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MITIGATION OF HIDDEN CARDIOVASCULAR RISK FACTORS AMONGST PRE-ADOLESCENT MALE ATHLETES OF KOLKATA, WEST BENGAL: A NOVEL COMBINATION OF YOGA & NUTRACEUTICALS

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ABSTRACT

Background: The importance of developing good conditioning programs based on the specific physiological demands of each sport is considered a key factor to success. ***Objectives:*** To identify hidden health problems amongst male athletes who are involved in volleyball and basketball; to identify the primary physical shortfalls with respect to young volleyball and basketball players and to ratify and recommend the newly emerged training protocols which include specific Yoga exercises, for better performance of athletes. ***Material& Methods:*** This interventional study was conducted amongst 96 male athletes of volleyball and basketball players & control subjects (51 athletes & 45 control group). All general physical parameters, physiological and cardio-respiratory parameters were performed between athletes and non athletes groups by standardised procedure. 17 athletes with unnatural values of serum $Lp_{(a)}$ and Echo-cardiography, were undergoing intensive modified yoga training program and some nutraceuticals supplementation. ***Result:*** Selected athletes showed primarily high blood pressure, heart rate, blood oxygen level, lipoprotein $_{(a)}$ level, ejection fraction percentage and slope and lower hemoglobin level. After supplementation and yoga training program, all the mentioned parameter showed natural values than pre intervention. ***Conclusion:*** All athletes belonged to medium-low socioeconomic status. Improper food habits hampered their physiological homeostasis as well as agility. Use of nutraceuticals and proper modified yoga training procedure improved the physiological and cardio-respiratory parameters of the athletes.

KEYWORDS: Athletes, Lipoprotein $_{(a)}$, nutraceuticals, yoga, training.

INTRODUCTION

An athlete is a person who is good at a sport that involves physical strength, speed or endurance. India with a population about 130 crores people is known as a sports crazy nation. The importance of developing good conditioning programs based on the specific physiological demands of each sport is considered a key factor to success and improvements to this activity pattern has further been defined as power endurance.[1]

Basketball and volley ball like games require tremendous endurance, speed, agility, and power. Anaerobic fitness represents a characteristic of a muscle that exists due to sufficient blood and oxygen supply to that muscle. It is the ability of muscle to generate significant amounts of power and is considered to be a strong predictor of athletic success.[2]

Volleyball has been described as an 'interval' sport with both anaerobic and aerobic components. At the higher skill levels, technical performance may be limited by physical characteristics as well as physical fitness, and performance characteristics such as speed and vertical jump test.

Preadolescent basketball player

Physical fitness is essential for the development of a basketball player. Initially the purpose of testing is to gather baseline data on fitness components such as speed, power, endurance and strength. This will help determine the athlete's strengths and weaknesses relative to the demands of basketball and assist in identifying what training and activities are required to improve their game.

The main focus of the training process is improving performance. Training refers to the teaching activities whereby the athletes acquire and apply the knowledge and skills of doing a particular in a better and effective manner. Training programs are designed for specific objectives i.e. improvement in knowledge aptitude and overall personality development. The results of any training program depend upon its effectiveness of training objectives. Effective training should contribute to growth and development of athletes' competency and motivation, physical strength, speed or endurance. If training program has to be effective it has to be well planned, evaluated, monitored and used.[3]

Not only training procedure, a well designed diet also meets the energy and nutrient intake needs and incorporates the proper timing of meals, improve performance can be developed. Nevertheless, there is the common belief that, in conjunction with well designed training, the appropriate ingestion of some dietary supplements can enhance team-sport performance.

The basic need of an athlete in the competitive world is the ability to rapidly switch between different movements. To enhance such movement qualities in any type of games, high levels of power, strength, endurance, flexibility and agility are required to achieve the goal. Undoubtedly, such components are inter-dependent and as such may be developed through common training regimen with proper dietary habits.[4]

Objectives

Under these circumstances the study aims to fulfil the following purposes

- To identify different health problems amongst male athletes who are involved in volleyball and basketball game.
- Identification of the primary physical shortfalls with respect to young volleyball players and basketball players in Bengal.
- Ratification and recommendation of the newly emerged Training Protocols which include specific Yoga exercises, for better performance of athletes from West Bengal.

MATERIAL AND METHODS

Sample for the study

The Present study was carried out on the budding volleyball and basketball players. The sample comprised of 51 athletes and 45 non athletes (n= 96). 96 subjects were divided into two groups, 51 subjects were randomly assigned for athlete group, who are involved with volleyball and basketball games for 5 years uninterruptedly, whereas in non athlete group, 45 samples, who are not involved in such regular playing games, were taken into account.

The subjects belonged to same socio-economic status. Ethical clearance was procured from Institutional Ethics Committee (IEC-H) from Hooghly Mohsin College, Govt of West Bengal.

Delimitation

- All subjects were taken from emerging basketball players and volleyball players.
- These players will be considered as representative samples of Bengal athletes, in general.
- Number of subjects: 26 basketball players & 25 volleyball players.

The following parameters were assessed.

Table no-1: Assessment of different Dynamic Anthropometric and Physiological parameters.

Serial no	Parameters assessed	Testing method
1.	Age	Questionnaire method
2.	Height	Anthropometric rod
3.	Weight	Weighing machine
4.	Body Mass Index (BMI)	Calculated by the formula(height/weight^2)
5.	Ponderal Index (PI)	Calculated by the formula(height/weight^3)
6.	Waist & Hip circumference	Tape
7.	Blood pressure	Sphygmomanometer
8.	Heart rate	Stop Watch

Table no 2: Assessment of Specific Cardio-respiratory parameters.

Serial no	Parameters assessed	Testing method
1.	SPO_2	Pulse oximeter
2.	Serum lipoprotein$_{(a)}$	ELISA
3.	Blood Haemoglobin	Haemoglobin meter
4.	Ejection Fraction %	Echocardiography
5.	Ejection Fraction Slope	Echocardiography

Table no 3: Assessment of different agility testing parameters.

Serial no	Parameters assessed	Testing method
1.	Moving ability	Quadrant Jump Test
2.	Standing ability	Stark balance Test
3.	Measuring lower limb explosive power	Vertical jump Test

Data collection procedure
Data were collected at two time periods.

Period 1: Structured schedule cum measurement technique was adopted to elicit the information about physical anthropometric parameters and blood samples were collected in presence of physician of athletes (players of basketball and volleyball) and non athletes groups.

17 athletes with unnatural values of serum $Lp_{(a)}$ and Echo-cardiography were given some nutraceuticals supplementation and all 51 athletes underwent intensive modified yoga training program. Specific yoga training protocol had been developed, to improve aerobic fitness as well as anaerobic fitness and agility.

Intensive yoga training program includes
a. Extensive jumping ability skill development
b. Extensive running at low speed about 30 to 35 minutes.
c. Specific yoga training includes five (5) specific poses namely **Pigeon** (Eka-Pada-Rajakapotasana/ Kapotasana): this pose is perfect for tight hips because it stretches the hip rotators (the buttocks area) and the hip flexors **(**long muscles of thighs and pelvis).

Plank (Kumbhakasana): It tones all of the core muscles of the body, including the abdomen, chest, and low back. It strengthens the arms, wrists, and shoulders, and is often used to prepare the body for more challenging arm balances and also strengthens the muscles surrounding the spine.

Warrior II (Virabhadrasana 2): It strengthens the legs, opens the hips and chest. Warrior II develops concentration, balance and groundedness. This pose improves circulation and respiration and energizes the entire body.

Standing Forward Bend (Uttanasana): It stretches the hips, hamstrings, and calves, strengthens the thighs and knees, keeps spine strong and flexible, Reduces stress and fatigue, relieves tension in the spine, neck, and back and activates the abdominal muscles.

Extended Side Angle Pose (Parsvakonasana): It relieves stiffness in the shoulders and back. It provides a deep stretch to the groins and hamstrings, and it also improves stamina. This pose strengthens the legs, knees, and ankles, while also stretching and toning the abdominal muscles.

All the yoga poses were advised to practise 3 bouts each & total duration of each within 20 minutes per day, for all 51 athletes.

Supplementation made as per Medical Personnel
a) Beplex Forte Elixir tablets- 1 tablet every day
b) ASA 50 Tablets- ½ tablet every day, as recommended by physician.

Beplex Forte Elixir contains D-Panthenol, L-Lysine, Niacinamide, Nicotinic Acid, Vitamin B1, Vitamin B12, Vitamin B2, Vitamin B6 and Vitamin C as active ingredients.

ASA 50 contains aspirin 50 mg.
Selected 17 athletes were asked to take these particular supplementations as recommended by physician.

Period 2: After six weeks specific parameters were reassessed.

Statistical Analyses
Statistical analyses were done by Minitab 16 software. Quantitative variables were expressed as mean±SD. Paired t tests were performed to evaluate the overall cumulative effects when treatment effects were significant. P-values<0.05 were considered to be significant.

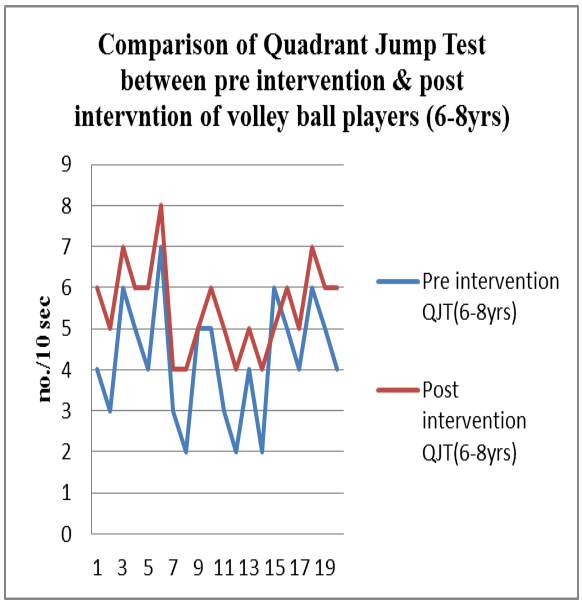
RESULTS
The modules of supplemental regimen with modified yoga training were continued for 6 weeks from Jan 2018. Our research team volunteered this intervention properly. Blood samples were collected before and after supplementation to measure serum lipoprotein $_{(a)}$ level specifically. Student's t-test indicated there is a positive factor that might be affecting serum $lipoprotein_{(a)}$ level. Modified specific yoga training also showed improvement of moving, standing and lower limb explosive power of volleyball and basketball player in both age groups. Since the athletes and non athletes group of players belonged to same socioeconomic group, so they do not have any significant difference between anthropometric parameters like height, weight, Body Mass Index (BMI), Ponderal Index (PI) and Waist/Hip Ratio (W/H Ratio). Some physiological and cardio-respiratory parameters are tabulated in table no 4.

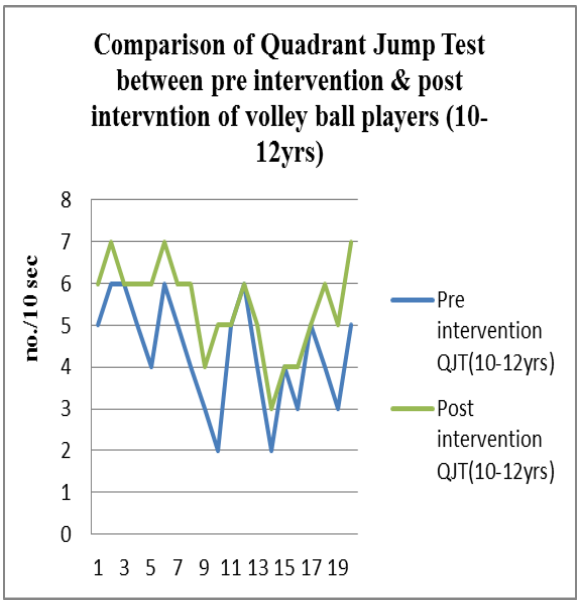
Table no 4: Demographic representation of physiological and cardio-respiratory parameters. (N=96).

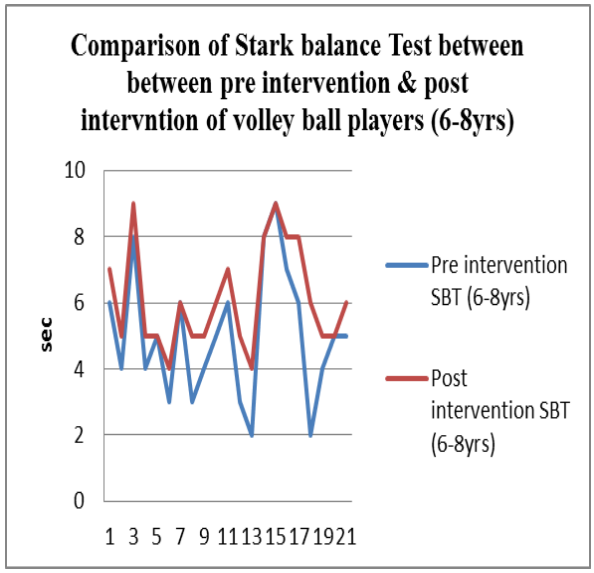
Variables	*Athletes(n=51)*	*Non Athletes(n=45)*
	Mean ± SD	*Mean ± SD*
Systolic blood pressure (mmHg)	100.6±4.2	110±1.1
Diastolic blood pressure (mmHg)	69.3±7.2	82.2±6.5
Heart rate (beats/min)	72.1±2.5	81.6±4.7
SPO_2 (%)	95.6±1.6	97.1±1.7
Serum $Lipoprotein_{(a)}$ (mg/dl)	30.5±6.2	19.7±2.4
Blood hemoglobin (gm/dl)	11.64±0.6	13.44±1.4
Ejection Fraction (%)	72±1.7	65±2.1
Ejection Fraction Slope (mm)	102±3.1	74±1.9

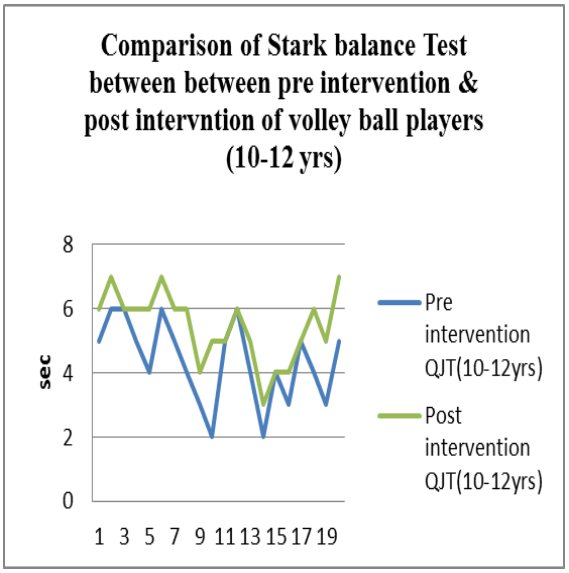
Level of significance: p<0.05

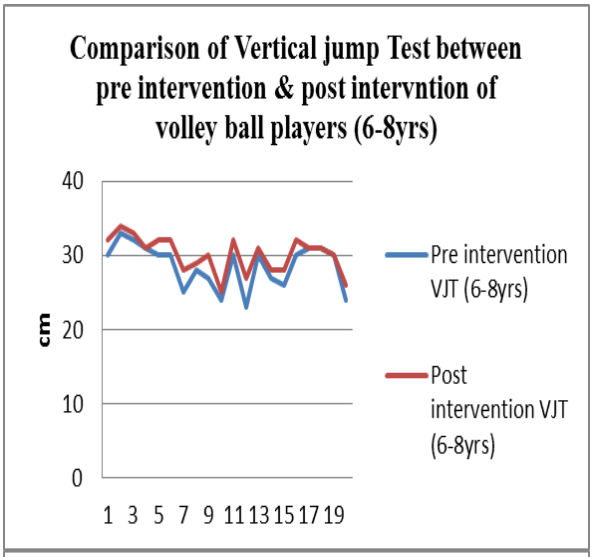
All line diagrams depict agility improvement of all 51 athletes who were involved in specific yoga training for 6 weeks duration. Amongst 51 athletes, 26 athletes were from basketball and 25 were from volleyball. Again they were categorized into two groups: 6-8 years and 10-12 years.










Comparison of Vertical jump Test between pre intervention & post intervntion of volley ball players (6-8yrs)
cm
40
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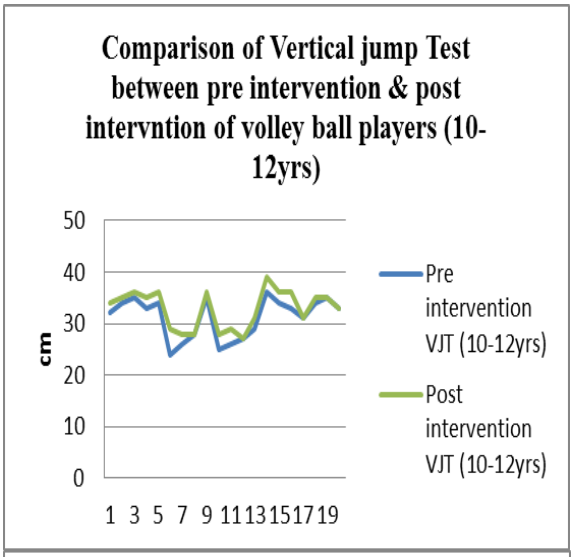
Pre intervention VJT (6-8yrs)
Post intervention VJT (6-8yrs)


Comparison of Vertical jump Test between pre intervention & post intervntion of volley ball players (10-12yrs)
cm
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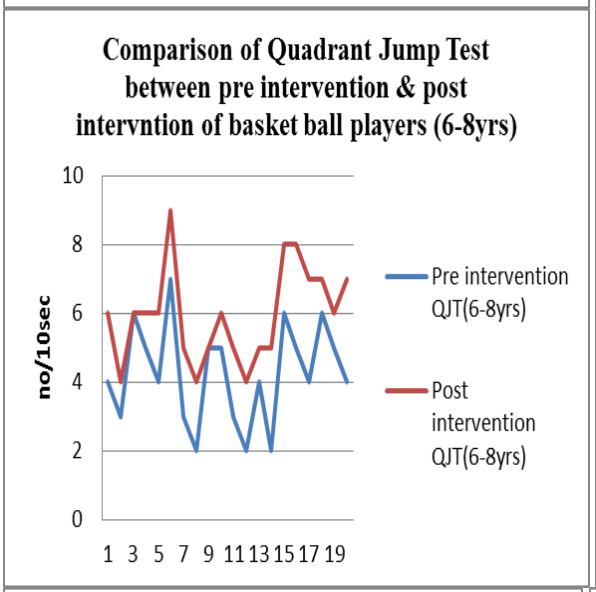
Pre intervention VJT (10-12yrs)
Post intervention VJT (10-12yrs)


Comparison of Quadrant Jump Test between pre intervention & post intervntion of basket ball players (6-8yrs)
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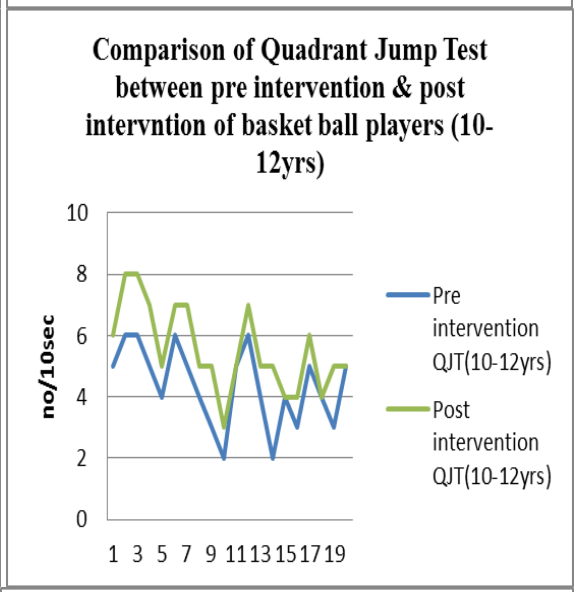
Pre intervention QJT(6-8yrs)
Post intervention QJT(6-8yrs)


Comparison of Quadrant Jump Test between pre intervention & post intervntion of basket ball players (10-12yrs)
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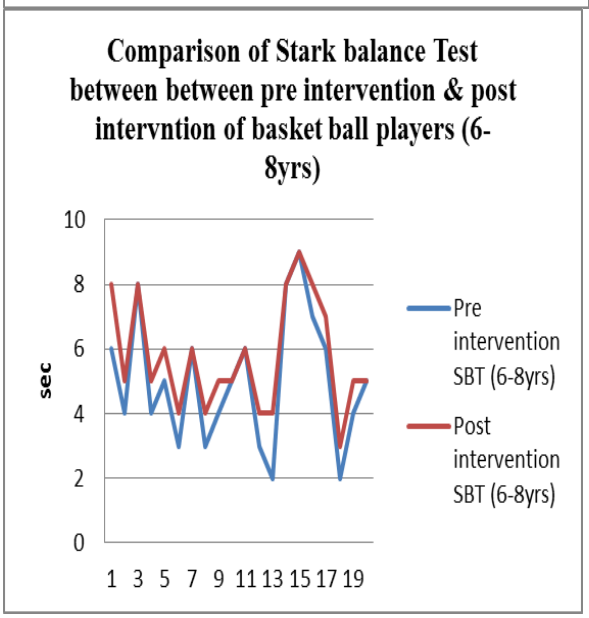
Post intervention QJT(10-12yrs)


Comparison of Stark balance Test between between pre intervention & post intervntion of basket ball players (6-8yrs)
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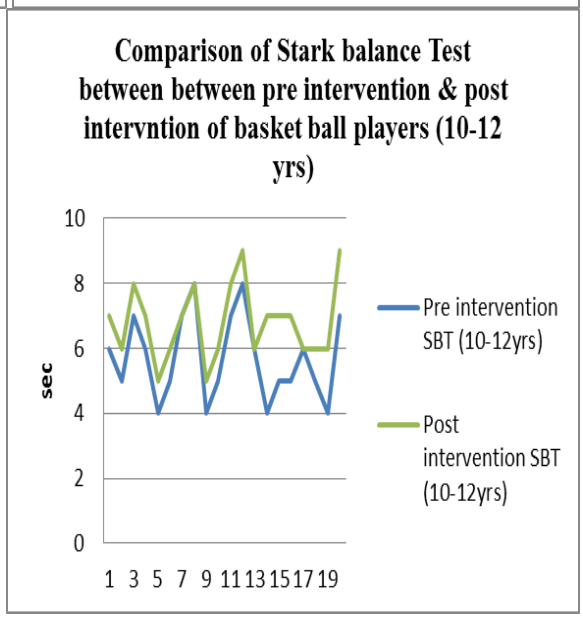
1 3 5 7 9 11 13 15 17 19
Pre intervention SBT (6-8yrs)
Post intervention SBT (6-8yrs)


Comparison of Stark balance Test between between pre intervention & post intervntion of basket ball players (10-12 yrs)
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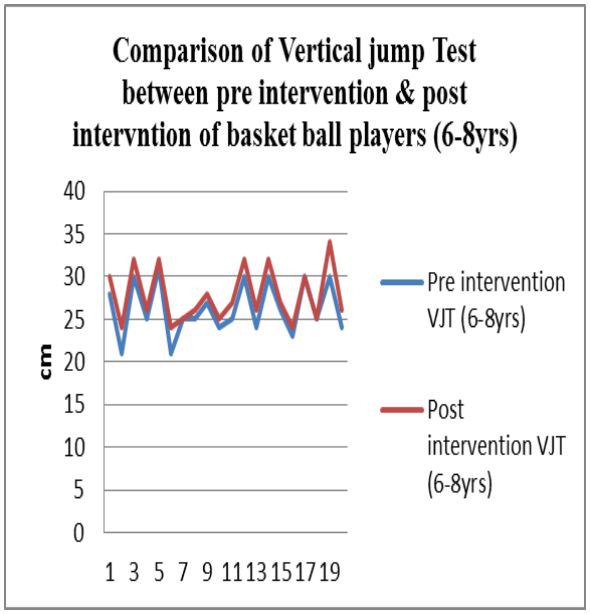
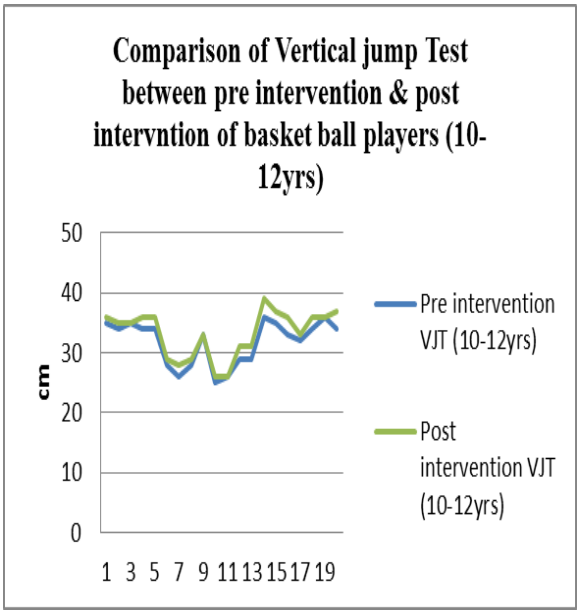
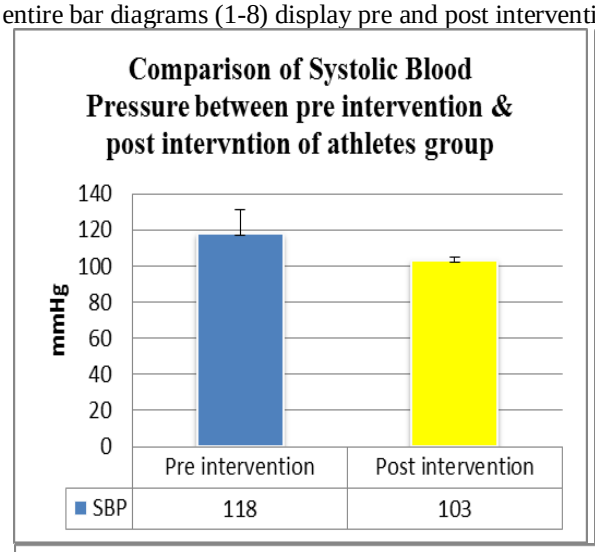
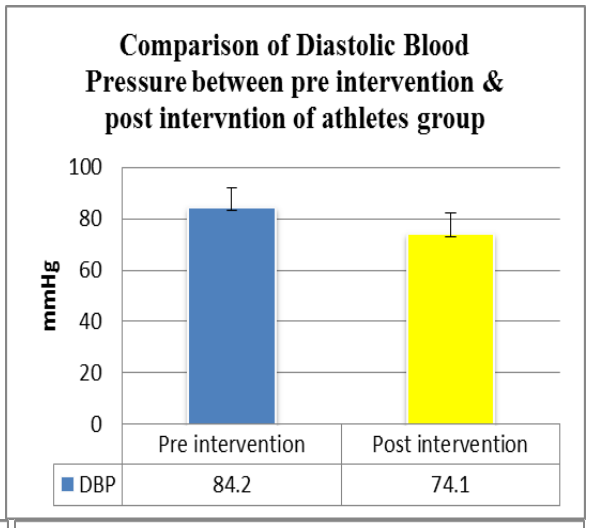
Pre intervention SBT (10-12yrs)
Post intervention SBT (10-12yrs)

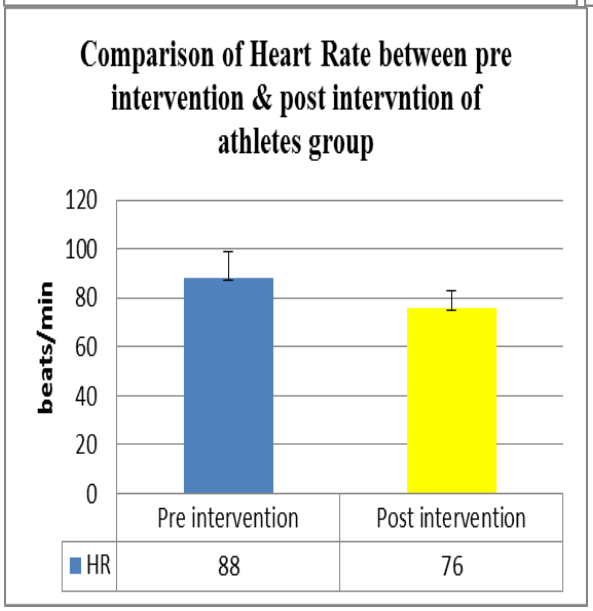


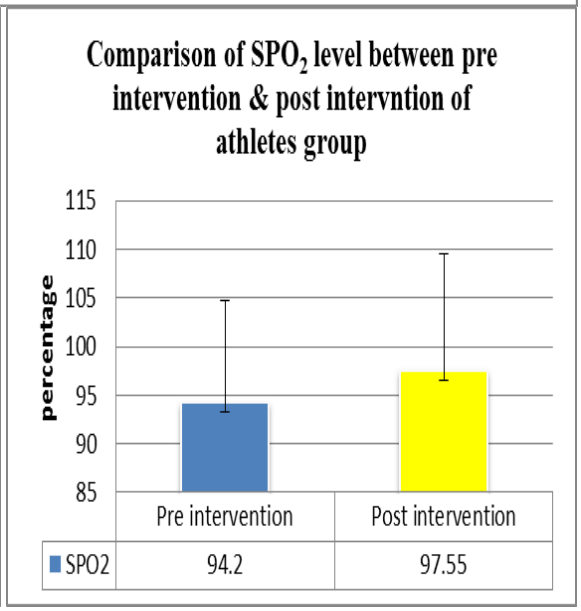


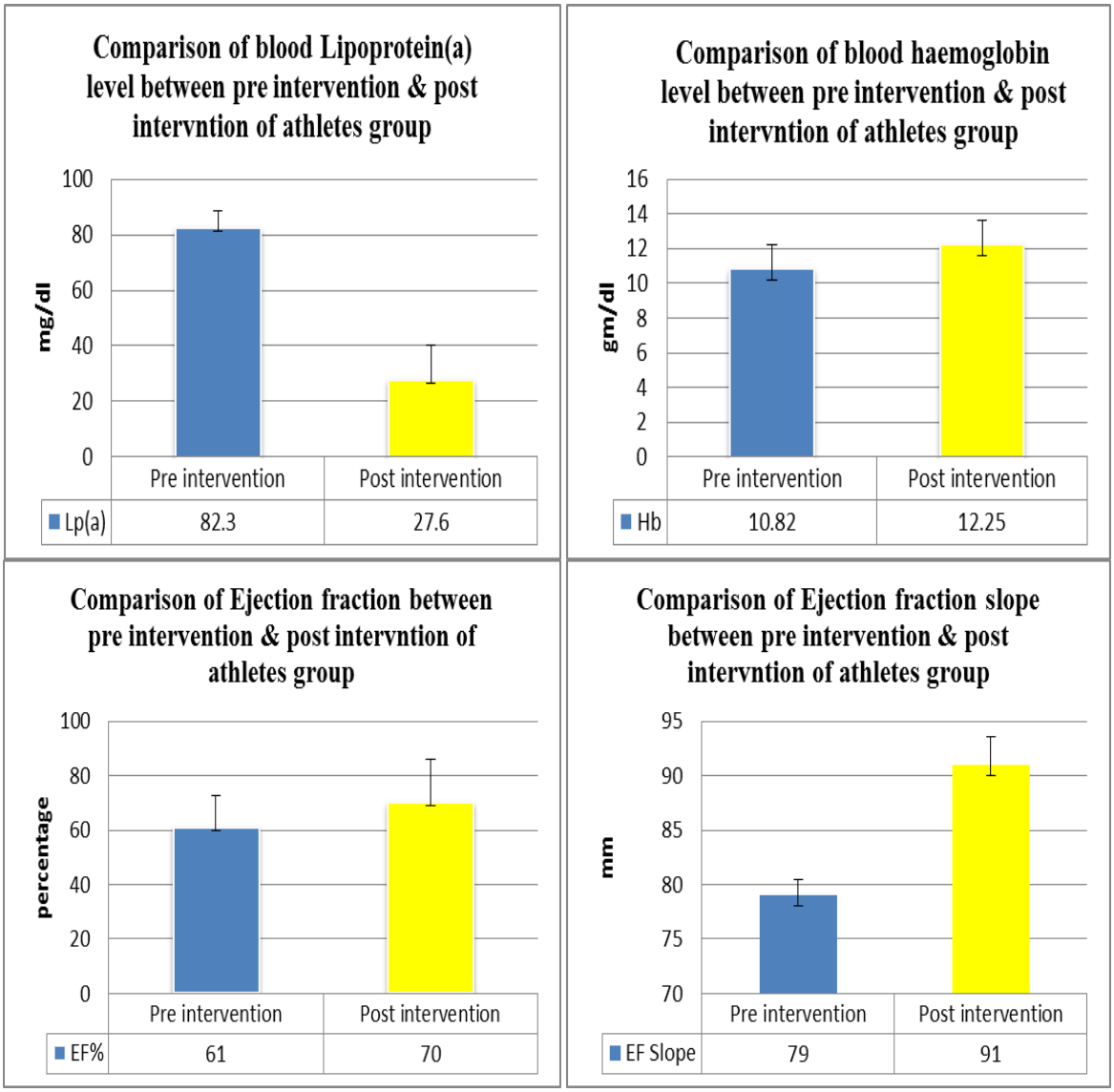
The entire bar diagrams (1-8) display pre and post intervention data of selected 17 athletes.











DISCUSSION

The present study investigated the effect of nutraceuticals supplement and skill-based modified yoga training program on skill and physical fitness in volleyball players and basketball players.

A primary observation of our result showed that the pre-adolescent male athletes group and non-athletes group had comparable physique, as evident from their mean height, weight, Ponderal index and Waist to Hip ratio. Mean systolic blood pressure, diastolic blood pressure and heart rate of athletes group showed significantly lower data in comparison to non-athletes counterpart. These differences are probably due to training and athletic activities. However SPO_2 level also showed a bit reduction from that of the non-athletes which is surprisingly different from the athletic point of view. This minute difference in SPO_2 would be an eye opener for further experimentations. Because athletes are known to use and extract a higher percentage of oxygen in their aerobic and anaerobic outfits, compared to their non-athletes counterpart. But here we found a different observation. Non-athletes are extracting better oxygen compared to that of the athletes. The primary doubt of this different kinds of observation compelled the researchers to analyse other physico-chemical and cardiac parameters. Again we have found that athletes showed a significantly lower haemoglobin content than their non-athletic counterpart.

Modern echo-cardiography analyses features showed the mean (Ejection Fraction) EF% in athletes is 72% where as that of non-athletes is 65%. The EF Slope in athletes is 102mm and in non-athletes it is 74mm.

Individual data analyses surprisingly showed that among 51 athletes, 17 boys are probably suffering from some hidden cardiac stress factors as evidenced by abnormally high serum (Lipoprotein a) Lp(a) value & comparatively lower echo-cardiographic data. All other physiological data however fall within normal mean athletic regime as recorded in Table no 4.

Accordingly, our observation regarding their personal lifestyles with complete diet survey analysis, indicated excess intake of saturated fat, with lower intake of green leafy vegetables what so ever.

Experimental intervention, along with the advice of clinicians, developed a specific protocol which include physical training for jumping, running and development skill for 5 specific yoga poses for about 6 weeks. Additionally intake of standard dosages of antioxidant vitamins including D-Panthenol, L-Lysine, Niacinamide, Nicotinic Acid, Vitamin B1, Vitamin B12, Vitamin B2, Vitamin B6 and Vitamin C and nutraceuticals including 25 mg of Aspirin were advised. They were debarred from taking any other medicine during the entire tenure. After completion, all the tests were repeated and a completely different observation was noticed as is evident from the bar diagrams 1-8.

We have noticed that due to a combination of regular aerobic exercise and supplementation of antioxidants/nutraceuticals for a minimum of 6 weeks resulted in significant improvement of athletic parameters. This combination should be instrumental for the budding athletes of West Bengal, we claim; particularly for pre-adolescent athletes with high $Lp_{(a)}$ value and abnormal echo-cardiography records.

It has been found, in spite of normal haemoglobin level, SPO_2 level, Blood pressure, normal Heart Rate and comparable BMI along with Waist to Hip ratio amongst male pre-adolescent athletes in Kolkata, their serum $Lp_{(a)}$ level and ejection fraction percentage (EF%) showed completely different values away from normal ranges indicating some hidden risk factors. This kind of observation reflects that probably some of the pre-adolescent male athletes are susceptible to cardio-respiratory problems in future, probably from the hereditary consequences or from the incompatible daily dietary intake. These biochemical cardiac risk factor titre showed such hike.

Training induced improvements in moving, standing, setting, and passing accuracy and spiking and passing technique is found to be significant. Significant improvements in speed and agility were also observed. Skill-based modified training programs should be supplemented with an appropriate amount of energy system and specific yoga training, to enhance the physiological and anthropometric characteristics of talented adolescent volleyball and basketball players. [5] Earlier experiments showed that regular aerobic exercise has long-term sustained effects on athletes blood pressure. Among people with normal blood pressure, 30 to 45 minutes of moderate aerobic exercise daily results in a 3 to 5 mmHg reduction in resting systolic pressure and a 2 to 3 mmHg reduction in resting diastolic pressure.

SPO_2 levels are not only critical for good health, but essential for peak athletic performance. Low levels of oxygen have been shown to contribute to physical and mental fatigue, poor endurance, lactic acid build up and a decreased ability to heal. Improved haemoglobin level may improve oxygen level as well.

Sports anemia is a rumor because in such cases, especially in male athletes, the low hemoglobin level is a false anemia. The total volume of red cells in the body is not low. Hemoglobin level is decreased because aerobic exercise expands the baseline plasma volume; this reduces the concentration of red cells, which contain the hemoglobin.[6]

Lipoprotein$_{(a)}$ [$Lp_{(a)}$] is a unique lipoprotein complex in the blood. At high levels (>30 mg/dl), $Lp_{(a)}$is considered an independent risk factor for cardiovascular diseases. $Lp_{(a)}$ can act athreogenically and has been found in artery walls. Because of its structural similarity to plasminogen, it can also inhibit fribinolysis and hence acts thrombogenically.

High $Lp_{(a)}$ concentration in serum correlate with premature manifestation of arthrosclerosis and strokes. When $Lp_{(a)}$ concentration exceed 30mg/dl, the coronary risk is approximately doubled. An elevated level of $Lp_{(a)}$ level is considered to be the most sensitive parameter for the development of coronary heart disease.

Since regular exercise is associated with favourable changes in lipoproteins in the blood, in this study, attention was focused on whether serum $Lp_{(a)}$ levels are also influenced by physical activity or not. There is an association between serum $Lp_{(a)}$ levels and regular moderate physical activity. Serum $Lp_{(a)}$ levels do not change in response to light exercise training alone. However, recent studies suggest the possibility that serum $Lp_{(a)}$ levels may increase in response to intense load-bearing exercise training, such as distance running or weight lifting, over several months to years. In this study, adolescent budding basketball and volleyball players were involved in intensive running method during 30-35 min duration for 6 weeks continuously with different yoga training, which was found to be a major factor to reduce $Lp_{(a)}$ level in serum.[7]

Additionally literature showed that Niacin (nicotinic acid) lowers $Lp_{(a)}$ by approximately 30 percent.[8] Our study supplemented Niacin along with other nutraceuticals for betterment of athletic conditions and performances in a much quicker tenure.

CONCLUSION

From this study it can be concluded that preadolescent male volleyball and basketball players of Kolkata belong to medium low socioeconomic group; as a result of which they are not getting proper nutrition as per athlete need. This improper food habit hampers their physiological homeostasis as well as agility. Quantitative analyses of hidden cardio-respiratory risk factor are the key features of this study. However oral nutraceuticals supplementation with modified yoga training program and running-jumping training programme could be effective in ameliorating such physical and physiological conditions. Furthermore, this study claims that high $Lp_{(a)}$ level can be controlled by regular aerobic and anaerobic exercise with specific nutraceuticals supplementation.

ACKNOWLEDGEMENT

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