THE ATHLETE'S NUTRITION: IS THERE A DEMAND FOR THE PHARMACIST'S ADVISORY SERVICES?

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Introduction

Information about how well-balanced the athlete's diet is, is limited. Athletes look for any competitive edge through training and dietary manipulation. At the very basic levels good nutrition plays an important role in the maintenance of health, allowing the athlete to train and compete. Beyond health maintenance, nutritional considerations include adequate hydration, weight maintenance, adequate carbohydrate intake, supplement taking and pre-exercise and post-exercise nutrition (Grandjean, 1989).

In nutrition many beliefs and misconceptions exist with respect to athletic performance. By describing the dietary patterns of competitive athletes, a better understanding of nutritional habits would be obtained.

The purpose of this study was to determine whether local athletes have any notion of the basic food groups in their diet and thus recommendations can be made to ensure an appropriate diet among the athletes.

A survey was carried out to describe the food selection of athletes competing in endurance (low-intensity aerobic exercise) and non-endurance (high-intensity aerobic exercise) events on the local scene.

One other important purpose of the investigation was to describe the supplementation practices among athletes in relation to the diet. This study also endeavours to assess the pharmacist's validity as a professional educator on the issue of supplementation.

Methodology

Subjects

This survey was restricted to competitors in the full and half marathon, middle and short distance races, javelin and discus throws and shot put. 65 male and female amateur athletes selected at random from among participants in the fifth Malta Marathon and the Small Nations Games in Andorra completed the questionnaire. 55 athletes competed in the local full marathon - 41.95km (26.219 miles) - and half marathon - 20.96km (13.10 miles). The remaining 10 athletes took part in the events held at Andorra in the Small Nations Games. These events included the long-jump, javelin and discus throws, shot put, 5km and 10km races, 100m and 200m races, 4 x 100m relay races, 800m and 1500m race.

Out of the 55 athletes who took part on the national level, 46 were males and 9 females. One of 10 athletes who competed abroad, 5 were males and 5 were females. The overall age range was between 16-62.

Data collection instrument: The data gathering instrument was a 2-part food-frequency questionnaire.

The survey was structured thus:

A: Part 1 covering 1 - 7
Questions 1 - 4 dealt with the athletes' response to different food groups. Question 1 assessed his preference in choice from breads and cereals, and milk and milk products. Question 2 considered meats, fish, poultry and alternatives. Question 3 dealt with fruits and vegetables. Question 4 described the athletes' intake of various cheeses.
Questions 5 and 6 dealt with the athletes' habits and preferences as to preparation of foods within the groups.
Question 7 recorded the athletes' intake of confectionery products.

B: Part 2 covering questions 8 - 20
These questions were devoted entirely to sports related practices which include fluid intake, supplement taking, carbohydrate loading, pre-game meal, and diet related questions and the athletes' exposure to nutrition information and the pharmacist.

The four food group system was used as the basis for nutritional assessment. The athletes were asked to record how often foods in each of the 4 food groups were consumed. The final information gathered from the relative replies would collect enough data to help assess and therefore help improve the eating habits of the Maltese athletes.

Besides the nutrition of the athlete, the amount of fluid intake before, during and after an event was assessed. The athlete answered from a choice of fluids which included - mineral drinks, water, fruit squashes, juices and nectars, electrolyte preparations and others.

Also the survey asked a question upon the athletes' intake of a pre-game meal. The question details the type of such a meal: whether it is carbohydrate-based, meat-based or else a liquid meal. The number of hours prior to the event during which it was consumed were recorded.

Questions related to the consumption of supplements were also included. The survey tried to elicit from the athlete whether such supplements were prescribed by a doctor, pharmacist or therapist; or whether these were taken on his own initiative, upon colleagues' suggestions or through influence from advertisements besides other reasons which she or he would have indicated. The athletes were also questioned on the reasons behind their supplement taking. The system of carbohydrate loading and its usefulness during the event concluded this part of the survey. The final part of the survey assessed the athletes' knowledge about nutrition, throughout training and prior to the event. Also the role of the pharmacist in the sports environment of a particular athlete was established, to assess his validity as a professional educator on the subject of nutrition and supplement taking.

Procedure

A total of 120 questionaires in the Maltese language were distributed by post to local athletes which were randomly selected from among the participants of the fifth Malta Marathon held in February '91. Out of these 120 participants, 100 were males and 20 were females. Another 14 questionnaires were mailed to all male and female athletes taking part in the Small Nations Games held in Andorra in May 1991: 7 were males and 7 were females. Subjects had considerable time to complete the 20 item questionnaire. It can be safely assumed that most of the participants took 30-45 minutes to answer the whole questionnaire. Answers were recorded directly on typed booklets.

Out of 134 questionnaires mailed, 65 were returned but only 64 were considered to be valid. Out of these 64, 54 were local athletes competing in the Fifth Malta Marathon and the remaining 10 were athletes competing in the Small Nations Games.

The percentage response was as follows:

		Number	Percentage
*	Overall response (n=134)	65	48.5%
	For women (n=28)	14	50.0%
	For men (n=106)	51	48.1%

* This percentage proves to be low despite continuous reminders by mail and phone calls.

Results and Discussion

Suplementation

Vitamin Supplements

Out of the 64 competitors who completed the questionnaire, 45.3% acknowledged the intake of vitamin supplements. Vitamin supplementation figures derived from data collected from the athletes participating in the survey are shown in Table 1 below according to combinations of supplementation.

Table 1: Vitamin supplementation by the 29 athletes (n=64)

Combination	Number of Vitamins	Percentage
Vitamins only	5	7.8
Vitamins and minerals, amino acids and ergogenic aids	2	3.1
Vitamins, minerals and ergogenic aids	6	9.4
Vitamins, minerals and amino acids	3	4.7
Vitamins, ergogenic aids and amino acids	2	3.1
Vitamins and minerals	5	7.8
Vitamins and ergogenic aids	2	3.1
Vitamins and amino acids	4	6.3
Total	29	45.3%

Table 2 below groups supplements in 4 classes as indicated and shows athletes intake of one of the classes of vitamins shown.

Out of 29 athletes, 11 are consuming supplements which are fat-soluble. Fat-soluble vitamins when consumed, are stored for months in the liver and if taken on a regular basis especially in mega doses (i.e. 10 times the recommended daily allowance - RDA), tend to accumulate, eventually leading to toxicity.

Even water-soluble supplements taken in excess of the RDA can lead to toxicity. This could be a problem for the 18 athletes who consume these types of supplements.

Table 2: Numbers and percentages of athletes reporting use of supplements

Class		Number of athletes	Percentage
Vitamin supplements:			
a. Both fat- and water-soluble		10	34.5
b. Fat-soluble only		1	3.4
c. Water-soluble only		8	27.6
d. A multivitamin supplement		10	34.5
	Total	29	100.0%
Mineral supplements:		19	29.7
	Total	19	
Ergogenic aids		16	25.0
	Total	16	
Amino Acid Supplements		18	28.1
	Total	18	

Mineral supplements

As in the case of vitamins, a relatively high percentage of athletes (i.e. 19 out of the 64 athletes) take these supplements without considering the damage that excess consumption of some of these minerals can bring about. An athlete should know that a diet containing a good variety of foods, should be adequate in these essential nutrients.

Ergogenic aids

There is no scientific proof that these products do in fact improve the efficiency of an athlete's activity. However, on the other hand, if the athlete has a well-balanced diet, these do no harm provided there are no contra-indications to their use. Their role is essentially psychological

and the athlete may improve his performance believing he is actually benefitting from their intake (Table 2 under ergogenic aids).

Amino acid supplements

There is no evidence that protein or amino acid supplements are necessary or that they improve muscle size or strength (Bean and Smeaton, 1990). However, this percentage indicates a lack of knowledge on the part of the athletes that, if they are consuming a healthy diet from the four food groups, than there is no need for extra supplementation of this kind (Table 2 under amino acid supplements).

Table 3 classifies the combinations of supplementation by athletes. These reasons can be divided into 2 main areas - one area concerns professional advice coming from the medical doctor, pharmacist or physiotherapist; the other area concerns non-professional advice which may include another athlete's advice, influence from advertisements or personal initiative.

It is worth noting that out of the 23.7% athletes mentioned above none sought the advice of a pharmacist suggesting that the athletes are not aware that one of the most important roles of the pharmacist, even in the sports world, is to give professional advice be it regarding supplement, the intake of electrolyte and carbohydrate drinks, liquid pre-game meals or nutritional advice. This last point mentioned, i.e. nutritional advice, gives rise to yet another deficiency in the knowledge of athletes.

It was found that athletes have various misconceptions to justify the intake of supplements. From the survey it resulted that these could be (a) a belief that performance is improved - 55.3% i.e. 21 athletes (n=38); (b) a conviction that they should form part of the daily diet to ensure there will be no deficiencies - 36.8% i.e. 14 athletes (n=38); (c) reduction of incidence of disease - 7.7% i.e. 3 athletes (n=38).

Pre-game Meal

The sample shows 2 types of athletes competing:

1. Those competing in high-intensity anaerobic exercise (n=10 athletes)
2. Those competing in low-intensity aerobic exercise (n=54 athletes)

Table 4 represents a summary of the consumption or non-consumption of a pre-game meal by athletes falling under categories (1) and (2) as explained above. Table 5 shows the habits of the 54 athletes of category (2) concerning the choice of a pre-game meal, i.e. whether carbohydrate-based, protein-based or liquid type of meal. Fig. 2 shows how the 32 athletes interviewed who confirmed the consumption of a pre-game meal, prefer this meal to be: carbohydrate-based, protein-based or else a liquid meal.

Table 3: Supplementation by 38 athletes (n=64)

Combination	Number of athletes	Percentage
Vitamins only	5	7.8
Minerals only	1	1.6
Ergogenic aids only	1	1.6
Amino acids only	3	4.7
Vitamins and Minerals and Amino acids and Ergogenic aids	2	3.1
Vitamins and Minerals and Ergogenic aids	6	9.4
Vitamins and Minerals and Amino acids	3	4.7
Vitamins and Ergogenic aids and Amino acids	2	3.1
Vitamins and Minerals	5	7.8
Vitamins and Ergogenic aids	2	3.1
Vitamins and Amino acids	4	6.3
Minerals and Ergogenic aids and Amino acids	1	1.6
Minerals and Amino acids	1	1.6
Ergogenic aids and Amino acids	2	3.1
Total	38	59.5

Table 4: Consumption/Non-consumption of a pre-game meal by athletes falling under Categories (1) and (2)*

Category		Number of athletes
Category (1) (n=10)		
Pre-game meal not consumed		4
Pre-game meal consumed		6
	Total	10
Category (2) (n=54)		
Pre-game meal not consumed		22
Pre-game meal consumed		32
	Total	54
Type of meal		
Carbohydrate-based		22
Protein-based		7
Liquid meal		3
	Total	32

* Category (1) includes athletes competing in high-intensity anaerobic events.
Category (2) includes athletes competing in low-intensity aerobic events.

Fluid Intake

The athlete's drinks (which are normally taken before and after an event) can be classified into one of four categories:

1. water - ordinary and mineral;
2. carbohydrate drinks - squashes, juices, nectars, soft drinks;
3. electrolyte drinks;
4. carbohydrate - electrolyte beverages.

Table 5: Habits of the 54 athletes of category (2) concerning consumption of a pre-game meal

Category (2) athletes Type of Meal	(a)	Number of athletes (b) (i)	(ii)	(iii)	Fasting (c)
Carbohydrate-based	3 - 4	15	5	2	
Protein-based	5 - 6	1	6	0	
Liquid meal	1 - 2	1	0	2	
	Total	17	11	4	
Overall		32			22

(a) Recommended hours prior to event for consumption
(b) Consuming pre-game meal -
(i) Hours as recommended
(ii) Hours less than recommended
(iii) Hours more than recommended
(c) More than 7 hours

Low-intensity events

Fluid consumption before prolonged exercise

Although evidence is incomplete, it appears that the consumption of carbohydrate solutions immediately before prolonged exercise (in this case, in the case of full and half marathon) can help maintain normal or elevated blood glucose levels and positively affect endurance. Murray (1987) stated that such feedings resulted in a better performance than if the athletes had only ingested plain water.

The athletes who took part in the endurance events are 54, however 4 athletes said that they did not usually drink anything before the event. The remaining 50 drank as follows:

1. 14 athletes drank water and carbohydrate and electrolyte drinks
2. 8 athletes drank water and carbohydrate drinks
3. 21 athletes drank water only
4. 3 athletes drank carbohydrate and electrolyte drinks
5. 1 athlete drank carbohydrate drinks only
6. 3 athletes drank water and electrolyte drinks.

The 21 athletes who only drink water are advised to supplement with carbohydrate drinks in the light of what has been said above. Provided that athletes have a well-balanced diet, the ingestion of electrolytes does not result in a better performance by the athletes and is therefore a superfluous fluid intake.

Fluid consumption during prolonged exercise

19 of the endurance event athletes report that they do not drink during the event. However, the importance of drinking cannot be overstressed since dehydration can lead to such symptoms as nausea, headache, dizziness and thirst; more sever dehydration can lead to heat exhaustion and coma.

Fluid consumption after exercise

It appears that it is beneficial for rapid recovery from exhaustive exercise to consume fluids containing carbohydrates until gastric discomfort is noticed. Water replacement during recovery should be accompanied by adequate electrolytes to replenish those lost during exercise. In the case of endurance events, speed of recovery is not critical. In this instance, therefore the electrolyte need can usually be met by the athlete's ordinary diet.

The figures for athletes according to what they drink are as follows:

1. 16 athletes drank water only
2. 16 athletes drank water, carbohydrate and electrolyte drinks
3. 12 athletes drank water and carbohydrate drinks
4. 4 athlete drank carbohydrate drinks only
5. 3 athletes drank water and electrolyte drinks
6. 3 athletes drank carbohydrate and electrolyte drinks

The first 2 cases deserve some discussion. The intake of water only is not ideal and this should be supplemented with carbohydrate drinks. On the other hand athletes who are drinking electrolyte preparations need not do so since an ordinary meal eaten a few hours after the event provides the replenishment of electrolytes lost in sweat.

High intensity events

For athletes competing in the non-endurance events, where rapid recovery is important, the principal electrolytes lost in sweat i.e. sodium and chloride should be included in the recovery beverage in order to restore electrolyte levels to normal. In addition to the electrolytes, the beverage should also include water and carbohydrate, the latter being added to replenish depleted muscle glycogen stores.

The figures for athletes making up this group regarding their drinking methods are -

1. 6 athletes consume water, carbohydrate and electrolyte drinks
2. 1 athlete consumes water only

For the 3 athletes who took part in shotput, discus and javelin throws and long jump, fluid intake was not considered since duration of the exercise does not lead to excessive fluid losses.

Obviously because of what was discussed above, the athlete drinking water only is not replenishing electrolytes lost and depleted muscle glycogen stores.

Carbobydrates Loading

Regarding this topic, figures are based upon athletes which fall under category (2).

From the sample of 64 taken in reply to question number 17 of the survey, 25 athletes (n=54) confirmed that they followed the method of carbohydrate loading while 29 athletes (n=54) never tried the method. These 54 competitors took part in low-intensity aerobic events. Out of the 25 people who were familiar with and tried this method of glycogen loading 22 agreed that it was beneficial in the overall performance. The remaining 3 did not think that the method helped in any way in improving their performance. These figures show an overwhelming agreement on the part of users that this method does in fact boost muscle glycogen stores, resulting in an extension of endurance, even though strength is not affected. This method proved to be very popular with athletes involved in such events because it helps them overcome the problem of 'hitting the wall', i.e. when muscle glycogen stores become exhausted.

In the results given above it has been shown that 29 athletes (n=54) never tried the method of carbohydrate loading. This shows ignorance about the ideal substitution of athletes in their preparation for specific events. As has been shown above, the technique of carbohydrate loading would have been beneficial even to these 29 athletes. They are therefore at a serious disadvantage regarding both energy and fluid stores (Cogen 1986).

The remaining 10 athletes who fall under category (i) (Refer to Pre-Game Meal) of the 64 athletes took part in high intensity anaerobic maximal and supermaximal events. It resulted that none of these competitors ever tried the method of glycogen loading. This proves their knowledge that there is a great disadvantage in the use of this method. This because this kind of exercise, usually lasting less than one hour requires only normal glycogen levels (Costill 1988).

Food Groups

In this section of the study the recommendations made follow the recommended 'Balanced Diet' developed by the National Academy of Sciences, Food and Nutrition Board (Hock 1980).

Bread and Cereals

It is recommended that there should be at least 4 or more servings from the breads and cereals food group.

Regarding types of bread preferred by the Maltese athletes, the Maltese and fancy bread variety are still the most popular enjoying a majority of 39 athletes from among 61 who confirmed intake of bread. A further 22 athletes from the same group of 61 confirmed an inclusion of either brown and/or wholemeal bread and/or Maltese/fancy bread in the diet. This indicates that starchy unrefined foods such as wholemeal bread, wholegrain cereals, brown rice and wholewheat pasta, which should form an integral part of the daily diet, are not being consumed as recommended.

Meat, Fish, Poultry and Alternatives (eggs, nuts and seeds, pulses)

The recommended intake of this food group is 2 servings or more. The sample of athletes interviewed indicates the following results -

29 athletes who took 2 or more servings daily (n=64)
35 athletes who took less than 2 servings daily (n=64)

Red meat, especially beef consumption should be reduced. Out of the sample of athletes, 30 athletes from among the 64 who consumed meat, fish and poultry, consumed red meat in higher proportions than white.

In the sample it resulted that 8 athletes showed no preference to choice of meat and this does not reflect proper information about appropriate nutrition. 7 athletes out of 64 athletes took more of this food than the recommended 3-4 times/week. This recommendation is taken from the Report of the First Conference on Nutrition in Malta (August 1986) entitled 'Formulation of a nutrition policy'. This is more than a moderate consumption and levels of cholesterol are increased. This increase has been shown to reduce endurance capacity as well as increasing the risk of cardiovascular diseases once the athlete has stopped regular training. Ideally when meat is consumed, excess visible fat should be trimmed.

Milk and Milk Products

From the data collected in the survey it was found that -

1. a total of 22 athletes were deficient in this food group (n=64)
2. 17 athletes consumed an excess of the recommended number of daily servings
3. 25 athletes were within the recommended number of daily servings

The above 22 athletes followed a diet which is very low in fat, not recommended for sport activities with very high energy needs, especially marathon and half marathon participants. Visible fat should be reduced - butter, margarine, lard, oil, fats on meats and skin on poultry - whereas vegetable fats such as soya oil, cornflower oil, sunflower oil - are the fats recommended, being high in polyunsaturates. Tinned milk, having 9% fat was quite a popular source of fat in Malta even among athletes. In fact the survey showed that 19 out of 35 athletes consumed this high-fat milk variety. Fresh milk which had approximately 3% fat is considered to be medium in fat content. Among the athletes 31 out of 55 athletes consumed this type of milk. Skimmed milk having less than 1% fat should be the option of the athlete. However, only a mere 5 out of 55 athletes consume this variety of milk.

From the survey it has been shown that the high fat varieties of cheese, namely Cheddar and Emmenthal are favorites with the athletes registering 34 athletes out of 61. 22 athletes out of 61 consumed a lower fat variety of cheese, namely Edam and Processed, while 5 out of 61 consumed the lowest fat cheeses which were Cottage Cheese and Ricotta.

Fruit and Vegetables

From the 64 athletes interviewed, 45 took less than the recommended number of daily servings and 19 athletes consumed the required number of servings recommended.

It is recommended that athletes should make sure that their intake of this food group is within the recommended number of servings.

Weight Control

To compete effectively, athletes need to be of appropriate weight. The athletes participating in the survey have been divided as follows, according to their weight, under normal, underweight, overweight and very obese. These distinctions were possible by working out the body mass index (BMI) for each athlete. The division was as follows -

1.	Normal	45 athletes (n=64)
2.	Underweight	13 athletes (n=64)
3.	Overweight	4 athletes (n=64)
4.	Obese	1 athlete (n=64)
5.	Very Obese	1 athletes(n=64)

The 13 underweight athletes did not follow a weight gain programme to achieve desirable weight. 3 underweight athletes did not meet the daily requirement of 4 or more servings from the breads and cereals group. This is especially serious for an athlete whose diet should be high in carbohydrates. An athlete who is also underweight cannot expect to gain weight if a crucial food group is lacking.

Regarding the milk group, it has been found from this survey that 5 athletes who were underweight were not consuming the 2-4 daily servings required. Even in the meat group, there were 8 athletes taking less than the recommended number of daily servings. 11 athletes were consuming less fruits and vegetables than recommended.

Obviously these athletes need to improve these eating habits by sticking to the recommended number of daily servings suggested earlier. This also applies to overweight athletes (who amount to 4) who should take care that their diet is balanced throughout. In the sample it was found out that generally these athletes consumed excessive amounts of breads and cereals, whereas the meat group was taken in less than the recommended amounts. In order for these athletes to reach a normal weight, the proportions between the food groups mentioned previously, as in the case of the underweight athletes, should contribute the appropriate framework for the athlete to follow.

It should be noted that in the sample one very obese athlete who took part in the full marathon consumed excessive amounts of milk and milk products, and fruits and vegetables. However he registered less than recommended intake from the bread and cereal group.

Role of the Pharmacist

In Pharmacy there are a number of ways to dispense one's products. Dispensing includes not only a transaction where money is involved bu also professional advice on the part of the pharmacist which adds value to the product sold. The following outline the maxims in pharmacy practice -

- selling health, diet and drug related literature and books
- informing patients about quack remedies
- introducing a pharmacist who is confident and competent enough to answer questions about nutrition drug products
  providing a comfortable waiting area or a private area where pharmacists can talk confidentially to patients
- offering health screening procedures such as skinfold measures, periodic testing of vitamins and minerals to detect any deficiencies
- offering drug- and health-related information either verbally or in writing
- making trainers aware that certain legitimate OTC and prescription drugs can cause aberrant positive test results.

Conclusion

Athletes are thought to be the epitome of physical health and thus their nutritional status is presumed to be superior to that of the nonathletic population. It can be said that few athletes follow the best dietary

pattern for optimal sports. From the survey it results that more than half of the population i.e. 54.7% (n=64) are deficient in the meat group and on the other hand 70.3% (n=64) of athletes do not take the recommended daily servings from the fruits and vegetables food groups. It has also been found that 23.4% (n-64) of athletes take less than recommended from the breads and cereals food group.

Experts generally agree that the same basic dietary principles the promote good health for the general public will maximise performance for most athletes.

From this dietary survey there is no evidence that a distinct dietary pattern is spontaneously adopted by athletes. The ranges of protein, fat and carbohydrate intakes exhibited by athletes suggest that a wide variety of dietary behaviour is at least compatible with, if not optimal for, sports activity. Moreover variations in dietary behaviour presumably reflect individual tastes and attitudes, rather than any common knowledge about optimal nutrition for sports performances. The overall impression is that national dietary customs have the predominant influence on athletes' diets. There is no hard and fast evidence that participants in sports generally select healthier diets than less active people.

Pharmacists need to move boldly into the area of proper nutrition among athletes. Besides, the role of the pharmacist requires that they also give their professional advice to people who work close to the athletes, these being coaches, trainers, physiotherapists and team physicians. The pharmacist is also in a position to advice sports enthusiasts on nutritional quackery which is continuously bombarding them.

References

Bean, A. and Smeaton, I. Nutrition and Sports Performance. Information Sheet no 18. Community Nutrition Group 1990; 1-19.

Colgan, M. Effects of Mulnutrition Supplementation on Athletic Performance. In Katch, F.I. (ed.) Sport, health and nutrition. Champaign, Ill. Human Kinetics Publishers 1986; 21-50.

Costill, D.L. Nutrition and Dietetics. In, The Olympic Book of Sports Medicine Vol. I, edited by Dirix, A., Knuttgen, H.G., Tittel, K. Blackwell Scientific publication 1988; 603-634.

Formulation of a Nutrition Policy. Report of the First Conference on Nutrition in Malta. WHO regional office for Europe; 1-35.

Garrow, J.S. Introduction. In, Treat Obesity Seriously edited by Garrow, J.S. Churchill Livingstone 1981; 1-7.

Grandjean, A.C. Macronutrient intake of US athletes compared with the general population and recommendations made for athletes. American Journal of Clinical Nutrition 1989; 49 (5 suppl.): 1070-1076.

Heck, K. Nutrition, Diet and Weight Control for athletes. Journal of Physical Education and Recreation, Vol. 51, No. 6, 1980; 43-55.

Murray, R. The Effects of Consuming Carbohydrate-Electrolyte Beverages on Gastric Emptying and Fluid Absorption During and Following Exercise. Sports Medicine (Auckland) 4(5). Sept./Oct/ 1987; 322-351.