



INTRODUCTION

When exercise is a fun activity and becomes an antibody giving immunity for many diseases, take this prophylactic drug to prevent all diseases of inactivity.

**- Rochana Govil (2013),
Director, Sports Authority of India**

Globally sports and athletics receive tremendous attention today. The sports industry is growing by leaps and bounds. India is making rapid strides in the field of sports and Indian athletes are endeavouring to reach the top position in national and international arena. Their performance is often obstructed by lack of stamina and poor health due to nutritional deficiencies and disorders. Moreover, lack of grass root level sports and training, poor stature, sub optimal diet, poor knowledge and understanding about sports nutrition are the causes of poor performance. Dr.R.Natarajan (2013) an International athlete has rightly pointed out that the need of the hour for India is fitness through right eating habits and lifestyle.

Nutrition forms the foundation for physical performance. Sports scientists and diet counselors alike, now realize that adequate nutrition coupled with scientific training alone can give the winning edge to athletes (Sesikeran, 2012).

Good health is the first condition for greater achievements in sports and games. Good health brings about optimal functioning of body and enhances physical fitness.

Physical fitness is a price less treasure an athlete can possess. It cannot be purchased but has to be earned through a daily routine of balanced diet and optimum physical exercise. Optimal physical fitness aids in physical, emotional and physiological health, leading to high quality of life. It is an inseparable part of

sports performance and achievement. It brings success, helps to withstand stress and strain caused by sports and prevents injuries.

Physical fitness is a set of attributes that people have or achieve, which are either health or skill related (Chanda and Mathur, 2015). Physical fitness is associated with a person's ability to work effectively, enjoy leisure time, be healthy, and resist hypokinetic diseases or conditions. They are grouped into health related and skill related components (Charles *et al.*, 2009).

The health-related components of physical fitness are directly associated with good health. The five components of health related physical fitness are body composition, cardio-respiratory endurance, flexibility, muscular endurance and strength. Each health related fitness characteristic has a direct relationship to good health and reduced risk for hypokinetic diseases. High levels of health related fitness relate more to performance than to health benefits (Chanda and Mathur, 2015).

The skill related components of physical fitness have a greater association with performance than with good health. The components of skill related physical fitness are agility, balance, co-ordination, power, reaction time and speed. They are called skill-related because people who possess them find it easy to achieve high levels of performance in motor skills, such as those required in sports and in specific types of jobs. For excellence in performance in sports and games both health related and skill related physical fitness are essential (Goswami, 2011).

The term "sports" comes from the French word "deport" meaning leisure. Games are a means of keeping the body and mind healthy, happy and fit. Indian sports dates back to the Vedic era. The ancient scriptures of India referred as, "Atharva Veda" defines an oath for the sportsmen, "Duty in my right hand and the fruits of victory in my left" indicating the sincerity and dedication in practice to achieve the desired goal to get victory. Since ancient eras sports like horse riding, wrestling, archery and athletics have always been very popular. Games like polo, chess, hockey, cricket, tennis, football, chess, volleyball, badminton and golf are mostly played in India. Field hockey is the official national sport of India. Until the

mid 20th century India dominated International hockey, winning eight Olympic gold medals.

The performance of athletes, in particular women athletes has seen drastic improvements. Nowadays women and men compete equally in track and field events (Brookhill, 2007). This is substantiated by the increase in the medal tally with each participating year in Olympics. Women participation in the Olympics has gradually increased from zero to twenty three, competing in 13 sports disciplines.

In the 1951 Asian Games conducted in India, women did not participate, but in 17th Asian Games 2014, 3658 women participated in athletics. In the 16th Asian Games 2010 conducted by China at Guangzhou, India earned 14 gold medals and 33 bronze medals. India was in the sixth place in the Asian games. India lost many medals which they could have grabbed if they were better equipped with good health.

The poor standing of Indian sports in comparison to leading nations like the United States of America and China implies that stamina level is not up to the mark to compete with the participants of developed countries. The vicious cycle of low achievement in sports by Indian athletes could be attributed to the genetic makeup, cereal based vegetarian food habits and poor physique. Other reasons may be poor socio-economic back ground, increased food cost, inadequate quality and quantity of food and nutrient intake, lack of nutrition knowledge and poor skills in selection and preparation of meals. Such athletes with poor nutritional status fail to build sound endurance capacity resulting in reduced levels of physical performance. Moreover knowledge on sports nutrition is scanty. India is yet to win medals equal to its population which could never be done, if nutrition is ignored.

Sports nutritionist Shiny Chandran (2015) has expressed that there is a dire need for customization of diet and nutrition for Indian athletes and mindful eating is doubly important for those who actively participate in sports.

Sports nutrition has many goals to enhance performance. First it improves performance by improving body composition, which in turn increases speed,

quickness, mobility and strength. Secondly, it aids the speed of recovery, which will in turn create more capacity for practicing and competition as the body becomes well fit and adjusts to the coupling of the good nutrition incorporated into the workout regimen. Third, it will allow one to increase energy for practice and competition, which will definitely help one's performance (Rathi, 2015).

Low levels of body fat seem to be related to improved performance (Quinn, 2011). The players need the nutrients in optimal quantities for the functional demand made and that should not deprive the normal function of tissues for daily routine. If nutrient requirement is not met through diet then enhancement of performance would be threatened (Pugazlendi, 2013).

Athletes who have sound nutritional knowledge and understanding about their dietary habits can reflect that in their total dietary intake to achieve better performance and be more successful in their sports life (Montecalbo and Cardenas, 2015).

Athletes expend their calories more than the non-athletes and hence need extra calories in their diet. Carbohydrates are the master fuel for athletes to make the brain active. They act as building blocks for biosynthetic processes. Ingestion of carbohydrate is necessary for prolonged exercise lasting more than 60 minutes duration and also for enhanced sports performance. Carbohydrate feedings before or during exercise spares the limited muscle glycogen stores and prevents fatigue. In order to have sustained aerobic performance, carbohydrate replacement and carbohydrate loading are essential. Gradually decreasing the amount of training and simultaneously increasing the amount of carbohydrates during the last 6 to 7 days before a game or competition will result in higher physical performance.

The type of carbohydrates ingested play a critical role. A glucose plus fructose beverage, is the best means for staying hydrated (Jeakendrup and Mosby, 2010) and potentially sparing endogenous carbohydrate during exercise (Currell and Jeukendrup, 2008). A unique high molecular weight starch base carbohydrate amylopectin is preferable to low molecular weight carbohydrates for expediting glycogen replenishment (Stephens *et al.*, 2008).

Protein produces antibodies to fight against infections, helps to gain lean body mass and aids to achieve optimal health status and performance. It is helpful for muscle repair and strength. It prevents athletic related injuries and useful to maintain positive nitrogen balance. The protein in muscle and liver is broken down into amino acids during exercise. This will be utilized as an energy source either directly or indirectly. Ingesting carbohydrates before or during exercise spares protein and limits the breakdown of protein. Protein intake of 1.2 to 2.0g/kg/day is needed for athletes (ACSM, 2000, Phillips, 2006). Intake of high quality protein regularly throughout the day ensures the anabolic building blocks (amino acids) in skeletal muscles to support lean tissue accretion. For athletes undergoing vigorous training as well as for those wishing to increase muscle mass, an additional intake of around 10 to 15 g of easily digestible protein such as whey protein, milk or milk shake an hour before exercise and then a further 10 to 15 g within an hour after exercise is suggested by Birch *et al.*, (2007). This helps to minimize protein degradation and promote protein synthesis in recovery. Athletes who follow vegetarian diets have greater protein requirements (1.3 to 1.8 g/kg body weight) because of the lower quality of plant derived proteins (Pameela, 2015).

Fat is the primary fuel while at rest. It also acts as a major source of energy for prolonged exercise and it can also be utilized during low intensity exercise. Dietary fats sustain satiety for several hours. Fatty acid release from lipid stores spares muscle glycogen stores. ACSM (2000) recommended 1g fat/kg of body weight for athletes. Recommended Dietary Allowances for athletes include 30 percent fat, of which 10 percent should be from polyunsaturated fatty acids and 10 percent from monounsaturated fatty acids and 10 percent from saturated fat. Diets too low in fat are associated with decreased testosterone concentrations and exercise performance (Lowery, 2011). Very high fat diets are undesirable for athletes since it leads to acidosis during exercise and thus hinders the performance.

Vitamins and minerals are required in small quantities for growth, repair of body tissues, metabolic reactions, and immune functions and for elimination of

free radicals produced during exercise. Deficiency of B-group vitamins can result in premature fatigue and inability to maintain heavy training since they are involved in energy metabolism. Folic acid and vitamin B12 are involved in cell development. Vitamin C, vitamin E and selenium are antioxidants and they act as defense against oxidative stress. Micro nutrients such as vitamin K are essential for blood clotting and bone metabolism. Vitamin A is needed for improved immune function and antioxidant activity.

Trace minerals such as iron is a component of haemoglobin and is essential for athletic aerobic endurance. Iron supplementation among elite athletes with low ferritin and normal haemoglobin concentration lead to an increase in maximal aerobic performance capacity without an augmentation of red blood volume (Young, 2009). Zinc is a component of enzymes and proteins. Sodium and potassium are the two important electrolytes. Replacement of electrolytes during continuous activity longer than two hours is beneficial in a hot environment.

Calcium, phosphorous, magnesium, vitamin D and fluoride are bone building nutrients. Optimal bone mineralization in athletes prevents the risk of stress fractures and helps to attain the optimal performance. Results of the randomized controlled trials showed that exercise has the potential to improve bone health under conditions of adequate calcium intake (Almarcegui *et al.*, 2015).

Fluid loss during exercise causes a substantial decline in performance and leads to heat injury in hot and humid climates. Fluid loss leads to diminished stamina, power, speed and strength. Increased levels of dehydration causes increased loss of muscle protein. Institute of Medicine (IOM), United States of America (2004) had recommended 2.7 litres of total water from all beverages and foods /day for women and 3.7 litres/day for men. Athletes should consume approximately 5 to 7ml fluid per kg body weight at least four hours before exercise. They should consume the fluid slowly, approximately 3 to 5 ml per kg body weight, two hours before exercise if the individual is not urinating or if the urine is dark (Sawka *et al.*,2007).

The latest development in nutrition research is the nutrient timing. The practice of consuming a specific nutrient in a given time period within proximity to

training or performance to achieved desired outcome. Carbohydrate consumption is an area of nutrient timing that has a great impact on many athletes (Bill and Marie, 2011).

Nutrition periodization ensures that the athlete receives the nutrients that are required to enhance health, improve strength, sustain power and endurance at the right time. At the same time, this strategy helps the athlete maintain a healthy immune system and ensures appropriate body weight and composition. Nutrition periodization supports changes in training load so that the athletes are able to achieve high-quality workouts and recover rapidly. Properly planned nutrition supports physical training, enables athletes to practice and recover well and move ahead to achieve the goal of improved performance. Nutrition periodization is meant to be a year- long endeavour to support the athlete's changes in energy expenditure. The science of nutrition and performance is growing at a great pace. As this body of research expands and as scientists carefully scrutinize the factors that can affect an athlete's performance and physique, the need and demand for sport nutrition practitioners also grows (Bob Seebohar,2012).

Human resource is one of the strengths of any strong nation. A nations true wealth is not determined by the lands and waters, not by its forests and minds, not by its flocks and herds, not by its dollars and rupees but by its healthy population. A healthy population can lead a nation better in all frontiers like education, economics, agriculture, sports, defense, medical and other sectors.

Nutritional supplements are referred to as ergogenic aids meaning substances which "increase work". Holway *et al.*, (2011) describe pregame supplements as performance improvers, helping in the speed of recovery and energy suppliers for both practice and competitions to enhance performance.

Supplements are popular worldwide. They are required for their ability to increase physical power and mental strength of the athletes. Supplements delay the fatigue during prolonged exercise; improve strength, stamina, agility, speed, endurance and aid rapid recovery from injuries. Some of the supplements act as an antioxidant to quench free radicals generated during exercise and some as

immune boosters. Commercial supplements available in India and other countries include protein supplements in the form of shakes or protein bars, whey protein, branched chain amino acid supplements, meal replacement products, creatine, antioxidant supplements, glutamine, caffeine and beta-hydroxy beta methyl butyrate from leucine. Demand of the dietary supplements are increasing on a greater fold in developing countries like the Brazil, Russia, India and China (Devla *et al.*, 2011).

A market survey conducted by the investigator indicated that in India locally produced sports supplements are scarce and the available ones are imported from other countries. Their exorbitant cost and scarcity curb the use of these supplements by the local athletes who are from a humble background. The cost ranged from Rs 30 to Rs70 per 100 ml which was unaffordable by most of the sports persons in India. Therefore there is an urgent need to formulate innovative low cost food supplements to help the players who cannot afford to buy expensive supplements from the market. Hence the present research on the “Health status and impact of pregame sports supplements on the performance capabilities of sports persons and athletes” was undertaken to develop a suitable sports supplement. The specific objectives were:

- A. Study the demographic, socio-economic and athletic profile of selected athletes.**
- B. Assess the nutritional status of the selected athletes.**
- C. Determine the performance capabilities of selected athletes.**
- D. Formulate and standardize pregame nutrition supplements and assess their acceptability.**
- E. Evaluate the efficacy of pregame nutrition supplements formulated.**