

# Intake of Nutritional Ergogenic Aids among Malaysian Team Sport Athletes

Ling Li Keat, Hazizi Abu Saad, and Chee Huei Phing

**Abstract** — Substantial evidence denotes the ignorance of athletes concerning their required nutritional practices, as disclosed by the extensive use of nutritional ergogenic aids to enhance performance. There has been extensive information on the use of nutritional ergogenic aids among athletes in Western countries. However, little is known about the nutritional ergogenic aids used among Malaysian athletes. This study was to evaluate the intake of nutritional ergogenic aids among team sport athletes in the National Sports Institute, Malaysia. A total of 120 team sport athletes out of 400 athletes in the National Sports Institute, Malaysia were invited to participate; they consisted of football, hockey, and *Sepak Takraw* athletes. There was a significant moderate positive correlation between age ( $r=0.415$ ,  $p=0.01$ ) and year of participation ( $r=0.446$ ,  $p=0.01$ ) with the number of nutritional ergogenic aids taken by the subjects. There was a significant weak positive correlation between physical activity level ( $r=0.231$ ,  $p=0.05$ ) and the number of nutritional ergogenic aids taken by the subjects. In addition, there was a significant association between gender and the nutritional ergogenic aids used among the subjects ( $\chi^2=18.207$ ,  $p<0.001$ ). There was a significant association between type of sports and nutritional ergogenic aid intake of the subjects ( $\chi^2=31.264$ ,  $p<0.001$ ). The study indicated that the prevalence of nutritional ergogenic aids used among team sport athletes in the National Sports Institute, Malaysia was lower (59.7%) when compared to previous studies conducted in Western countries, and even in Singapore, with sports food and drinks (45.5%) as the most commonly used nutritional ergogenic aids, followed by vitamins and minerals (27.3%) and protein (24.7%).

**Keywords** — Ergogenic aids, Malaysia, National athletes, Team sport

## I. INTRODUCTION

Nutritional ergogenic aids, or sports supplements, are a supplementary source of nutrients meant to modify body composition or enhance physical performance. Thus, they have frequently been employed in the sports industry. The desire to accomplish better performance has made the intake of nutritional ergogenic aids very appealing for athletes and individuals who are involved in gym activities (Goston & Davisson, 2010).

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Substantial evidence indicates the ignorance of athletes regarding their required nutritional practices as revealed by the substantial intake of nutritional ergogenic aids to enhance performance. The general inappropriate practices comprise unregulated ingestion of amino acid supplements, protein supplements, pseudo-vitamins (carnitine, inositol, and lecithin), vitamins and minerals supplements, and sports drinks. Hence, it is essential to study and assess the dietary patterns of athletes in their daily routines.

There has been considerable information on the nutritional ergogenic aids consumed among athletes in Western countries. Yet, little is known about the intake of nutritional ergogenic aids among Malaysian athletes. Hence, this study aimed to evaluate the intake of nutritional ergogenic aids among team sport athletes in the National Sports Institute, Malaysia.

## II. MATERIALS AND METHODS

### A. Study location

The study was carried out at the National Sports Institute, Malaysia, which is situated in National Sports Complex, Bukit Jalil, Malaysia. The National Sports Institute, Malaysia, an agency under the Ministry of Youth and Sports, is a pioneer of excellence and advancement in national sports science, technology, and medicine.

There were six major categories of sports available in the National Sports Institute, Malaysia: combat, endurance, paralympic, power, racquet, and team. In addition, there were around 400 athletes who were undergoing training at the institute.

### B. Sampling

The National Sports Institute, Malaysia was purposely selected as the study location. A list of the sports categories available in the National Sports Institute, Malaysia was obtained. Team sports were the category selected, as the team sports category represent team sports. A total of 120 team sports athletes out of 400 athletes in the National Sports Institute, Malaysia were invited to participate; they consisted of football, hockey, and *Sepak Takraw* athletes (Fig. 1). Male and female team sports athletes aged between 18 and 30 years were recruited. On the other hand, team sports athletes who were pregnant, were diagnosed with diet-related chronic diseases, were part-timers, or refused to participate were excluded from the study.

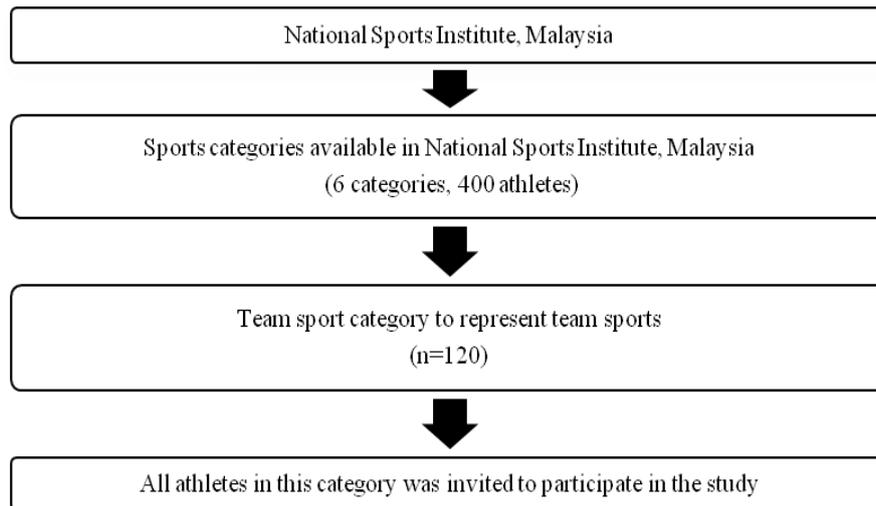


Figure 1: Sampling procedure

### C. Sample size calculation

The sample size required for the study was computed based on the sample size calculation formula by Cole (1997).

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2}{d^2 / (1 - d^2)} + 5$$

Where d = correlation between age and supplement intake (sports achievements), 0.41 (Rodek, Sekulic, & Kondric, 2012).

Based on the calculation, the minimum sample size required was 57 athletes.

### D. Procedures

Ethical approval was granted by the Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia. Permission to carry out the study at the National Sports Institute, Malaysia was obtained from the Sports Research and Innovation Department of the National Sports Institute, Malaysia. Furthermore, all subjects provided informed consent prior to data collection. The study was carried out from January to February 2014 (Fig. 2).

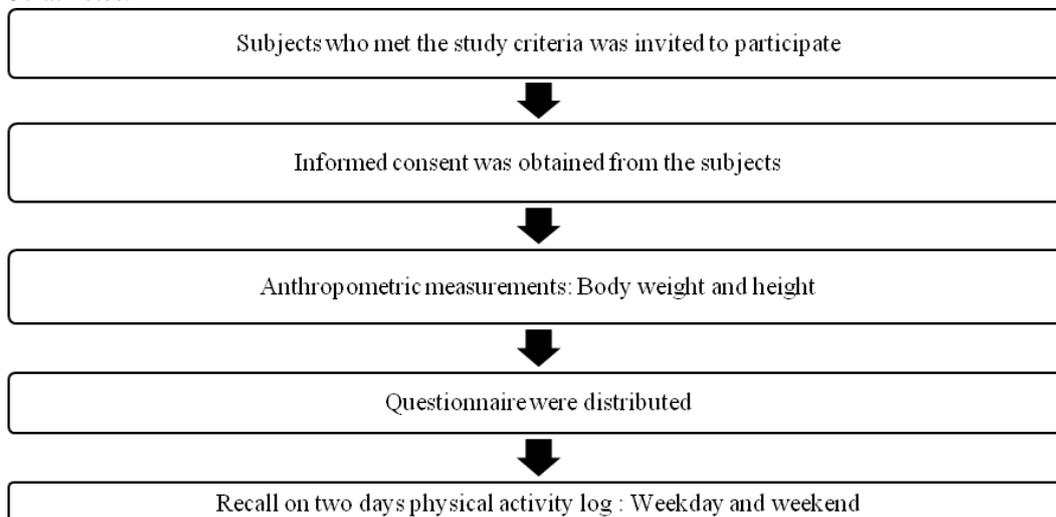


Figure 2: Data collection procedures

### E. Measurements

#### 1) Anthropometric measurements

Subjects' body weight and height were measured by using a Tanita Digital Weighing Scale and a Seca Body Meter, respectively.

#### 2) Socio-demographic characteristics

Subjects' socio-demographic characteristics, such as age, gender, ethnicity, marital status, and education level, were collected via a pre-tested questionnaire.

#### 3) Type of sports

The information on type of sports and year of participation in the specific sports of the subjects were obtained using the questionnaire.

#### 4) Physical activity level

The physical activity log was employed to evaluate the subjects' physical activity energy expenditure. The physical activity log was formulated according to a modified version of the Bouchard Physical Activity Record. Subjects were required to recall their physical activity and duration as

performed for two days (one weekday and one weekend day). For data analysis, the physical activity that was performed was converted into a Metabolic Equivalent (MET). The harder the body works during physical activity, the higher the MET value (Reed & Hill, 1996). The computation of physical activity energy expenditure by using MET formula is as shown below:

$$\text{Energy Expenditure per minute} = \text{MET minutes} \times (\text{body weight in kilograms} / 60)$$

(Ainsworth et al., 2011)

Furthermore, the physical activity level was computed by dividing the total daily energy expenditure by the basal metabolic rate (BMR) (Ismail, Ng, Chee, Roslee, & Zawiah, 1998). The calculation was based on the following formula:

BMR for males aged between 18 to 30 years (kcal/day):  
 $15.057 \times \text{body weight} + 692.2$

BMR for females aged between 18 to 30 years (kcal/day) =  
 $14.818 \times \text{body weight} + 486.6$

Physical activity level was grouped into three categories, sedentary or light activity (1.40 to 1.69), active or moderately active (1.70 to 1.99), and vigorous or vigorously active (2.00 to 2.40) (World Health Organization, 1985).

#### 5) Use of nutritional ergogenic aids

Subjects were required to answer an adapted version of the questionnaire from the Use of Resources Ergogenic and Food Supplements for Assistance of Weight Training questionnaire (Domingues & Marins, 2007) and the Supplement Use Survey (Meacham, Bergman, Ditmyer, Wilson, & Mobley, 2008). Subjects were asked if they were taking any nutritional ergogenic aids. Those who reported intake of nutritional ergogenic aids were further asked to provide information on patterns of taking nutritional ergogenic aids, such as doses, reasons, sources of information, and types. On the other hand, subjects with no previous or current intake of nutritional ergogenic aids were asked to tell the reasons for not using nutritional ergogenic aids.

#### F. Statistical analysis

Data were analysed using SPSS Version 21.0 (SPSS Inc., Illinois). Descriptive statistics (frequencies, mean, standard deviation, and range) were performed to present socio-demographic information and patterns of nutritional

ergogenic aid intake among the subjects. Pearson's correlation analysis was used to determine the correlation between continuous variables, while chi-square analysis was used to determine the association between categorical variables. The statistical significance was set at  $p < 0.05$ .

### III. RESULTS

A total of 77 completed questionnaires were received from team sports athletes over a spectrum of three team sport disciplines. Some 54.5% of the subjects were hockey players, and the remaining 24.7% and 20.8% consisted of football team players and *Sepak Takraw* players, respectively. Table I demonstrates the subjects' socio-demographic characteristics.

TABLE I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE SUBJECTS

| Demographic characteristics            | Mean        | n (%)     |
|--|-------------|-----------|
| Age (Years)                            | 23.05±4.242 |           |
| Gender                                 |             |           |
| Male                                   |             | 57 (74)   |
| Female                                 |             | 20 (26)   |
| Ethnicity                              |             |           |
| Malay                                  |             | 69 (89.6) |
| Chinese                                |             | 1 (1.3)   |
| Indian                                 |             | 3 (3.9)   |
| Others                                 |             | 4 (5.2)   |
| Marital Status                         |             |           |
| Single                                 |             | 64 (83.1) |
| Married                                |             | 13 (16.9) |
| Team sport disciplines                 |             |           |
| Hockey                                 |             | 42 (54.5) |
| Football                               |             | 19 (24.7) |
| " <i>Sepak Takraw</i> "                |             | 16 (20.8) |
| Education Level                        |             |           |
| Malaysian Certificate of Education     |             | 54 (70.1) |
| Malaysian Higher School of Certificate |             | 1 (1.3)   |
| Diploma                                |             | 5 (6.5)   |
| Bachelor Degree                        |             | 17 (22.1) |
| Body mass index (kg/m <sup>2</sup> )   | 22.69±2.60  |           |
| Underweight                            |             | 2 (2.6)   |
| Normal                                 |             | 62 (80.5) |
| Overweight                             |             | 12 (15.6) |
| Obese                                  |             | 1 (1.3)   |

Based on the findings, the prevalence of nutritional ergogenic aids used among team sport athletes was 59.7%. The average number of nutritional ergogenic aids used among the subjects was  $1.52 \pm 1.66$ . The use of nutritional ergogenic aids is as tabulated below (Table II).

TABLE II: USE OF NUTRITIONAL ERGOGENIC AIDS

| Nutritional ergogenic aids | Type of sports |              |                             | n (%)     |
|----------------------------|----------------|--------------|-----------------------------|-----------|
|                            | Hockey (n)     | Football (n) | " <i>Sepak Takraw</i> " (n) |           |
| Sports food and drinks     | 33             | 0            | 2                           | 35 (45.5) |
| Sports drinks              | 33             | 0            | 1                           |           |
| Energy bar                 | 2              | 0            | 1                           |           |
| Food replacement           | 4              | 0            | 0                           |           |

|                                  |    |   |   |           |
|----------------------------------|----|---|---|-----------|
| Protein                          | 14 | 3 | 2 | 19 (24.7) |
| Protein powder                   | 12 | 3 | 0 |           |
| Amino acid                       | 1  | 0 | 0 |           |
| Weight gainers                   | 2  | 1 | 2 |           |
| Vitamins and minerals            | 18 | 1 | 2 | 21 (27.3) |
| Vitamin C                        | 12 | 0 | 0 |           |
| Vitamin B complex                | 6  | 0 | 2 |           |
| Calcium                          | 3  | 1 | 2 |           |
| Multivitamins                    | 4  | 0 | 0 |           |
| Health concern                   | 9  | 0 | 0 | 9 (11.7)  |
| Fish oil                         | 4  | 0 | 0 |           |
| Chicken's essence                | 2  | 0 | 0 |           |
| Bird's nest                      | 2  | 0 | 0 |           |
| Green tea                        | 1  | 0 | 0 |           |
| Other nutritional ergogenic aids | 11 | 0 | 0 | 11 (14.3) |
| Creatine                         | 2  | 0 | 0 |           |
| Chondroitin                      | 3  | 0 | 0 |           |
| L-Carnitine                      | 6  | 0 | 0 |           |

A total of 34 subjects had consumed sports drinks to replenish the water and electrolytes lost after activity, as well as for recovery. Four subjects were consuming food replacements for losing weight. On the other hand, the most commonly consumed nutritional ergogenic aids under the protein category was protein powder (n=15) for muscle building and to improve strength. Furthermore, there were five subjects who had consumed weight gainers to increase their body weight. A total of nine subjects were taking self-prescribed nutritional ergogenic aids under the health concern category. In addition, there were two and three subjects consuming Creatine and Chondroitin, respectively, for recovery. Apart from that, there were six female athletes consuming L-Carnitine, which was prescribed by the dietitian to lose weight and reduce body fat.

A total of 48.1% of the subjects were taking nutritional ergogenic aids as an energy supply. In addition, 37.7% of the subjects took nutritional ergogenic aids for recovery after games, whereas 27.3% of the subjects were taking nutritional ergogenic aids for muscle building. Furthermore, 18.2% of the subjects used nutritional ergogenic aids for improving athletic performance and strength. Moreover, 3.9% of the subjects were not sure about the functions of the nutritional ergogenic aids that they were consuming.

On the other hand, for those athletes who were not taking any nutritional ergogenic aids, the main reason (50.6% among those who were not taking any nutritional ergogenic aids) was due to regular practice or training that had equipped them with optimal health status and fitness. In addition, 41.6% were not taking nutritional ergogenic aids due to sufficient nutrient intake throughout their daily dietary intakes. Furthermore, 14.3% did not take nutritional ergogenic aids due to the dearth of knowledge to choose the right nutritional ergogenic aids. Moreover, financial issues hindered 10.4% of the subjects from taking any nutritional ergogenic aids. Only 3.9% of the subjects were not taking nutritional ergogenic aids due to side effects concerns.

The primary source of information concerning nutritional ergogenic aids was from the dietitian at the National Sports Institute, Malaysia, which accounts for 59.7% of the subjects. Apart from that, 45.5% and 42.9% of the subjects also

obtained information about supplementation from coaches and other health experts, respectively. Mass media was also a source for athletes to obtain supplementation information. Some 35.1% of the subjects got supplementation information from the Internet, while 20.8% received such information from magazines. Apart from that, 33.8% of the subjects stated that they also purchased nutritional ergogenic aids based on friends' recommendations. A total of 9.1% of the subjects purchased nutritional ergogenic aids based on their family's recommendation.

There was a significant moderate positive correlation between age ( $r=0.415$ ,  $p=0.01$ ) and year of participation ( $r=0.446$ ,  $p=0.01$ ) with the number of nutritional ergogenic aids taken by the subjects. There was a significant weak positive correlation between physical activity level ( $r=0.231$ ,  $p=0.05$ ) and the number of nutritional ergogenic aids consumed by the subjects (Table III).

TABLE III: CORRELATION BETWEEN AGE, YEAR OF PARTICIPATION, AND PHYSICAL ACTIVITY LEVEL WITH THE NUMBER OF NUTRITIONAL ERGOGENIC AIDS CONSUMED

|                         | Number of nutritional ergogenic aids taken |
|-------------------------|--|
| Age                     | 0.01*                                      |
| Year of participation   | 0.01*                                      |
| Physical activity level | 0.05*                                      |

\* indicates significant correlation at  $p<0.05$

Based on Table IV, there was a significant association between gender and the nutritional ergogenic aids used by the subjects ( $\chi^2=18.207$ ,  $p<0.001$ ). In addition, there was a significant association between type of sport and nutritional ergogenic aid intake of the subjects ( $\chi^2=31.264$ ,  $p<0.001$ ).

TABLE IV: ASSOCIATION BETWEEN GENDER, MARITAL STATUS, AND TYPE OF SPORT WITH THE NUTRITIONAL ERGOGENIC AIDS USED

|                | Nutritional ergogenic aids used |
|----------------|---------------------------------|
| Gender         | <0.001*                         |
| Marital status | 0.44                            |
| Type of sports | <0.001*                         |

\* indicates significant association at  $p<0.05$

#### IV. DISCUSSION

There are few classification systems for nutritional ergogenic aids in the sports industry. According to the classification system applied by the National Sports Institute, Malaysia, there are five major categories of nutritional ergogenic aids consumed by athletes. They are sports food and drinks, protein supplements, vitamins and minerals, health concerns, and other nutritional ergogenic aids. On the other hand, the Australian Institute of Sports further classifies nutritional ergogenic aids into four groups, Group A, B, C, and D, according to their safety and effectiveness. Group A comprises nutritional ergogenic aids that are supported for consuming and proven to be effective in specific circumstances in sports, such as sports drinks, creatine, and vitamins. Group B comprises nutritional ergogenic aids that are still under research and that have only been offered to athletes under research protocols, such as fish oil and beetroot juice. Group C comprises nutritional ergogenic aids that have no significant proof of beneficial effects and that are not offered to athletes, such as MCT oil and ginseng. Group D comprises nutritional ergogenic aids that are strictly restricted to be consumed by athletes due to their nature and high risk of contamination, such as glycerol and ephedrine (Australian Institute of Sports, 2013).

Generally, nutritional ergogenic aids consumed among athletes ranged from 46% to 100%. The prevalence of nutritional ergogenic aids used among team sport athletes in the National Sports Institute, Malaysia in the study was lower (59.7%) compared to previous studies in Western countries, and even in Singapore. The variation may be due to methodological differences such as the definition of nutritional ergogenic aids, the characterisation of consumption, and the mode of data collection. For instance, a study that involved 21, 225 university athletes, which did not include multivitamin consumption, revealed a rate of 42% (Green, Uryasz, Petr, & Bray, 2001), whereas other studies, which included multivitamin consumption, reported rates ranging from 65.4% to 98.6% (Kristiansen, Levy-Milne, Barr, & Flint, 2005; Burns, Schiller, Merrick, & Wolf, 2004; Froiland, Koszewski, Hingst, & Kopecky, 2004).

The most popular nutritional ergogenic aids consumed in the study were sports drinks. It may be due to Malaysia's climate, where maximum daily temperatures may reach 31°C and humidity may climb above 90%. The findings may also indicate the type of sports involved, with most of the subjects involved in endurance disciplines. Sports drinks provide these athletes with a source of electrolytes, fluid, and fuel that is swiftly delivered and absorbed. Dehydration will raise physiological strain and compromise endurance performance via raised core temperature, cardiovascular stress, glycogen utilisation, and perceived exertion (Sawka, Toner, Francesconi, & Pandolf, 1983). Carbohydrate and fluid intake during exercise lasting more than one hour has been revealed to improve endurance and delay fatigue (Coyle, 2004; Sawka et al., 1983).

The use of other nutritional ergogenic aids was significantly lower (14.3%) among our subjects. However,

this figure was similar to the Western countries, which accounted for 11% to 28%, as revealed in the previous studies (Kristiansen et al., 2005; Jacobson, Sobonya, & Ransone, 2001; Jonnalagadda, Rosenbloom, & Skinner, 2001). The second most popular nutritional ergogenic aids used among the subjects was vitamins and minerals. The prevalence of vitamin use among athletes ranged from 19% to 94% (Kristiansen et al., 2005; Herbold, Visconti, Frates, & Bandini, 2004; Burns et al., 2004; Baylis, 2001). Approximately 27% of the subjects in the study consumed vitamins and minerals, with the most popular being vitamin C. Although exercise may slightly increase the requirements for certain vitamins and minerals (Fogelholm, 2006; American College of Sports Medicine, American Dietetic Association, & Dietitians of Canada, 2000), many of which are required in muscle contraction and metabolic processes during energy production, this can usually be met by the high energy intake of many athletes (Fogelholm, 2006). There is currently no conclusive evidence that taking nutritional ergogenic aids improves health or sports performance. However, taking nutritional ergogenic aids may benefit athletes with pre-existing nutritional deficiencies, or who are on caloric/dietary restrictions, or travelling for prolonged duration to regions with restricted food supplies (Fogelholm, 2006). In such conditions, a broad range multivitamin-mineral intake with amounts not exceeding two times the Recommended Daily Allowance (RDA) is adequate and safe (Fogelholm, 2006).

In observing the source of nutritional ergogenic aids information, approximately 60% of the subjects in the study sought information from the dietitian at the National Sports Institute, Malaysia. However, approximately 46% also received information from "questionable" sources, such as the mass media, the Internet, peers, and coaches. Similarly, 77.6% of the athletes in previous studies cited family members, friends, and the mass media as sources of information (Herbold et al., 2004; Jacobson et al., 2001). Apart from that, besides healthcare professionals, the study conducted by Kristiansen and colleagues (2005) demonstrated that athletes also followed recommendations from family members, friends, and magazines. A majority of coaches and parents have little specialised sports nutrition knowledge. Hence, their recommendations may be unsuitable, inappropriate, or inaccurate. Sobal and Marquart (1994) surmised that younger athletes were more likely to be affected by the mass media than their doctors.

The study also found a significant correlation between age and number of nutritional ergogenic aids used. In the study by Heikkinen, Alaranta, Helenius, and Vasankari (2011), the consumption of nutritional ergogenic aids increased significantly in older age groups. Similarly, a Canadian study (Erdman, Fung, Doyle-Baker, Verhoef, & Reimer, 2007), which involved high-performance elite athletes, and a German study (Braun et al., 2009) with young elite athletes reported higher rates of nutritional ergogenic aids used among older athletes than younger athletes. A study with young elite athletes between ages 12 to 21 revealed that 48.1% consumed at least one nutritional ergogenic aid (Petróczi et al., 2008).

Likewise, a study conducted in central Nebraska reported that 27% of adolescent athletes consumed nutritional ergogenic aids in the past (Schofield & Unruh, 2006). These rates of nutritional ergogenic aids used are noticeably lower than percentages of nutritional ergogenic aids consumed among older athletes (Petróczi et al., 2008; Erdman et al., 2007; Huang, Johnson, & Pipe, 2006).

The study also revealed a significant association between physical activity level and nutritional ergogenic aids used. Regular strenuous exercise elevates the requirement for energy intake, and a high energy intake will meet the requirement for all micronutrients, provided that a varied diet is consumed (Maughan, 1999). Theoretically, exercise could raise the need for these micronutrients in several ways: through reduced nutrient absorption; by elevated turnover, metabolism, or nutrient loss; through biochemical adaptation due to training that elevates nutrient requirement; by an increase in mitochondrial enzymes that demand for nutrients; or through an increased need for the nutrients for tissue maintenance and repair (Manore, 2000).

The study focused on the team sport athletes at the National Sports Institute, Malaysia, and covered three core sports in team sports, hockey, football, and *Sepak Takraw*. There is a paucity of studies focused on team sport athletes, with most of the studies involving athletes from all different sports disciplines. Hence, the findings of the study may shed light on the nutritional ergogenic aids used among team sport athletes in Malaysia. Taking into consideration the difference in nature and requirements between individual and team sport athletes, the findings from the previous studies, which were not focusing on team sport athletes, may not be able to be compared. Future studies are warranted to investigate the nutritional ergogenic aids used among individual compared to team sport athletes. However, from the few studies that have been carried out, it appears that individual sport athletes, such as those participate in rowing, canoeing/kayaking, and wrestling, reported higher intake and dosage of nutritional ergogenic aids compared to team sport athletes (Lazic et al., 2011; Huang et al., 2006). According to Huang and colleagues (2006), it seemed that athletes competing in sports that involved endurance-type activity and that can be categorized as individual sports are more likely to use nutritional ergogenic aids.

It should be emphasized that the findings and the conclusions drawn stem mostly from the self-reported nature of the study data. In addition, the questionnaire administered, which provided options for the nutritional ergogenic aids of each category, may cause the subjects to tend to answer based on the options and avoid those not listed. Hence, an interviewer-administered questionnaire should be constructed for future studies. Furthermore, as the subjects did not cover all the team sport athletes at the National Sports Institute, Malaysia, the generalizability of the findings may be questionable.

#### IV. CONCLUSION

The study indicated that the prevalence of nutritional ergogenic aids used was lower (59.7%) among team sport athletes in the National Sports Institute, Malaysia when compared to previous studies in Western countries, and even in Singapore, with sports food and drinks (45.5%) as the most commonly used nutritional ergogenic aids, followed by vitamins and minerals (27.3%) and protein (24.7%).

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