

Composition of Protein Supplements - A Web Based Survey

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Abstract: **Background:** Protein is one of the most popular dietary supplements marketed to athletes. Protein supplements are promoted to increase muscle mass, prevent protein catabolism and enhance glycogen resynthesis. **Methodology:** The objective of the study was to explore the composition of protein supplements in terms of protein content, source and cost. All the supplement stores in Vadodara were identified and all protein supplements from their websites were listed. The details of these products were collected from official websites of the respective brands. Products that did not provide Nutrition Facts Panel were excluded. **Results:** In all, 59 products from 15 brands were surveyed which were in the form of powder (83.05%), bar (13.56%) and beverage (3.39%). The serving sizes varied from 24g to 72g for powders which have to be reconstituted into beverage by adding to milk or water. Serving sizes for bars ranged from 50-80g and for beverages from 414-429ml. Protein content per 100g of product was 80-90g in 11.7%, 70-80g in 30% and 60-70g in 25% of the products. The top protein sources were whey protein concentrate (58.33%), whey protein isolate (50%), milk protein concentrate (23.33%), milk protein isolate (21.66%) and micellar casein (20%). The cost per gram of protein ranged from INR 1.71 to 11.78 for powders and INR 4.95-13.9 for bars. Of the total products, 71.67% contained only sugar, 28.3% only sweetener and 61.6% sugar plus sweetener. Directions for use were not indicated on 20% of the products. **Conclusion:** The most common source of protein was whey protein concentrate and the protein content of majority of the products ranged from 70-80%.

Keywords: Protein supplement, Protein bar, Protein beverages, Protein content, Protein sources, sports supplements

1. Introduction

A dietary supplement is a commercially available product that is consumed as an addition to the usual diet and includes vitamins, minerals, herbs, amino acids, and a variety of other products/nutrients. A large number of athletes were demonstrated to be consuming dietary supplements even in the earliest of studies. United States sales of dietary supplements increased from \$US 4 billion in 1994 to \$US 33 billion in 2012 which is an eightfold increase over 18 years. Moreover, the Global sales of supplements was worth \$US 96 billion in 2012 [1]. Dietary supplements are intended to improve sports performance and recovery following exercise in athletic population [2].

With the supplement market being what it is today, supplements are readily available to athletes and are more accepted within the athletic culture [3]. Athletes prefer dietary supplements depending on the nature of the physical activities of the respective sport and the desired outcomes from the product. There is a huge range of sports supplement products and the most popular among them are sports drinks, minerals, caffeine, Protein, Coenzyme Q10, and Creatine [4]. Competitive or elite athletes perform intense and prolonged physical activity frequently and often report that the primary reason for using dietary supplements is to enhance performance or recovery from exercise [1].

Protein is an essential nutrient in the diet and is used to manufacture body proteins that have important structural and functional roles. Endurance athletes in heavy training require extra protein to cover a small proportion of the energy costs of their training and to assist in the repair and recovery process after exercise. Strength athletes, who are interested in gaining muscle size and optimize its function, require more protein in the early stages of very intensive resistance exercise. Adolescent athletes being in the growing

phase also have additional protein requirements [5]. Protein supplementation has both been demonstrated to increase strength and lean body mass. Protein intake in combination with resistance training augments gain in fat-free mass [1]. Emerging research looking into milk proteins, whey and casein, points to a role of protein in assisting post exercise fluid retention [6].

The sports supplements market is flooded with Protein supplements. Various sources of Protein of animal and vegetarian origin are utilized in them. Many protein supplements are very expensive primarily due to the amount of marketing that accompanies products and the processing [5]. Despite the diverse composition of available protein supplements, not enough Research has been undertaken to explore the same.

2. Methodology

The objective of the study was to explore the composition of protein supplements available in the Sports Supplement stores. The composition of these products was studied in terms of protein content, source and cost. All (three) the sports supplement stores in the city of Vadodara, Gujarat, India were identified. All protein supplements from the websites of these stores were listed. Further, the detailed composition of these products was accessed from official websites of the respective brands. Products that did not provide Nutrition Facts Panel were excluded from the study.

3. Results and Discussion

In all, 59 products were surveyed for their protein content, the source of protein utilized and the cost of these products. These products belonged to 15 different brands. The products were in the form of Powder, Bar and Beverage. The supplements available in powder form have to be

reconstituted into beverage by adding to milk or water. Most of them recommend one serving to be added to 250-350ml water or milk (if the individual has additional calorie requirements). These products are available in various flavors and pack sizes. The bars are supposed to be consumed one at a time. These are recommended to be taken as snacks in between major meals. Those supplements which are in beverage form are ready to drink formulas. Like the powder forms, beverages are also available in various flavors and pack sizes. The bars and beverages are ready to use therefore have an added advantage over powders. Figure 1 shows the percent distribution of various forms of products.

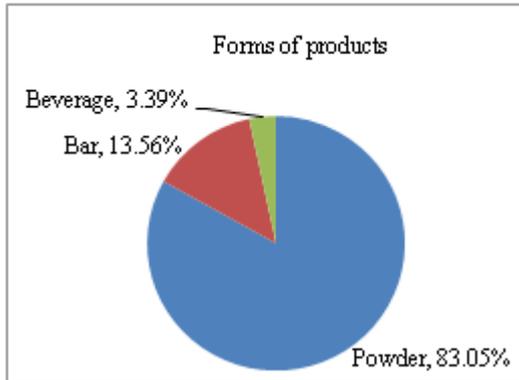


Figure 1: Percent distribution of various forms of Protein supplements

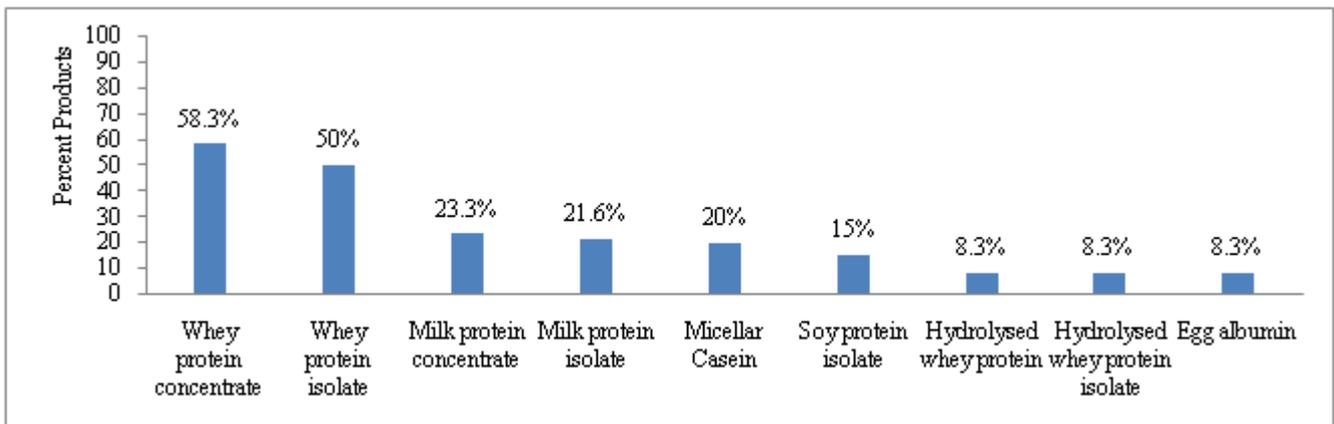


Figure 2: Source of Protein in the Supplements under Study

The top sources of protein depicted in the Figure 2 are discussed here forth. Amongst the top nine sources of protein found in the surveyed products, only one (11.1%) was of vegetarian origin (Soy protein isolate). Seven (77.8%) protein sources were of milk origin and one (11.1%) was egg based. Whey proteins have a strong position in the sports nutrition market based on the purported quality of proteins and amino acids they provide [8]. Whey protein has high amount of essential amino acids, branched chain amino acid, particularly leucine and has rapid digestibility [9]. Whey is the translucent liquid part of milk that remains following the coagulation and curd removal process of cheese manufacturing. From whey, whey proteins are separated and purified using various techniques yielding different concentrations of whey proteins [10]. Whey is one of the two major protein groups of milk, accounting for 20% of the milk protein while casein

Table 1: Range of Serving size and Cost per gram of protein of all the forms of Products

Variable	Powder (n=49)	Bar (n=8)	Beverages (n=2)
Serving size (g/ml)	24-72	50-80	414-429
Cost per gram of Protein (Rs)	1.71-11.78	4.95-13.9	6.17-7.11

As mentioned in table 1, the serving size of powder form of supplements varied largely. This could be due to the varied protein to carbohydrate ratio across products. As the serving sizes, Protein content and cost per serving vary with products, cost per gram of protein was calculated rather than cost per serving of product. Cost per gram of product also depicted a diverse picture within and between all the forms of products. A study by Moughan (2013) stated that the financial costs of protein products are highly variable, as are the costs of protein-containing foods [7].

accounts for the remainder. All of the constituents of whey provide high levels of essential and branched chain amino acids and rapidly elevate plasma amino acids, thus providing foundation for preservation of muscle mass [11]. There are three main forms of whey protein namely whey protein, whey protein concentrate and whey protein isolate. Whey concentrate typically contains more biologically active components and proteins [12]. Whey protein isolates contain protein concentrations of 90% or higher. Processing of whey protein concentrate into whey protein isolate leads to significant removal of fat and lactose. As a result, individuals who are lactose intolerant can often safely consume it. Hydrolyzed whey protein is predigested whey and it typically releases amino acids at a faster rate. The increased bioavailability of hydrolyzed whey further enhances the muscle protein synthesis.

Milk protein concentrates are dairy proteins containing both casein and whey proteins that are available in protein concentrations ranging from 42% to 85% [12]. Although ultra-filtration is the preferred method for producing milk protein concentrates, they can also be produced by precipitating the proteins out of milk or by dry blending the milk proteins with other milk components [13]. Compared to skim milk powder or whole milk powder, milk protein concentrates are higher in protein and lower in lactose. Casein exists in milk in the form of a micelle, which is a large colloidal particle. In athletes supplementing their diets with additional protein, casein has been shown to provide greatest benefit in terms of increase in protein synthesis for prolonged duration [12].

Soyabean can be separated into three distinct categories; flour, concentrates and isolates. Of these three categories,

soy flour is the least refined form. While retaining most of the bean's protein, concentrates do not contain as much soluble carbohydrates as flour, making it more palatable. Soy isolates are most refined soy protein containing highest protein content but unlike flour and concentrates, contains no fibre. They are easily digestible. Soy protein isolate contains maximum i.e. 90% protein, followed by soy protein concentrate (70%) and soy protein flour 50%. [12].

Products containing egg albumin as a protein source are low on fat and carbohydrates. Egg protein is of high biological value and as it is digested even slower than casein and results in longer release of amino acids in the blood. In a study carried out by Hida et al (2012), egg white protein supplementation caused a significant increase in resistant muscle strength [14].

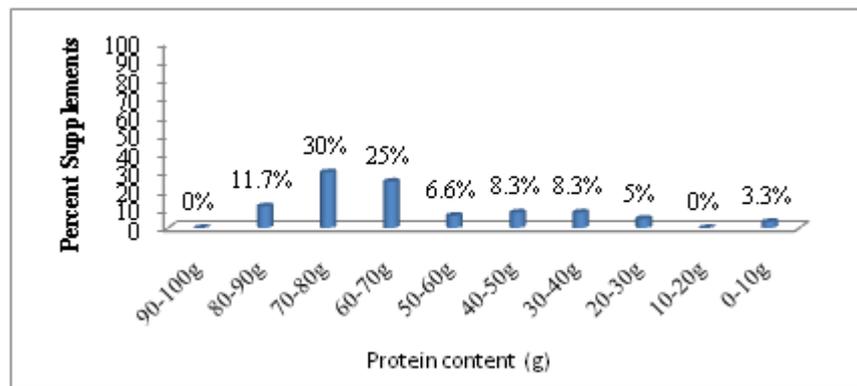


Figure 3: Protein content per 100g of Supplements

Amongst the protein supplements surveyed, the protein content per 100g of supplement varied largely as demonstrated in Figure 3. Maximum i.e. 30% products contained protein in the range of 70-80g. The products in the range of 80-90g protein (11.7%) were all of animal origin. The products containing protein below 10g were beverages. The supplements having protein content between 20 to 30g were bars. The highest protein content was 90g in a powder form product.

Figure 4 illustrates the presence of sweetening agents added to the products. Sweeteners are added in order to reduce the calorie content of the product. Some products had sweeteners as the main sweetening agent plus sugar in very minute quantity. Amongst those products that contained

sweeteners, 87% had Sucralose, 15% had Stevia and 43% had Acesulfame Potassium. Sucralose is the only noncaloric sweetener made from sugar and is about 600 times sweeter than sugar. It is minimally absorbed by the body. It is approved by both the Food and Drug Administration and Prevention of Food Adulteration Act. Stevia is a sweetener used as sugar substitute extracted from the leaves of plant species *Stevia Rebaudiana* and is about 150 times sweeter than sugar. Acesulfame Potassium is a non-calorie sweetener with a clean, quickly perceptible sweet taste. It has good solubility and is 200 times sweeter than sugar. In 2003, it was approved by the United States Food and Drug Administration [15].

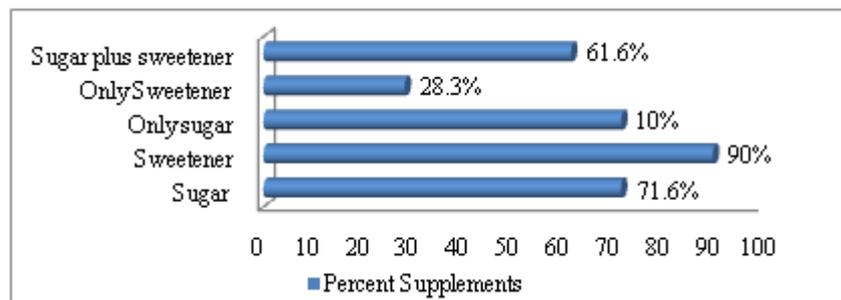


Figure 4: Presence of Sugar/Sweetener in Protein Supplements

Directions for use indicate the way in which the product has to be consumed. The products in powder form were

recommended to be added to either water or milk and turned into a shake. Bars and ready to drink beverages carried the

recommended use to be consumed one serving at a time. Directions for use were not indicated on 20% of the products. This may be considered a drawback of the product as the consumers would be forced to consume the supplement in their own different ways.

4. Conclusion

Majority (83.05%) of the surveyed Protein supplements were in the form of powder. The most common source of protein was whey protein concentrate and the protein content of majority of the products ranged from 70-80%. Artificial Sweeteners replaced sugar in 28.3% of products indicating their increasing popularity to target the calorie conscious population. With the products having a wide range of cost per gram of protein and the origin of protein source (plant, animal and egg based) consumers definitely have a broad spectrum of supplements to choose from.

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Author Profile



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