ±0.2	2.1* ±0.1	2.1 ±0.1	1.9* ±0.1	318.4 ±27.2	261.6* ±23.1
15	2.6 ±0.1	2.3* ±0.1	2.4 ±0.1	2.1* ±0.1	335.8 ±26.9	298.7* ±19.2
16	2.9 ±0.1	2.5* ±0.2	2.6 ±0.1	2.2* ±0.1	362.4 ±24.3	304.0* ±22.9

All the values were expressed as mean and standard deviation (SD), N=25; $P<0.05$; * when compare to Tribal children, NS= not significant; FVC=forced vital capacity, FEV1=forced expiratory volume in 1 second, PEFR=peak expiratory flow rate.

cantly ($P<0.05$) lower maximal aerobic capacity (VO_{2max}), forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1) and peak expiratory flow rate (PEFR) were noted among the Non-Tribal children when compared to Tribal children of some age groups. However, no significant change was reported in resting heart rate, maximum heart rate among the Tribal and Non-Tribal children of either age group.

DISCUSSION

Childhood and adolescence are crucial periods of life, since dramatic physiological and psychological changes take place at these ages. During childhood and adolescence, body size and composition change markedly, which are strongly associated with the development of various physical performance characteristics. Body size plays important role during selection of players Johnson *et al* (2009), Silvestre *et al* (2006). The tall players get an advantage during recruitment in athletics, soccer, volleyball and other games. Body mass is a considerable factor in games and sports, since body contact is essential in sports like soccer, field hockey and some other games Tahara *et al* (2006). Body mass index (BMI) has been used as a simple anthropometric index which reflects the current nutritional status of an individual, and that of body surface area (BSA) can be made of an individual's daily resting energy expenditure Wilmore *et al* (2005). The percentage of body fat plays an important role for the assessment of physical fitness of the players Tahara *et al* (2006), Wilmore *et al* (2005). Generally, the amount of fat in an adult male in his mid-twenties is about 16.5% of body weight Wilmore *et al* (2005), Åstrand *et al* (1986). A lean body is desirable for all sports discipline Ekelund *et al* (2001);. A low-body fat may improve athletic performance by improving the strength-to-weight ratio Wilmore *et al* (2005), Åstrand *et al* (1986). Excess body fat adds to the load without contributing to the body's force-producing capacity Wilmore *et al* (2005), Astrand *et al* (1986). The waist to hip ratio (WHR) has been shown to be related to the risk of coronary heart disease Ekelund *et al* (2001); Bassareo, *et al* (2013) Dobbelsteyn *et al* 2001). Further, mid-upper arm circumference (MUAC) is a measure of nutritional status Åstrand *et al* (1986). In the present study, a significantly higher ($P<0.05$) body mass, waist hip ratio (WHR) and percent body fat were observed among the non-tribal children when compared to tribal children of some age groups. However, significantly lower ($P<0.05$) mid upper arm circumference (MUAC) was observed among the non-tribal children when compared to tribal children of some age groups. But, no significant change was reported in height, body mass index (BMI), body surface area (BSA) and lean body mass (LBM) among the tribal and non-tribal children of either age group. The possible reason for the increase in body mass, waist hip ratio (WHR), and percent body fat; and decrease in mid upper arm circumference (MUAC) of the non-tribal children might be due to less exposure to physical activity and or sports when compared to tribal children. On the other hand, a significantly higher ($P<0.05$) height, body mass, BMI, BSA, LBM and MUAC were noted with the advancement of age in both tribal and non-tribal children. However, significantly lower ($P<0.05$) body fat percent and WHR were observed with the advancement of age in both tribal and non-tribal children. The possible reason for the increase in height of the tribal and non-tribal children might be due to the osteotropic response to exercise. The osteotropic effect of exercise is dependent on load dynamics, the volume, intensity and duration of training, administered on the individual and the period in life when exposure occurs Wilmore *et al* (2005), Astrand *et al* (1986). The gain in height is dependent on growth hormone and exercise is a potent stimulus for growth hormone Wilmore *et al* (2005), Åstrand *et al* (1986). It has been reported that genetic influence can alter morphological status only within a narrow limit, set by his genotype Wilmore *et al* (2005), Astrand *et al* (1986)., Yalein *et al* (2005). Increment in body mass (weight) in each age category might be due to the increment in bone and muscle weight. The gain in body mass (weight) is dependent on growth hormone and exercise is a potent stimulus for growth hormone [Wilmore *et al* (2005), Åstrand *et al* (1986)]. It is possible that a particular body size will encourage acquisition of certain skills and force gravitation towards a specific playing position: this is likely to occur before maturity so that the individual will tend to favour one positional role before playing at senior level Wilmore *et al* (2005), Astrand *et al* (1986). The changes in MUAC and WHR might be because of level of maturation factors and/or motivation, and exposure to long term and higher intensity of training with the advancement of age of the children of both tribal and non-tribal group. Similar findings were also noted by other research groups who reported significant change in these parameters with the advancement of age, level of maturation and exposure to high intensity of exercise for long time among the children Fukunaga *et al* (2013); Ujevic *et al* (2013). The lower body fat values were noted with the advancement of age of the children of both tribal and non-tribal group. This might be because of exposure to long term and higher intensity of aerobic endurance training among the children with the advancement of age. This was supported by the evidence of significant increase in LBM with the advancement of age of the children of both tribal and non-tribal group. This might be again due to long term effect of exercise which reduced body fat and increased LBM among the children Silvestre *et al* (2006); Bassareo *et al* (2013). The observations of our study are supported by several studies, where decrease in body fat was noted with the advancement of age of the players [Silvestre *et al* (2006); Bassareo *et al* (2013)].

Heart rate and blood pressure are essential for assessing cardiovascular fitness of the athletes. Heart rate increases with an increase in work intensity and shows a linear relationship with work rate Ekelund *et al* (2001). Quick recovery from strenuous exercise is important in sports which involve intermittent efforts interspersed with short rests Katch *et al* (2011); Wilmore *et al* (2005); Rampirini *et al* (207). The heart rate recovery curve is an excellent tool for tracking a person's progress during a training program Katch *et al* (2011); Wilmore *et al* (2005);. The highest rate at which the heart can beat is the maximal heart rate (HRmax). A significantly ($P<0.05$) lower maximal heart rate (HRmax) and recovery heart rates were noted in Postpubertal children when compared to Prepubertal and Pubertal children. However, no significant change was reported in resting heart rate among the groups. On the other hand, a significantly ($P<0.05$) higher resting systolic and diastolic blood pressure were observed in Postpubertal children when compared to Prepubertal and Pubertal children. It has been reported that exercise cardio acceleration results from release of parasympathetic inhibition at low exercise intensities, and from both parasympathetic inhibition and sympathetic activation at moderate intensities Katch *et al* (2011); Wilmore *et al* (2005);. Nevertheless, parasympathetic activation is considered to be the main mechanism underlying exponential cardio deceleration after exercise Katch *et al* (2011); Wilmore *et al* (2005); The results of the present study suggested that the strain on the circulatory system during sports activities is relatively high. Exercising at this intensity should provide a good training stimulus. Therefore, heart rate and blood pressure monitoring is essential for selection of athletes and during the training seasons.

The maximal aerobic capacity VO_{2max} is the best overall measure of aerobic power (Coelho E-Silva *et al* (2013); Popadic Gacesa *et al* (2009). Aerobic capacity certainly plays an important role in athletics activities and has a major influence on technical performance and tactical choices Katch *et al* (2011); Wilmore *et al* (2005); Reilly (2005). A significantly ($P<0.05$) higher VO_{2max} was observed in Postpubertal children when compared to Prepubertal and Pubertal children. The higher VO_{2max} value in the postpubertal children might be because of exposure to long term and higher intensity of aerobic endurance training compared with Prepubertal and Pubertal children. Increase in VO_{2max} might be due to an increase in the systemic a-v O2 difference and stroke volume Katch *et al* (2011); Wolmore *et al* (2005). Moreover, these changes might be due to increased volume of endurance training [Katch *et al* (2011); Wolmore *et al* (2005)]. The aerobic endurance training enhances the activity of the cardiovascular system as well as developed oxidative capacity of the skeletal muscles which leads to an increase in the delivery of oxygen to working muscles Katch *et al* (2011); Wilmore *et al* (2005). This is accepted as the main reason for elevation of VO_{2max} [Katch *et al* (2011); Wilmore *et al* (2005)]. Similar observation has been reported previously [Reilley (2005); Hoff (2005); miller *et al* (2007)]. The extent by which VO_{2max} could be changed depends on initial fitness levels of the athletes, aerobic training and genetic factor Katch *et al* (2011); Wolmore *et al* (2005). Lung function tests are of little value for predicting fitness and exercise performance, provided that the values fall within a normal range. Peak expiratory flow rate (PEFR) is used as an indicator of asthma or similar lung disease [Katch *et al* (2011); Wilmore *et al* (2005)]. In the present study, a significantly ($P<0.05$) higher peak expiratory flow rate (PEFR) was observed in Postpubertal children when compared to Prepubertal and Pubertal children. The higher peak expiratory flow rate (PEFR) of the postpubertal children might be because of exposure to long term and higher intensity of aerobic endurance training when compared with Prepubertal and Pubertal children. Moreover, this might be because of level of maturation factors and / or motivation of the Postpubertal children when compared with Prepubertal and Pubertal children.

CONCLUSION

Identification of children at early stage of their growth and development may produce elite athletes in the future. Talent identification also can be used as a counseling technique that helps to discover and explore areas of talent for particular athletes. In order to reach their goals, young children should be subjected to a series of tests reflecting their body composition and cardiorespiratory fitness variables which will indicate the present over all strengths and weaknesses. Improvement in these parameters depends on level of maturation factors and / or motivation, and exposure to long term and higher intensity of training. It has been seen that tribal children have significantly better body composition and cardio-respiratory fitness profiles than non-tribal children. It can be suggested that more emphasis should be given on the tribal children for identification of potentiality and talent in sports.

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