



ROLE OF NUTRITION IN SPORTS PERFORMANCE: SPECIAL REFERENCE TO FEMALE ATHLETES

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Abstract: Nutrition is the back bone of sports performance. This science is increasingly recognized as a key component of optimal sporting performance. Athletes and Fitness Enthusiasts need the same essential nutrients that non-active people need with varied increases in their caloric needs as well as some increase in macro and micronutrients. Therefore, it is essential to explore and assess these increased nutritional needs of athletes before, during, and after competition for achieving optimal sports performance. Success in sports depends on three factors - genetic endowments, the state of training and nutrition. Genetic make-up cannot be changed. Specialized exercise training is the major means to improve athletic performance and proper nutrition is an important component of the total training programme. Nutrition for female athletes is not very different from that of male athletes. But care has to be taken in respect of calcium and iron intake because of the additional physiological demands of female athletes. In addition, meals should be rich in B12, folate and zinc.

Keywords: Nutrition, Female Athletes, Physical Activity, Sports Performance

Introduction:

Sports nutrition implies to application of nutrition principles for maximising the sports performance. It is the application of nutrition knowledge to a practical daily eating plan providing the fuel for physical activity; facilitating the repair and building process following hard physical work and achieve athletic performance in competitive events, while also promoting overall health and wellness. Success in sports depends upon the genetic characteristics, the type of training and the nutrition, of which specialized training to improve the sports performance and proper nutrition are the important deciding components.

“Athlete” includes individuals competing in a range of sport types, such as strength and power (eg, weight-lifting), team (eg, football), and endurance (eg, marathon running). Sports-related fitness involves skills that are necessary for sports performance. These skills are sport-specific neuromuscular motor skills such as agility, timing and accuracy, balance, speed, strength, power, and endurance. Specificity of training involves training these components as well as the health components that will be directly needed for one’s sport.

Athlete challenges their bodies on a regular basis through tough physical training and competitions. In order to keep up with demand for stamina of their activity or sport, athlete needs adequate fuel for their body on day to day basis. Nutrition is important for an athlete because it provides energy required to perform the activity. The food they take leaves an impact on strength, training, performance and recovery. It also has an impact on their performance level and their body ability to recover after workout. An athlete needs to pay close attention about when, what and how much does he eat or drink prior to a game or match. The role of nutrition in sports performance is very important. Proper nutrition must be available prior, during and post competition. As a general rule of thumb an athlete should eat about two hours before any exercise and the meal should be high in carbohydrates, low in fat and low to moderate in proteins.

Athlete’s nutritional status can be assessed by Anthropometric measurements such as weight and height, Biochemical analysis such as blood and urine tests, Clinical assessment for recognizing signs and symptoms of deficiencies or excesses and Dietary history. Diet history is a method

of assessment of what a person has been eating over a period of time. Economic status should also be taken into consideration while assessing one's nutritional intake.

Nutrition for Female Athletes: The nutrients carbohydrates, lipids, protein, vitamins, minerals and water are essential for every cell in the body and for human life to exist. The nutrients in foods offer four general functions: Energy for every cell in the body, Growth and Repair of tissue, Regulation of metabolism, and Provision of water for every cell. The carbohydrates, Proteins and Lipids provide the necessary energy to maintain bodily functions during physical activity and at rest.

Carbohydrates provide 4 kcal per gram and can be generally classified as "complex" or "simple". Physically active people and athletes should consume a majority (65-75%) of their calories from carbohydrates. Dietary Carbohydrate intake takes on additional importance for individuals involved in a significant amount of physical activity or in exercise training and sports competition. Carbohydrates are essential for athletes, especially endurance athletes. Stored glycogen becomes the prime energy contributor under condition of inadequate supply of oxygen to the active muscles. In addition to this, the stored glycogen provides substantial energy during intense exercise. For many competitive athletes e.g. swimming, rowing etc the importance of maintaining a relatively high daily carbohydrate intake relates more to the considerable energy demands of training than to the short term demands of competition. Focus should be given on wholesome unrefined complex carbohydrates in the menu planning for athletes as they are rich in fiber, vitamins, minerals, phytochemicals, antioxidants, have essential fatty acids, and promote satiety.

A nutrient rich diet would help the athlete to maintain high energy reserves to perform better and postpone fatigue. Such diets also have other health benefits. It is generally recommended that at least 55% of total calories should be from carbohydrate for an average person (FAO/WHO/UNU,

1985, Technical Series No. 724). Athletes need total carbohydrate grams to be closer to the WHO recommendation in order to properly store enough fuel for their events, especially for endurance competition. A minimal daily amount of carbohydrates recommended for an athlete is 300 grams if the total intake is 2000 K.cal.

For woman athlete about 70% of the woman's daily calories should be from carbohydrates. An athlete's body needs more energy and the human body uses carbohydrates as its main fuel. Body weight in kilograms multiplied by 10 gives the number of grams of carbohydrates required in the diet.

Lipids (fat) provide 9 kcal per gram and can be generally classified as unsaturated or saturated when considering the fatty acid make-up of triglycerides. It is generally recommended to consume less than 30% of calories from lipids. About 20-30% of total calories should come from fat.

Fats are essential for good health. They constitute an important source of energy storage in the body, cushion and protect vital organs and carry fat-soluble vitamins like vitamins A, D, E and K. However excess consumption of fats, particularly saturated fats, can be injurious to health. Fats can be classified into 4 categories viz. saturated fats, monounsaturated fats, polyunsaturated fats and Trans fatty acids. The food sources of these types of fatty acids are Saturated: Butter, cheese, meat and meat products, full-fat milk, pastries, coconut oil and palm oil. Monounsaturated: Olives, rapeseed oil, nuts, avocados, canola. Polyunsaturated (Omega-3) Salmon, mackerel, trout, walnuts, flax seeds Polyunsaturated (Omega-6) Sunflower seeds, wheat germ, soybean, corn. Trans fatty acids: Baking fats like hydrogenated vegetable oils (Vanaspati), fatty meat. Moderate consumption of fat and a balance between saturated and unsaturated fats is desirable. The total dietary fat should be less than 30 percent of total calories and saturated fats intake should be 10 percent of total calories.

Proteins provide 4 kcal per gram and will be approximately 10-15% of one's total calorie needs, if the appropriate grams for

amount of calories are chosen. Protein is one of the most important nutrients in the maintenance of good health and vitality. It is of vital importance in the growth and development of all body tissues. It provides a major source of building materials for blood, muscles, skin, hair, nails, and glands, as well as for hormones, enzymes etc.

Protein requirements and recommendations are based on many years of scientific research. Athletes do not generally need extra protein unless they are trying to gain muscle mass or they engage in endurance sports. The Recommended Daily Allowance (RDA) for protein for most people is 0.8 grams per kilogram of bodyweight and it is 1.0 to 1.5 grams per kilogram of bodyweight for endurance athletes and bodybuilders. This means 10-15% of calories should come from protein, although some have raised this to 20-25%.

Additional recommendations include increasing plant proteins for the added benefits and keeping the percentage to 10-15% of total calories for any person who is within their appropriate caloric range. Hard exercise increases protein needs. Intense exercise activates specific enzymes in the muscle that degrade the myofibrillar protein. Protein loss occurs through sweat and urine because of decreased absorption in kidney tubules during heavy exercise.

Micronutrients: Apart from macronutrients like carbohydrates, proteins and fats, the body requires micronutrients-Minerals & Vitamins in small quantities for its proper functioning. Organic fat and water-soluble vitamins and inorganic trace and major minerals do not contribute to energy, but they facilitate in the vital metabolic functioning responsible for energy release in the body. These are required for: growth and repair of body tissues, metabolic reactions, immune functions and elimination of free radicals. The water soluble vitamin C, B1, B2, B6 and niacin are involved in energy metabolism and folic acid and vitamin B12 are involved in cell development. Deficiency of B-group vitamins can result in premature fatigue and inability to maintain stamina.

The fat-soluble vitamins include

vitamins A, D, E and K. Vitamins A, C and E have antioxidant properties. Antioxidants offer a defence against the damaging effects of free radicals. Excepting vitamin D, most other vitamins have to be received from diet. Increased physical activity may necessitate higher input of vitamins particularly vitamins C, B2, A and E. For most athletes there is no need for vitamin supplements. However in respect of athletes who have to restrict body weight and therefore their diet (e.g. gymnasts) there is likely to be inadequacy of micronutrients and supplementation will become necessary. Diets should include: 30 mg of iron, 800 to 1,200 mg of calcium and 1.3 mg of B-12 a day. Calcium needs can be met by 3 to 4 servings of low-fat milk, yogurt, or other calcium-rich foods. Calcium absorption requires adequate amount of protein, lactose (milk sugar), vitamin D and acidic foods.

Care should be taken in the case of micronutrients especially iron and calcium, because of additional physiological demands of female athletes. In addition to iron and calcium the meals should be rich in, B-12, folate, and zinc. Iron from meat, poultry and fish are better absorbed by body than iron from plant sources. Vitamin C promotes the absorption of iron from plant sources. Tannins in tea and coffee hamper the absorption of iron from food and therefore, they should be taken in between meals and not along with meals.

Soybeans can be added to the diet as they contains phytoestrogens, which research has shown can significantly lower bad (LDL) cholesterol and raise good (HDL) cholesterol.

Weight training is important to the female athlete. Women need to balance upper and lower body weight to achieve overall body strength. Weight lifting programs that are done 2 or 3 times a week increase bone density, decrease fat, and improve muscle strength. They can improve sports performance, as well.

Losses of minerals can occur from strenuous exercises. Losses of iron and magnesium are likely from sweat particularly in hot conditions. If dietary intake fails to compensate for these losses

athletic performance will be adversely affected. Hence iron, zinc and magnesium supplements may be necessary. But these should not exceed 1-2 times the RDA. Excessive intake can be toxic.

Studies show that more than 50 percent of all women runners are deficient in iron. Sagging iron levels result in fatigue and poor endurance, since the blood is unable to carry oxygen as efficiently to working muscles. Feeling chilled or cold may be another sign that iron is low. Though losses of this important mineral occur during menstruation and in a few other small ways, lack of iron in the diet is the most likely cause of deficiency, as studies show that women distance runners usually get less than the RDA of 15 milligrams. Training causes the fluid in the blood to increase. This “dilutes” the red blood cells (RBC), so there appears to be anaemia when there is not. When female athlete is anaemic, her performance level deteriorates. Therefore, iron-rich foods, dietary supplements, and vitamin C (which help to absorb iron) should be included in their diets.

A serious problem for female athletes is known as the “female athlete triad”. It is a shared relationship with eating disorders, menstrual problems, and stress fractures. It begins with severely restricted eating and intense workouts. These three issues are of growing concern, especially due to the increasing pressure on adolescent girls to maintain an “ideal” body weight.

Female athletes should eat many, small, low fat meals. Small meals eaten often will stop hunger pangs, provide fuel and fluid for workouts, and increase the metabolic rate. They should eat five times a day, i.e. three meals and two snacks. Studies have shown that this helps in keeping the weight steady, improves memory, cognitive skill and work performance.

A larger number of female athletes have amenorrhea as compared to 5% of women in the general population. Amenorrhea is the lack of menstrual periods. An estimated 25 percent of women runners become amenorrheic at some point. The decreased estrogen levels associated with amenorrhea may be the cause of premature osteoporosis found among female athletes. The possible

changes required to resume menses include exercising 5 to 15% less and eating a little more. If training is totally stopped, as may happen in case of injury, period may be resumed within a few months. Some amenorrheic athletes have resumed menses by simply exercising less and gaining no weight or gaining less than 2 kgs. This small amount of weight gain is enough to achieve better health.

Water is vital to the life of every cell in the body. It is a solvent, lubricant, medium for transport, and temperature regulator that makes up the majority (about 2/3) of our body and yields no energy. The purpose of fluid consumption during exercise is primarily to maintain hydration and thermoregulation, thereby benefiting performance. Fluid consumption prior to exercise is recommended to ensure that the athlete is well-hydrated prior to commencing exercise.

Hydration requirements are closely linked to sweat loss, which is highly variable (0.5–2.0 L/hour) and dependent on type and duration of exercise, ambient temperature, and athletes’ individual characteristics. Sodium losses linked to high temperature can be substantial, and in events of long duration or in hot temperatures, sodium must be replaced along with fluid to reduce risk of hyponatremia.

Pre-Event Hydration: 1. Athletes should consume 1.5 to 3 L of fluid above their normal intake the day before the event. 2. Athletes should consume 0.5 L of water 1-2 hours prior to the event and 0.6L of water / other fluids 10-15 minutes before event. 3. Empty their bladder 15 minutes prior to the event is a must. 4. Athletes should drink cool water during the event as it is absorbed faster and cools the body better than water at room temperature.

During-Event Hydration: 1. Athletes should drink 150 ml to 250 ml every 10-15 minutes to maintain fluid balance. 2. Athletes should sip the water, and not gulp it down. 3. Warmer fluids are appropriate when ambient temperatures are cool to cold. 4. Glucose and sodium are combined to promote rapid absorption from the small intestine. 4. Diluted fruit juice and electrolyte glucose drinks may be best when

fluids and energy are needed immediately. They will also help with endurance exercises lasting longer than 90 minutes. 5. Electrolytes, like sodium and potassium, are important because they are used by the cells to maintain voltage across their cell membrane and carry electric impulses to other cells. During physical activity sweat losses can be quite heavy depending on the environment. Along with water there is also loss of electrolytes, mainly sodium and potassium. These are replaced in food but if the loss is heavy it can be met from sports drinks (which generally contain sodium chloride and potassium chloride), tender coconut water, fresh fruit juices, sugarcane juices, preparation made of honey salt and water etc.

The Pre-Event Meal: A pre-Event meal three to four hours before the event allows for optimal digestion and energy supply. Most authorities recommend small pre-event meals that provide 500 to 1,000 calories. The diet should provide adequate carbohydrates to maximize glycogen stores. With proper planning of the pre-event meal it is possible to prevent weakness and fatigue and ward off hunger. The contents of the pre-event meal will depend upon the time of the event.

Morning Event: The meal at night should be a high carbohydrate meal. The breakfast should be light consisting of, for example, cereals with non-fat milk, fresh fruit or juice, toast, low fat yogurt, etc.

Afternoon Event: The dinner at night and the breakfast in the morning should be high carbohydrate meals. The lunch should be light and consist of salads, sandwiches, fruits, juices etc.

Evening Event: The breakfast and the lunch should be high carbohydrate meals followed by light meal or snacks like pasta, soup, baked potatoes, yogurt, etc.

Cola, Coffee, Tea contain caffeine should be avoided as it may lead to dehydration by increasing urine production. The psychological aspect of eating foods which one enjoys and tolerates well before an event should be kept in mind.

The Post-Event Meal: Regardless of age, gender or sport, the post-game competition meal recommendations are the same.

Following a training session or competition, a small meal eaten within thirty minutes is very beneficial. The meal should be mixed, meaning it contains carbohydrate, protein, and fat. Protein synthesis is greatest during the window of time immediately following a workout and carbohydrates will help replenish diminished glycogen stores.

For Athletes consuming food within the 30 minute window may be difficult, as they often experience nausea or lack of hunger. To overcome this difficulty they should consume liquid smoothies and beverages that provide high protein and carbohydrates for replenishment. e.g. Chocolate milk. Fruit, popsicles, oranges, bananas, melon, or apple slices all would be better than not consuming any food.

Conclusion:

Athletes are always looking for an edge to improve their performance, and there are a range of dietary strategies available. Dietary recommendations should be individualized for each athlete and their sport to ensure optimal performance. Athletes must fuel their bodies with the appropriate nutritional foods to meet their energy requirements in competition, training and recovery. If these nutritional needs are not met, there is an increased risk of poor performance and health issues. It is vital to educate the sportsperson about the dietary pattern. It is necessary to maintain nutritional conditioning not only for athletic events, but all the time. Lifelong good nutrition habits must be emphasized. It needs to be mentioned however that no one food or group of foods works for everyone. Each athlete has to discover at the time of training which food/foods work best.

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