CONTRIBUTION OF NUTRITION IN SPORTS PERFORMANCE: AN OVERVIEW

Dr. Parmod Kumar Sethi,

Assistant Professor,
Department of Physical Education& Sports Sciences,
PGDAV College (EVE), University of Delhi

ABSTRACT

The Purpose of this study was to systematically review the literature regarding understanding of the nutrient needs to the athletes in the sports training or Competition. Athlete's optimum performance in sports depends on many factors in competition and training including Physiological nature of Sports Aerobic and Anaerobic, Aim of the competition, Time, environment. The importance of dietary advice has been recognized in the field of sports Nutrition, Including specific guide before, during and after training or Competition. A number of research studies have shown that deficiency of nutrients impair physiological function and physical performance. Athletes manage a different range of dietary strategies to improve sports performance. Recent studies have recommended the benefits of protein diet throughout the day for the athlete. Many research results identify that carbohydrates is largest percentage of an athlete calorie intake through diet and it helps to meet demands of energy needed during sports training, maintain glucose level and supply muscle glycogen stores. Although the availability of nutrition information for athlete varies, athletes will benefit from the experts of nutrition and diet.

Keywords: *Nutrition, Nutrients, Sport training.*

INTRODUCTION

Many factors Contribute to success in sports result and diet is an important component. The dietary requirement is based on many aspects including nature of sports activities, Training load, environment and time. The diet has been based on day to day requirement as before, during and after training or competitions. Athletes, in the world of sports are using wide range of dietary product for improving sports performance with key strategy of training systems. Recent research in dietary sports sciences focused on athlete's adaptation of before, during and after training & competition.

Nutrition in sports diet plan can be defined as the system of nutritional food for athletes to improve sports performance. Nutrition is an important aspect of sports training and competition. It focuses on types as well as quantity and quality through food taken by athletes during day to day requirements. The benefits of Nutrition intake throughout the day are now well recognized in the field of sports world wide. It is used to allow athletes to consume the Nutrients they require at the right time, in most planned & systematic format.

The energy value of food as nutrients is measured in Kilocalories (Kcal) and calories content: 1 gm Carbohydrate provide 4 Kcal, 1 g fat provide 9

Kcal, 1g Protein provide 4 Kcal. These calories convert into energy and this energy production is dependent on ATP system (Adenosine triphosphate). It is a high energy chemical compound in body muscle cells, when athlete muscles is stimulated by a nerve impulse , leading to the breakdown of ATP and release of energy for the muscles contract during training or competition. ATP is the immediate sources of energy for athlete's muscles.

Nutrients can be understood as different types of substance in food which athlete takes in daily diet plan. The nutrients perform three basic functions (i) To serve as energy source (ii) To regulate the energy source (iii) To produce energy, structure growth & development, maintaining and repairing of body tissues.

All nutrients an athlete needs for optimal sports performance, is obtained from the well balanced diet plan. The nutrients, sports person consumes can be grouped into six different classes. It is as follows:-

Classification of Nutrients

Macronutrients	Micronutrients
Carbohydrates a) Monosaccharide.(Simple) b) Disaccharides.(Complex) c) Oligosaccharides. (Complex) d) Polysaccharides. (Complex)	**Vitamins** a) B_1, B_2 B_6 B_{12} (Water Soluble) b) c (Water Soluble) c)A,D,E,K (Fat Soluble)
Protein a) Fibrous. b) Globular. c) Membrane.	**Minerals** a) Iron b) Magnesium c) Zinc d) Calcium e)Sodium f) Potassium g) Sulphur
Fats a) Saturated.(Monounsaturated) b) Trans. c)Unsaturated.(Monounsaturated) (Polyunsaturated)	**Fluids** a) WATER

CARBOHYDRATES

The macronutrients Carbohydrates, protein and Fat are essential for life sustaining activities. In sports it is commonly explored as the best source of energy production in sports training and competitions. Carbohydrate is the combination of three Compounds i.e. Carbon, hydrogen and oxygen and further classified in two types (1) Simple sugars such as glucose, fructose, and sucrose. (2) Complex sugars such as beans, rice, and whole grained potatoes. Simple sugars type of Carbohydrate are synthesized quickly and supply energy for working muscles and its sources are fruits, milk and milk products and the Complex Carbohydrates include Peas, beans, whole grains and vegetables foods. Both are turned to glucose and used as energy.

Carbohydrate is the primary substrate oxidized by muscle to provide energy during prolonged aerobic nature of sports training with intensities above 50% $VO_{2\ max}$. As the training intensity increases near 100% $VO_{2\ max}$, a greater percentage of fuel is required and carbohydrate nutrients supply the fuel as energy to the athlete. A number of researches have suggested that carbohydrate is the major energy sources during aerobic nature of sports activities. The dietary Carbohydrates come in a variety of forms like sugars and starches. On the other hand in Anaerobic Nature of Sports, Carbohydrate supports & provides the main source of energy through muscle & liver stores of glycogen in the body for High intensity and short duration of training schedule. In the evidence of above fact and many researches show that in Pre – training session or Competition, Carbohydrate rich meal 1- 2 hours before training can provide a good energy source to meet demand of training. Some sports scientists or sports nutritional expert suggests that during prolonged training session, 60 to 90 minutes and above, athletes can consume 1 to 4 gram per Kg body weight Carbohydrate in the 1-4 hours before aerobic nature as Foot Ball, Basket Ball or prolonged periods of events, such as 42.2km marathon, of sports activities. Some of research has shown the carbohydrate recommended before the training or competition is based on format divided for day to day or week to week schedule.

PROTEIN

Protein is the basic component of living cells in the human body and it is a made of carbon, hydrogen, oxygen, nitrogen and the chain of amino acids. There are 25 amino acids, 20 of biochemical importance, of these 10 are arginine, bistidine, isoleucine, lecine, lysine, methionine, phenylalanine, threonine, tryptophan and valine are known to be essential amino acids. They are essential because the body cannot normally produce these amino acids at the rate required for proper functioning. The Protein value of different food varies quite remarkably. The dietary protein come from two sourcec (1) Animal based Meat, Fish, and Eggs, Milk, chess & Yogurt (2) Plants based come from Soya, Pea, Potato, Cassava.

Protein is an essential macronutrient that athlete's body needs to grow, to repair cell, tissues & muscle and helps in process of recovery. The 0.6 grams day per Kg body weight protein is recommended for sedentary or no active person for day to day life functioning. Many research studies reported that, Pre and Post the training or during competition, the athletes of high intensity aerobic nature of sport training per day (60 to 90 minutes) needed about1.5-2 grams per day per Kg body weight, with 2.5-3 grams day per Kg body weight for anaerobic nature of sports with high intensity training interventions sports event like wrestling, Weightlifting, shot put.

FATS

Fat is composed of Carbon, hydrogen and less quantity of oxygen as compared to carbohydrates. Dietary fats play a number of different physiological roles in the body, but one of the most significant is to serve as fuel for the oxygen energy system. As a Fuel source for body, fat is abundant in the human

body and work as fuel supply substance to body at rest and during low intensity training. Fats can be categorized into two Major types Saturated and Unsaturated. The source of **Saturated** fat is animal food like chicken, beef, cheese, ice cream and in plant food, Coconut oil, palm oil and palm kernel oil. On the other hand source of **Unsaturated** fat are (1) Monounsaturated: - Olive, Peanut and conola oils, Nuts, seed, (2) Polyunsaturated fat: -Sunflower, Corn, Soy been, Flaxseed oil, Walnuts, Fish, Canola oil. Fat comes in several forms through diet, including triglycerides and Cholesterol. Research recommended that athletes consume a habitual diet of approximately 30% fat per day meal. Of this 30%, 10% should be saturated, 10% polyunsaturated, and 10% monounsaturated. Some of the recent studies show that percentage of total calories derived from fat does not have large impact on training of anaerobic nature of sports performance (weightlifting, wrestling, judo and taekwondo). Consuming too much fat in diet leads to gain in weight in the form of body fat or muscle fat. Muscle fat or body fat does not contribute to the anaerobic sports performance due to slow movement during technique and skill performance in training.

VITAMINS

Vitamins perform many functions essential for human life and 13 vitamins are important for optimal function of the immune system. In current days awareness of the synergy between diet and sports training stimulates interest in the roles that (Micronutrients) vitamins play in the attainment of peak sports performance. Vitamins are classified according to their solubility. The fat soluble Vitamins are A,D,E &K. These vitamins are ingested with fats in the diet. The amount of excess of these vitamins in daily needs are stored in body tissue. The sources of Fat Soluble vitamins are: **Vitamin A**: Milk Products, Liver, Eggs, **Vitamin D**: - Sun light, eggs, fish, Milk, Vitamin **E**: Vegetable Oils, Nuts Greens, Vitamin K: - Greens, Milk, Meats. On the other hand the B Complex and C vitamins are Water soluble. The Sources of Water soluble are **Vitamins** B1, 2, 6, 12**:-** Pork, Grains, Legumes Nut, Milk, Meat, Grains, Greens, Nuts, Eggs, Fish, Fruits, Vegetables, **Vitamins C:** Citrus Fruits, Strawberries. Excess water soluble vitamins are flushed away in the urine, making deficiencies more likely. The vitamin B Complex have major role related to training and exercise – energy production during training and the production of red blood cells, as well as involvement in protein synthesis and in tissue repair and maintenance including the central nervous system. Few Studies show that Vitamin E, C help athletes tolerate sports training to a greater degree by reducing oxidative damage. Vitamin C helps to maintain a healthy immune system during heavy training. Research has revealed that Physical performance may decrease remarkably, even with as short periods of time as 2 to 4 week, when the diet is low in the Vitamin B. Both Aerobic and Anaerobic capacity deteriorate, due to, presumably, the body inability to metabolize carbohydrate effectively. The basic Nutritional recommendation for athletes is to consume a well balanced diet.

MINERALS

Human body needs over 25 different minerals in order to support proper growth, development and function. Minerals fall in two categories: Macrominerals and trace minerals. The total mineral content of the body is approximately 4 percent of body weight. Macrominerals are present in the body in larger amounts than trace minerals and include calcium, Phosphorus, Magnesium, sodium, chloride, and potassium. The sources of Minerals are **Iron:** Animal product:- Meat, Fish, Liver**.** Green Vegetables:- Leafy, whole grain products. **Calcium**: all dairy products, Eggs yolk, Cauliflower, Beans. Research studies have shown that body may lose minerals during sports training. One route is through the sweat, which may contain sodium, chloride and potassium, as well as amount of calcium, magnesium, iron, zinc and other minerals. Another route is through urine, which may contain small amount of iron, chromium and copper, and others. A deficiency of Mineral can have a negative impact upon sports training or performance. Sometimes athletes suffer muscle cramps during the training or

competition due to deficiency of magnesium, sodium or potassium. Due to prolonged exercise in warm or hot environment, sweat is evaporated from the skin of athletes to help cool the body. Sweat consists primarily of water, with small amount of sodium, chloride and potassium. Minerals are important to athletes because they are involved in muscle contraction, normal heart rhythm, nerve impulse conduction, oxygen transport. Minerals cannot be produced by the body, but rather must be consumed in the diet, it is essential for athletes for training and competition.

FLUIDS

Water is the most important nutrient for the athlete's body. It is comprises 60% of average person body weight and can fluctuate between 45% and 75%. The amount of water in a person depends on factors such as age, gender, body composition and body size. Maintaining fluid is crucial in aerobic endurance sports training. Research has shown that 2% of body weight reduces during sports training performance in hot temperate environments. Athletes should Consume 5 to 7 ml fluid per Kilogram body weight at least 4 hours pre sports training session. During sports training athletes should consume fluid to prevent dehydration. It is evident that consuming carbohydrate during training maintains blood glucose levels and reduces fatigue. In Anaerobic Nature of sports training, athletes should be encouraged to emphasize on good hydration techniques throughout the day in an effort to remain as hydrated as possible pre – post and during training session.

DISCUSSION

One the basis of systematical review of available literature regarding understanding of the nutrients needed by the athletes in the sports training or Competition, this paper summarizes the latest evidence-based recommendations as well as highlights that high carbohydrate diets have long been tested and continues to be recommended in endurance athletes. Protein may help an athlete's body to grow, to repair cell, tissues & muscle and helps in process of training recovery in aerobic and anaerobic nature of sports training. Research show that high percentage of total calories derived from fat does not have large impact on training of anaerobic athlete performance. Consuming too much fat in diet leads to gain in weight in the form of body fat or muscle fat. Muscle fat or body fat does not contribute to the anaerobic sports performance. Some literatures emphasize that Vitamins play major role related to training and exercise – energy production during training and the production of red blood cells, as well as involvement in protein synthesis and in tissue repair and maintenance including the central nervous system. Vitamin E, C help athletes tolerate sports training to a greater degree by reducing oxidative damage. Vitamin C helps to maintain a healthy immune system during heavy training. There has been a shift away from forced hydration plans and personalizing fluid intake according to thirst and sweat rates to avoid exercise-associated hypothermia.

This review study helps clinicians treating and counseling athletes to clear up misconceptions athletes may have regarding sports nutrition and provide evidence-based recommendations according to current research. Future research may help shed new light on benefits of Sports Nutrient, more clarity of the roles of nutrients and the ideal balance diet of carbohydrate, Protein, Fat, Vitamin , Mineral and fluid intake to optimize athletic performance.

CONCLUSION

In conclusion present study indicated that carbohydrate diet recommended for endurance athletes. Protein helps in process of training recovery in aerobic and anaerobic nature of sports. Fat in diet leads to gain in weight in the form of body fat or muscle fat. Vitamin E, C help athletes tolerate sports training to reducing oxidative damage. Vitamin C helps to maintain a healthy immune system during heavy training..

REFERENCES

1. Burke LM, Meyer NL, Pearce J. National nutritional programs for the 2012 London Olympic Games: A systematic approach by three different countries. In: van Loon LJC, Meeusen R, editors. Limits of Human Endurance. Vol. 76. Vevey, Switzerland: Nestec Ltd; 2013. pp. 103–120. (Nestle Nutrition Institute Workshop Series).
2. Bill I. Cambpbell, Marie A. Sparno, Science of strength and Conditioning Series; NSC'S Guide to sports and Exercise Nutrition. National Strength and Conditioning Association, Human Kinetics: US, Champaign, 2011.
3. Hottenrott K, Hass E, Kraus M, Neumann G, Steiner M, Knechtle B. A scientific nutrition strategy improves time trial performance by ≈6% when compared with a self-chosen nutrition strategy in trained cyclists: a randomized cross-over study. Appl Physiol Nutr Metab.2012;37(4):637–645
4. Jeukendrup AE, Martin J. Improving cycling performance: how should we spend our time and money. Sports Med. 2001;31(7):559–569.
5. Wright DA, Sherman WM, Dernbach AR. Carbohydrate feedings before, during, or in combination improve cycling endurance performance. J Appl Physiol (1985)1991;71(3):1082–1088.
6. Hawley JA, Schabort EJ, Noakes TD, Dennis SC. Carbohydrate-loading and exercise performance. An update. Sports Med. 1997;24(2):73–81.
7. Bergström J, Hermansen L, Hultman E, Saltin B. Diet, muscle glycogen and physical performance. Acta Physiol Scand. 1967;71(2):140–150.