A SURVEY OF DIETARY SUPPLEMENTS CHOICES AND PREFERRED FORMS OF SUPPLEMENT USE BY MALAYSIAN ATHLETES

By

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KAJI SELIDIK PILIHAN MAKANAN TAMBAHAN DAN PILIHAN BENTUK SUPLEMEN OLEH ATLET MALAYSIA

ABSTRAK

Tujuan utama kajian ini adalah untuk mengkaji jenis dan sebab pengambilan suplemen serta bentuk-bentuk suplemen yang paling disukai oleh atlet semasa bersenam atau bersukan. Selain itu, kajian ini juga mempunyai tujuan khusus lain antaranya adalah untuk mengkaji jenis suplemen yang diambil oleh atlet semasa bersenam, faktor pengambilan suplemen di kalangan atlet semasa bersenam, dan untuk mengenal pasti bentuk suplemen yang paling disukai (contohnya tablet, kapsul, serbuk, gusi, cecair, atau bar) dan alasan untuk memilih bentuk makanan tambahan yang disukai di kalangan atlet semasa latihan**.** Para peserta diminta untuk melengkapkan temu ramah dalam talian yang terdiri daripada tiga bahagian: tahap kecergasan fizikal, penggunaan suplemen, dan bentuk pengambilan suplemen yang paling digemari. Setiap sesi mengambil masa sekitar 15 minit untuk setiap peserta menjawab soalan-soalan tersebut. Bagi peserta yang tidak dapat mengikuti sesi Webex disebabkan jadual yang padat atau sambungan internet yang tidak mengizinkan, mereka perlu menjawab soalan tinjauan melalui pautan yang dikongsi. Setiap jawapan akan dicatat pada kertas jawapan, sementara untuk jawapan di pautan tinjauan dimuat turun dan jawapan dikelompokkan ke dalam kata kunci tertentu dan dianalisis. Korelasi dan regresi bertahap digunakan untuk analisis statistik. Seramai 138 atlet negara dan kebangsaan dari pelbagai sukan menyertai temu ramah dalam talian ini. Terdapat 61 pemain bola sepak, 11 pemain hoki, 14 atlet olahraga, 32 pemain ragbi dan 20 dari sukan lain seperti bola keranjang, bola jaring dan bola lisut yang menyertai penyelidikan ini. Hasil kajian ini menunjukkan bahawa 87 atlet berlatih secara

aktif lebih dari 3 hari seminggu dengan purata min 3.61 ± 1.74 hari seminggu. Manakala 51 atlet melakukan kurang dari 3 hari seminggu dengan purata min2.01 ± 1.28 hari seminggu. Perkaitan antara aktiviti fizikal dengan jenis pengambilan suplemen dan kesan sampingan mempunyai hubungan negatif yang signifikan ($r = -0.28$, $p = 0.001$) dan ($r = -0.20$, $p = 0.019$) masing-masing. Selain itu, bentuk pengambilan suplemen yang disukai mempunyai kaitan yang signifikan dengan aktiviti fizikal ($r = 0.18$, $p = 0.034$). Dengan menggunakan analisis regresi bertahap, alasan memilih bentuk suplemen adalah peramal terbaik pengambilan suplemen bentuk yang disukai yang menyumbang 5.2%. dan R2 yang diselaraskan ialah -0.015. Walau bagaimanapun, penemuan utama untuk tujuan utama dapat disimpulkan hasil menunjukkan bahawa kerana bentuk cecair suplemen adalah bentuk yang paling disukai oleh para peserta. Hasilnya dipengaruhi oleh alasan yang diberikan oleh para peserta iaitu bagi meningkatkan tahap kecergasan selain ia mudah dibawa dan diambil

A SURVEY OF DIETARY SUPPLEMENTS CHOICES AND PREFERRED FORMS OF SUPPLEMENT USE BY MALAYSIAN ATHLETES

ABSTRACT

The main aim of this study is to investigate the type of dietary supplements, the reason for taking a supplement and the most preferred forms of supplement use by athletes during exercise. Another specific objective of this study is to examine the type of dietary supplement, consumed by athletes during exercise, the factors of taking the supplement among athletes during exercise, and to identify the most preferred forms of supplement (e.g., tablets, capsules, powder, gummies, fluids, or nutrition bars) and reason for choosing their favoured form of supplements among athletes during exercise. The participants were asked to complete an online interview that consisted of three parts: physical fitness level, supplement use, and the most favoured form of supplement ingestion. Each session took around 15 minutes for each participant to complete their responses to the questions. For the participants who cannot join Webex sessions due to their tight schedule or poor internet connection, they need to fill up a google form using the shared link. Every answer was noted on the answer sheet, while the answers on the survey link were downloaded and the answers were grouped into specific keywords and were analysed. Correlation and stepwise regression were used for statistical analysis. A total of 138 participants from state and national athletes from various sports were joining this online interview. There are 61 footballers, 11 hockey players, 14 track and field athletes, 32 rugby players and 20 from other sports such as basketball, netball and softball who are joining this research. These research findings shown 87 athletes were actively training more than 3 days per week with a mean average was 3.61 ± 1.74 days per week.

While 51 athletes were doing exercise or training less than 3 days per week with a mean average of 2.01 ± 1.28 days per week. The association between physical activity with supplements intake and side effects had a significant negative association (r= -0.28, p= 0.001) and (r= -0.20, p= 0.019) respectively. Besides that, the preferred form of supplements intake had a significant association with physical activity (r= 0.18, p= 0.034). Using stepwise regression analysis, reason on choosing the form of the supplement was the best predictor of favoured form supplement intake which accounted for 5.2%. and adjusted R2 was -0.015. However, the results showed that liquid forms of supplements were the most preferred form by the participants. The results were influenced by the reason that had been given by the participants which are to enhance fitness level other than it is easy to be carried and consumed.

CHAPTER 1

INTRODUCTION

The intake of dietary supplements has increased in all age groups, as a strategy for disease prevention, for the correction of poor lifestyle habits, and for improving physical fitness (Del Balzo et al., 2014). As established by the United States Congress in the Dietary Supplement Health and Education Act, which became law in 1994, a dietary supplement is a food (other than tobacco) intended to supplement the diet; contains one or more dietary ingredients (including vitamins, minerals, herbs or other botanicals, amino acids, and other substances) or is intended to be taken by mouth as a pill, capsule, tablet (Gahche et al., 2014). Undoubtedly, people all over the world are now beginning to consume dietary supplements with their different reasons. Besides, dietary supplements are now available at affordable prices, and there are so many forms of supplements that they can choose depending on their desired form and taste. The use of dietary supplements, especially multivitamin-mineral products, is growing worldwide and is regularly used by a large number of individuals (Hoseini et al., 2020). Dietary supplements are characterised as concentrated sources of nutrients or other nutritionally or physiologically effective substances that by supplementing the regular diet, increase the total dietary intake. They are sold in the specific dosages calculated (Del Balzo et al., 2014). Vitamins, minerals, fibres, amino acids, herbs or other plants, or enzymes may be present. Sometimes, foods, including beverages, are applied to the ingredients of dietary supplements. To purchase dietary supplements, a doctor's prescription is not required.

Nowadays, athletes often consume dietary supplements during exercise based on their awareness of supplements by increasing their efficiency levels. Dietary intake enhances athletic

performance, improves training adaptations, and increases exercise recovery (Kerksick et al., 2018). Also, additional dietary intake is needed to support optimal growth and development (Lyle, 2017). Based on literature searches, there is a mismatch between contemporary expert guidance and nutritional practices by athletes (Heikura et al., 2017). The diet intake by athletes does not fulfil their energy and nutrient requirements. Nutrition education services took the initiative to enhance nutrition knowledge among the athletes (Spronk et al., 2015) and a higher level of knowledge is associated with improved diet quality (Trakman et al., 2017). Lack of nutritional awareness is known to be one of the key causes of athletes' poor dietary behaviour. Studies have indicated that athletes have myths regarding nutrition and are poorly educated about dietary recommendations that may adversely affect their food choices (Heaney et al., 2011; Spronk et al., 2015).

In that case, athletes are recommended to consume exogenous ergogenic aid to keep up the body demand. Some supplements are commonly used by athletes, such as vitamins, minerals, fibres, amino acids, herbs, or other plants, or enzymes during exercise (Kerksick et al., 2018). However, the highest prevalence of supplements chosen by athletes are, or the most important for sports performance are still unknown. Athletes may have increased physiological protein requirements to maintain adequate protein synthesis and energy output, as well as proper immune function and good intestinal integrity in goal-oriented, regular, intense, and/or prolonged exercise routines. (Kårlund et al., 2019). Several foods and supplements have been formulated to fulfil these particular nutritional requirements. For example, branched-chain amino acids (BCAAs; valine, leucine, and isoleucine) supplementation is frequently used by athletes and has been suggested to alleviate muscle pain after intense exercise and improve training performance (Clark and Mach, 2016).

To date, there is a lack of studies that evaluate the type of dietary supplement and the preferred form of supplement mostly choose by athletes. In this present study, researchers will interview them to identify the type of dietary supplements and the most preferred forms of supplement use by athletes during exercise. These findings will educate athletes, coaches, physical educators, teachers, and sports scientists to understand the purpose of supplement intake and practice a healthy lifestyle.

1.1 Problem Statement

Based on the literature review, studies show the highest prevalence of supplement use is by athletes, especially among athletes in Malaysia. Studies of the supplement use in Malaysian athletes may have been done without the full knowledge to an understanding of the potential benefit and risks related to dietary supplement consumption. Furthermore, athletes may not have a consultation with a registered sports nutritionist. Most athletes usually consume supplements because of influence by advertisements on the website or social media and not an opinion from the expert or legal institution. The purpose of taking the dietary supplement also is unclear. The present survey is to identify the knowledge of supplement use in athletes who compete at the university level. This is important because a study by Heikura et al. (2017) found that athletes have poor knowledge of the proper nutrition intake before or during the training. A higher level of knowledge is associated with improved diet quality (Trakman et al., 2017).

1.2 Research Questions

a) What kind of dietary supplement did athletes consume during exercise?

b) What are the factors of taking the supplement among athletes during exercise?

c) What is the most preferred form of the supplement (e.g., pills, capsules, powders, gums, drinks, or dietary bars) used and the reason for the preferred choice of supplements among athletes during exercise?

1.3 Objectives of the Study

Main Objectives:

The main aim of this study is to identify the type of dietary supplements, the reason for taking a supplement and the most preferred forms of supplement use by athletes during exercise.

Specific Objectives:

a) To examine the type of dietary supplement consumed by athletes during exercise.

b) To determine the factors of taking the supplement among athletes during exercise.

c) To identify the most preferred forms of supplement (e.g., tablets, capsules, powder, gummies, fluids, or nutrition bars) and reason for choosing their favoured form of supplements among athletes during exercise.

1.4 Significance of the Study

The findings of this study can enable coaches and athletes themselves to find out what are factors cause athletes to take a dietary supplement and the reason they have taken it other than only to improve their performance. It is known that endurance athletes prefer to ingest supplements that could delay fatigue (Greenwood et al., 2008) and combat athletes prefer to consume a supplement that enhances muscle strength and muscle building (Office of Dietary Supplements, 2019) while

short-distance athletes prefer to increase their creatine storage (Tscholl et al., 2010). Thus, through the present survey, the researchers will find out the most preferred dietary supplement intake and the reason for supplement choice.

Besides, the findings of this study will also make a major contribution to an athlete's awareness of dietary supplements that can potentially be obtained in many forms, such as pills, capsules, powders, gums, beverages, or dietary bars. This finding will benefit the community, especially the coaches by finding out what are factors cause an athlete to take a dietary supplement and the reason they have taken it other than only to improve their performance. This study also will provide additional knowledge for the pharmacist, sports nutritionist, and dietician, so that they could provide an athlete with the dietary supplement in their most preferred form and at the same time they will receive a similar benefit of nutrition. This is because some of the athletes need an additional supplement intake due to their poor diet quality but hate to consume it in capsules or pills. Thus, they can choose to consume it in a different form, for instance in liquid or gel forms. Different individuals have their interests and preferences. Apart from that, this discovery would also allow nutrition companies to develop their products in the light of packaging, whether simple to carry or not the shape and taste of supplements that are favoured by athletes. This is because we know that athletes prefer to consume dietary supplements no matter before, during, or after exercise or sports.

CHAPTER 2

LITERATURE REVIEW

2.1 Prevalence and Type of Dietary Supplements Use Among the Athletes.

Dietary supplements are available to the general public, but the use of these supplements is higher in professional athletes than in non-athletes or recreationally active individuals (Aguilar-Navarro et al., 2020) and even the athletes claim that taking supplements will help them boost their power or/and confidence and their health, for example when they were injured. Dietary supplements can help speed up the recovery process.

The use of dietary supplements used by athletes has been the subject of a variety of inquiries and their findings have recently been examined and systematically analysed. Overall, the prevalence of supplement use varies from roughly 48 to 81 percent, though proteins and multivitamins are the most widely used supplements. The reasons stated by athletes for using dietary supplements are varied, but they are primarily related to health-related problems, improved physical and mental performance, and enhanced recovery rates. However, the patterns of use and purchase of supplements have not been well studied (Aguilar-Navarro et al., 2020).

	Total	Frequency % (n)		
		Yes	No	*P* value
Gender				
Male*	346	67% (232)	33% (114)	0.04
Female*	181	58% (105)	42% (76)	
Total	527	64% (337)	36% (190)	
Age Range				
< 15–20 years*	111	30% (33)	70% (78)	< 0.01
21–25 years	123	65% (80)	35% (43)	
26–30 years*	106	77% (82)	23% (24)	
31–35 years	58	74% (43)	26% (15)	
36–40 years*	62	79% (49)	21% (13)	
> 41 years	66	74% (49)	26% (17)	
Sport				
Body Building*	38	95% (36)	5% (2)	< 0.01
Cycling	36	86% (31)	14% (5)	
Athletics	238	77% (184)	23% (54)	
Triathlon	75	77% (58)	23% (17)	
Aquatics	31	77% (24)	23% (7)	
Weightlifting	16	75% (12)	25% (4)	
Football	8	75% (6)	25% (2)	
Volleyball	8	75% (6)	25% (2)	
Others	112	74% (83)	26% (29)	
Canoe/Kayaking	11	73% (8)	27% (3)	
Field Hockey	11	64% (7)	36% (4)	
American Football*	68	57% (39)	43% (29)	
Golf*	29	55% (16)	45% (13)	
Gymnastics*	17	53% (9)	47% (8)	
Basque pelota (jai alai)*	15	53% (8)	47% (7)	
Level of competition				
National*	262	71% (262)	29% (77)	< 0.01
International*	265	57% (265)	43% (113)	
Professional				
Yes*	85	75% (64)	25% (21)	0.02
No*	438	61% (269)	39% (169)	

(*)The distribution was different from the value expected at $p < 0.05$

Figure 1 shown the socio-demographic characteristics of the participants and the distribution of athletes who reported use/not use of supplements in the last year (Aguilar-Navarro et al., 2020).

Based on figure 1, the previous study showed that 64 percent of athletes were using a dietary supplement. The most widely used is bodybuilding athletes who need to develop the muscle in a good shape. Many gym-goers who were eager to gain muscle mass use dietary supplements to preserve a low-fat, slender body for athletic and esthetic purposes. This is called “body capital" and can have extreme implications (Druker and Gesser-Edelsburg, 2017). They also found that

there is a high degree of dietary intake in professional athletes, whether at the national or international level.

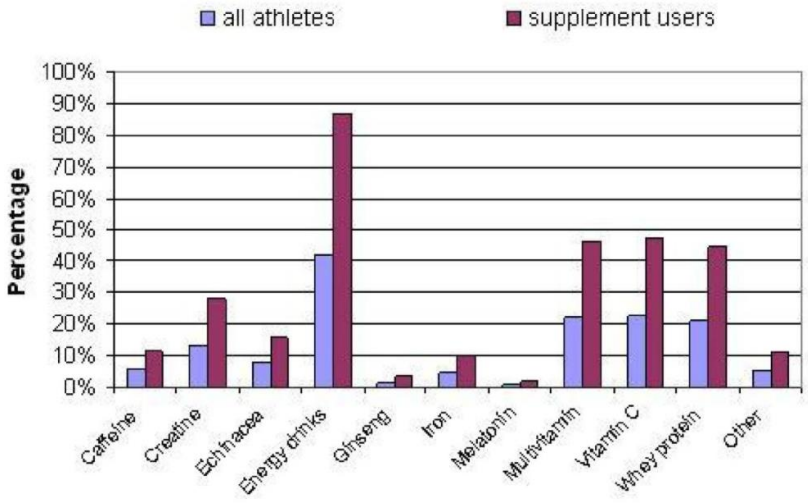

Figure 2 Supplement use reported by young (age 12–21) elite athletes; n = 403 (all athletes) and n = 194 (supplement users); each equates to 100% (Petróczi et al., 2008).

Figure 2 shows the proportion of athletes in the study and among those who confirmed the use of supplements. The most common supplements were energy drinks followed by vitamin C, multivitamin, whey protein, creatine, echinacea, caffeine, iron, ginseng and melatonin. Other nutrients included glutamine/glucosamine, amino acid, cod liver oil, B vitamin complex, Maximuscle, Met-RX, norateen, carbohydrates and protein shakes, omega oils and probiotics (Petróczi et al., 2008).

2.2 Factors Influencing Athletes in Consuming Dietary Supplements.

Psychosocial environments of athletes have been shown to have a substantial effect on their decision to use performance-enhancing substances. Understanding the reasons, perceived beliefs and driving factors for the use of dietary supplements is important for the production of more successful messages about the pros and cons of using these supplements. Communicating accurate information on health-conscious behaviour, it seems, is not enough to cause major behavioural changes in the population (Khoury et al., 2019). This could be caused by the influencer from social media (Peters et al., 2003) who has made them believe in the benefits of consuming dietary supplements without being conscious of the side effects of the medication. However, it can be prevented if they use it with the proper amount along with maintaining a balanced lifestyle where not only does it rely on supplements to work on the body without any effort on their own.

Athletes also rely on their coaches, families, and friends/teammates as their preferred sources of accurate information for their use of dietary supplements (Manore et al., 2017). However, sports nutritionists or scientists are seldom the primary sources of knowledge for preparing a supplementation schedule, except at the elite level. This can lead to unnecessary and/or incorrect use of dietary supplements with potential adverse reactions due to polypharmacy (Aguilar-Navarro et al., 2020).

Source of information	% Participants	N	% Taking supplements	N
Coach	38.1	53	32	16
Store clerk	10.8	15	6.6	1
Books/magazines	10.1	14	21	3
Advertising	0.7	1	0	0
Internet	6.5	9	33	9
Friends	0.7	1	0	0
Parents	5	7	14.3	1
Health clubs	24.5	34	21	7

Figure 3 showing a table of the source of information and percent reported currently taking dietary supplements (Scofield and Unruh, 2006).

The previous study by Maughan et al. (2007), states that supplements widely used include vitamins, minerals, protein, creatine, and various "ergogenic" compounds. One of the factors, why they are taking supplements, was because they want to lose weight Most of the weight-loss supplements taken contain stimulants shout knowing that most of the weight-loss supplements taken contain stimulants (Blanck et al., 2007)

In sports involving strength and power, athletes aim to gain fat-free weight through a muscle hypertrophy program at defined periods of the annual macro-cycle (Communications, 2016). Whereas some athletes strive to achieve total size and strength per se, in other sports in which an athlete has to transfer his body weight or compete within weight divisions, it is necessary to maximize power to weight ratios rather than absolute power (Stellingwerff et al., 2011). Some power athletes, therefore, often want to reach low body fat levels (Manore, 2015). In sports involving weight divisions (combat sports, lightweight rowing, weightlifting), athletes usually seek the lowest attainable bodyweight category, thus optimizing their lean weight within this target (Reale et al., 2017).

Marathon runners and cyclists gain from a low energy cost of travel and a favourable body fat ratio for thermodynamic efficiency (Rønnestad and I Mujika, 2013). Athletes can improve their speed and agility by being lean, while athletes in acrobatic sports (e.g. swimming, gymnastics,

dance) gain biomechanical advantages by being able to navigate their bodies within a smaller area (Communications, 2016).

For nutritional supplements to be efficient to its' consumers, they must ingest the amount prescribed for the recommended period. Specific attention must also be paid to the sensory qualities of these items. The presence of active compounds can lead to an off-taste or aftertaste (Delompré et al., 2019). Nutritional supplements are mixtures of ingredients, most of which have taste characteristics. For some of these elements, such as vitamins and some basic minerals, important data such as threshold values for perception and taste quality are lacking and need to be considered when designing the product (Abdel-Moemin et al., 2018). The main objective of flavouring supplements is to increase the acceptability of flavouring supplements by consumers, in particular by masking off-flavours (Delompré et al., 2019).

2.3 Most Favoured Form of Supplement Consumed by Athletes During Exercise

In survey conduct by Slater et al. (2003), sports drinks, caffeine, vitamin C, multivitamin/mineral supplements and chicken essence were some of the most commonly consumed products, confirming that although vitamin/mineral supplements are widespread, sports supplements and traditional/herbal preparations have also been well embraced. Information was sought not only on the type of supplements used but also on the dose, justification for use and other factors that could affect the use of supplements, including selected demographic criteria and sources of information on supplements.

No study to examine the most preferred form of supplement, however an old study by Mason et a. (1996) conducted a study to examine whether the physical form of carbohydrate supplementation influenced the blood glucose and insulin response during prolonged exercise (Mason et al., 1993).

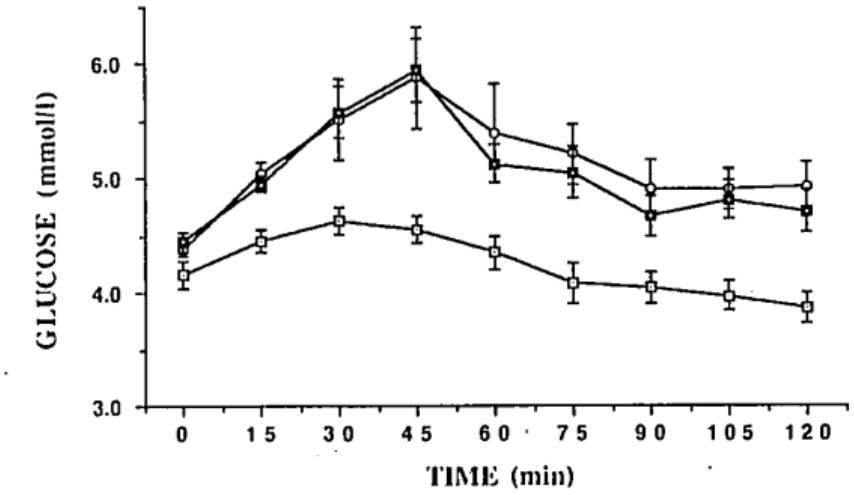

Figure 4 Blood glucose levels before and during 2 hours of exercise with ingestion of either sweet placebo (□ CON), liquid carbohydrate (○ CHO), or solid carbohydrate (■ S-CHO).

Researchers concluded that there were no clear comparisons of liquid and solid carbohydrate supplements have been made (refer to Figure 4). The study shows that liquid and solid carbohydrate supplements with equivalent carbohydrate content can produce identical blood glucose and insulin response throughout sustained exercise Mason et al., (1993). In a future study, athletes can use either in solid or liquid because it will give similar effects to physiological changes.

CHAPTER 3

METHODOLOGY

3.1 Study Design

In this study, the design of the qualitative content review was used to classify the perspectives of the sample through the online structured interview. There are a fixed set of questions asked to all interviewees. 138 athletes have been approached through social media and advertising using a poster with a QR code. After the participants willingly respond to the interview, they were given the informed consent to be fill in completely with signature and give back in form of an image or PDF (scanner) through WhatsApp to lessen face to face interaction. After that, the online link has been given to them. There are a few questions that need to be answered through the interview session. The first segment deals with physical activity, whether participants are actively involved or sedentary. The second section will ask the participants to fill in the type of supplement they used before and in what form they prefer whether it is in fluids, gums, pills, capsules, nutritional bars, and powder along with the explanation of why they prefer it in that form. The individual data were categorised to find out the type of supplement either natural, semi-synthetic, or synthetic and be analysed the most preferred types and forms (pill, liquid, powder, etc.). The reasons for supplement intake also were divided into different groups, and researchers had evaluated the popular reason for consuming certain supplements during exercise in athletes. Each session estimation time is 15-30 minutes. All the answers were noted on the answer sheet by the researcher. For the participants who cannot join Webex sessions due to their tight schedule or poor internet connection, they need to fill up a google form using the shared link (https://forms.gle/EnXM5PYmGSm7L8vDA). Data was analysed after all the participants

complete their sessions. This study is approved by Human Ethical Committees (USM/JEPeM/21010026).

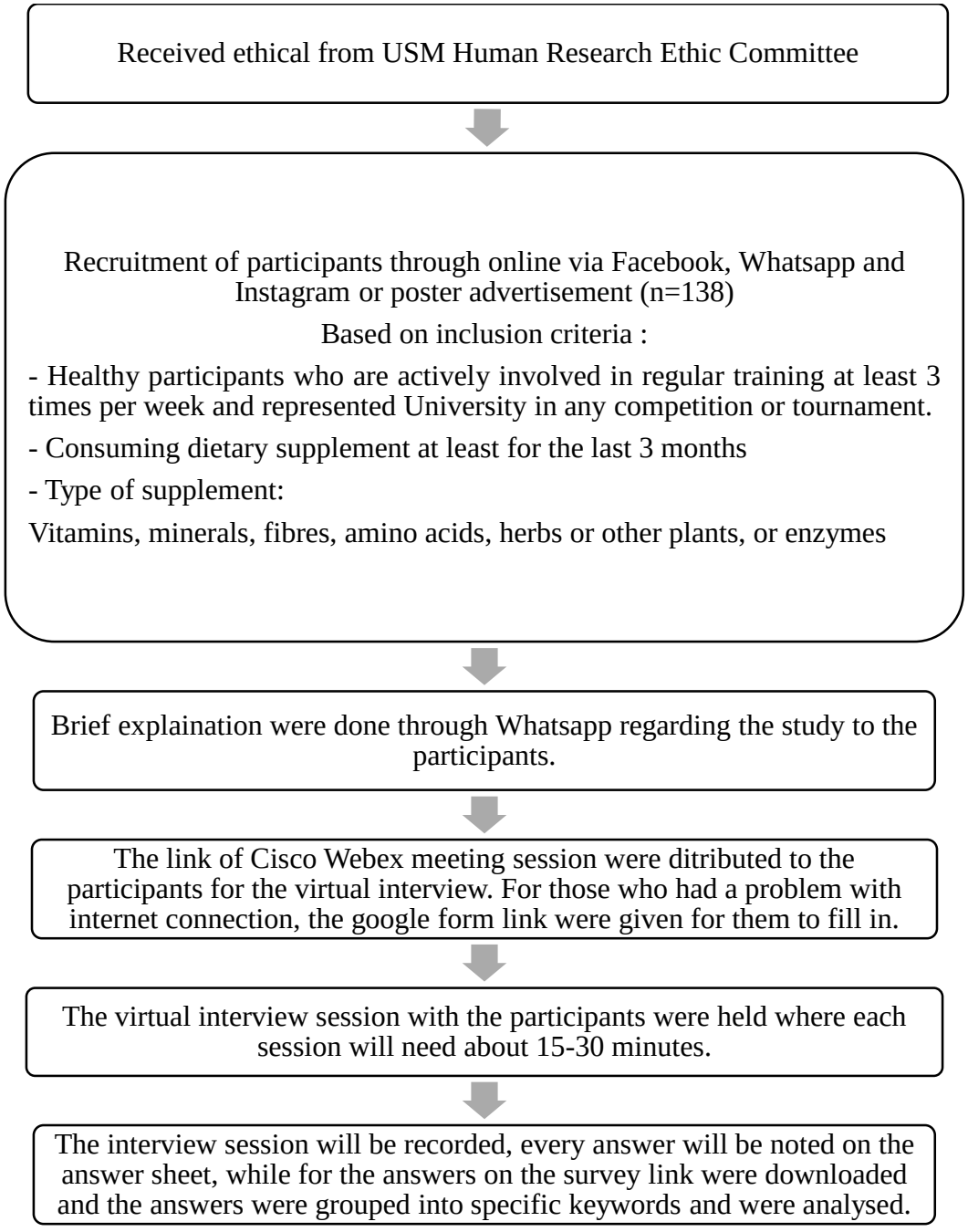

Figure 5 Flow chart of structured interview survey

3.2 Sample size

Sample size calculation was based on a single proportion formula as follow:

$n = (Z/\Delta)^2 \ (p(1-p))$

n = minimum required sample size

Z = value of the standard normal distribution = 1.96 for 95% CI

Δ = precision

p = true proportion

Based on the previous study by Scofield et al. (2006), the participants involved were 600 high school athletes and there has 26% of the participants were taking dietary supplements. The sample size of the previous study was n=139. Taking the precision of 0.05 at a 95% confidence interval, the minimum required for this study is 138 participants. This research will focus on athletes who play any kind of sports and take dietary supplements.

3.3 Participants

One hundred and thirty-eight athletes included men and women aged between 18-40 years old who take dietary supplements were recruited to answer the online structured interview or using google form link. The inclusion and exclusion criteria needed are as follows:

Inclusion Criteria	Exclusion Criteria
Healthy participants who are actively involved in regular training at least 3 times per week and represented University in any competition or tournament.	Participants with any chronic diseases such as diabetes, stroke, and high blood pressure
Consuming dietary supplements at least for the last 3 months (Beck et al., 2010)	Athletes who stop doing any exercise or consume a supplement for the last 3 months.
Type of supplement: Vitamins, minerals, fibres, amino acids, herbs or other plants, or enzymes	Participants who are currently taking medicine or antibiotic due to any health problems.

3.4 Participant Requirement and Location of Data Collection.

Participants were recruited through public messages on WhatsApp, Facebook, and Instagram social media sites. They have been given the informed consent to be read through and signed after understanding about the study and then they need to give back the consent whether in image or PDF (scan) format through WhatsApp. After that, they were scheduled for a virtual interview using Cisco Webex as a platform where the link was given, and they can choose their preferred time based on the suggested time and date. Each virtual interview session might need 15-30 minutes considered to any internet connection problems or any other problem which cannot be avoided during the session. All the answers were noted on the answer sheet by the researcher. For the participants who cannot join Webex sessions due to their tight schedule or poor internet connection, they need to fill up a google form link (https://forms.gle/EnXM5PYmGSm7L8vDA).

Snowball sampling was also used by encouraging the recruited participants to further recruit participants who met the inclusion criteria and were considered appropriate for the research (Moberg, 2017). Participants had been recruited from USM, UiTM, UPSI, Kedah Rugby Club and Silver Outdoor Sports (SOS) athletes.

3.5 Research Instrument

To obtain the data, an anonymous online structured interview was used. There are a few sections in the online structured interview that include the level of physical activity, the type of supplement used the factors that affect the intake of supplements, the desired intake of supplements in terms of condition and taste, and the source of information that the athletes obtain. Similar sessions were implemented for the google form link.

The questions of this interview are listed below:

Bahagian 1: Tahap Kecergasan Fizikal

i. Frekuensi bersenam/bersukan dalam masa seminggu
ii. Purata jam bersenam/bersukan
iii. Tujuan bersenam
iv. Jenis sukan yang anda terlibat

Bahagian 2: Jenis Supplemen yang Diambil

i. Adakah anda pernah/sedang mengambil supplemen?
ii. Nyatakan supplemen yang anda pernah/sedang ambil?
iii. Bentuk supplemen yang diambil.
iv. Siapakah yang mempengaruhi anda untuk mengambil supplemen?
v. Adakah anda mengalami kesan sampingan selepas mengambil supplemen tersebut?
vi. Jika 'YA', sila nyatakan jenis kesan sampingan yang dialami

Bahagian **3**: Bentuk Supplemen yang Dipilih

i. Semasa anda bersenam/bersukan, dalam bentuk apakah supplemen yang akan dibawa bersama?
ii. Nyatakan alasan mengapa anda suka bentuk supplemen yang dinyatakan

The answer to the survey is open-ended, thus there is a need for researchers to decide the key terms for some of the questions. These standard terms were used to group all the answers during statistical analysis.

3.6 Statistical Analyses

Collected data were analysed to check the variations in understanding and knowledge of the most favoured dietary supplements and the factors that affect the form of dietary supplement use on the athletes.

Results were presented as mean ± standard deviation unless otherwise stated. After verification of the normal distribution of the variable, the descriptive statistics were conducted to

observed and predicted frequencies. One-way ANOVA was conducted to compare the findings. The association between all parameters were determined by using correlation and followed by Stepwise Linear Regression to determine which factor best to predict physical activity level, nutrient intake, menstrual and bone status. Standardized β-coefficients, *t* and *p*-values were reported. All statistical analyses were conducted using SPSS (SPSS 26.0; IBM Corporation, Armonk, NY, USA).

3.7 Ethical Consideration(s)

1. There is no conflict of interest.

2. The form is anonymous and has been entered into the SPSS software.

3. Only members of the research team can access the data. Data has been viewed as aggregated data and will not be uniquely described by the participants. Data will also not be made publicly available unless disclosure is required by law.

4. The participants will receive a token of appreciation and incentive after completing the study intervention.

3.7.1 Privacy and confidentiality

All forms are anonymous and have been entered into SPSS software. Only research team members can access the data. Data were presented as grouped data and will not identify the respondent individually.

3.7.2 Risk

All answer for the survey was monitored by researchers and lab assistants. The researchers' team will explain and help in the process of data collection. Time is not specifically allocating to the participants to answer these questions, so the participants could choose their available time to do this virtual interview. Each interview session will need about 15-30 minutes to answer all the questions. So, the psychological distress is minimal, and participants still have a chance to reschedule their interview session if there are problems with the connection or any other problems that can be considered.

3.7.3 Community sensitivities and benefits

This interview could enhance their alertness on the type of supplement and the purpose of using it. Researchers will explain and consult the best supplement to take in the term of their type of sports and sport demands. Participation in this study is on a volunteer basis. The participants have the right and allow to withdraw if they are not willing to answer certain questions or feeling not comfortable with the way the question should be asked. The researcher also has the right to eliminate and terminate their participation from the study if they cannot give full commitment and are not suitable or doesn’t meet the criteria for this study.

CHAPTER 4

RESULTS

4.1 Type of sports of the athletes

Table 4.1a Frequency type of sports by the athletes

Type of Sports	N	Percent (%) ± SD
Football	61	44.2 ± 17.75
Hockey	11	8.0 ± 3.32
Others	20	14.5 ± 5.92
Track and fields	14	10.1 ± 4.18
Rugby	32	23.2 ± 9.38

Values are expressed as means ± standard deviation (SD)

One hundred and thirty-eight participants completed this study. Participants who are joining the research were coming from various kinds of sports including football (44.2%), hockey (8%), track and field (10.1%), rugby (23.2%) and others (14.5%) (Table 4.1a). Table 4.1b shown 87 athletes were actively training more than 3 days per week with a mean average was 3.61 ± 1.74 days per week. While 51 athletes were doing exercise or training less than 3 days per week with a mean average of 2.01 ± 1.28 days per week.

Table 4.1b Frequency days of training per week by the athletes

Frequency of exercise	N	Mean ± SD
More than 3 days per week (days per week)	87	3.61 ± 1.744
Less than 3 days per week (days per week)	51	2.01 ± 1.280
Average (days per week)	138	2.60 ± 1.655

Values are expressed as means ± standard deviation (SD)

4.2 Type of supplements intake by the athletes

The type of supplements intake by the athletes was calculated using descriptive analysis. Six types of supplements had been recognised as the most preferred supplement intake. The listed supplements include activator supplement (23.2%) i.e. amino acid, L-carnitine, creatine, glucosamine, protein (42.8%) i.e. whey protein, soy Nutrilite soy protein, oil-based supplement with vitamin and mineral (11.6%) i.e. fish oil, isotonic drink (3.6%) i. e 100 plus, energy drinks, snack bar (2.2%) i.e. fit bar and vitamin (16.7%) i.e. vitamin C (Hassan et al., 2020). Among all supplements, the protein was the highest supplement choice and significantly higher compared to the snack bar (59 out of 138 athletes).

Table 4.2 Type of supplements intake by the athletes

Type of Supplements	**N**	**Percentage (%)** ± SD
Activator supplement	32	23.2 ± 41.58
Protein	59	42.8 ± 38.53[a]
Oil-based supplements	16	11.6 ± 48.55
Isotonic drink	5	3.6 ± 6.14
Snack bar	3	2.2 ± 69.90
Vitamin	23	16.7 ± 25.83

Values are expressed as means ± standard deviation (SD)
[a], p values < 0.05 significantly higher compared to the snack bar

4.3 Purpose of the intake of the supplements

Athletes were asked the reason for taking supplements. The reasons for the intake of the supplements had been classified according to the keywords since the participants' responses is in the open-ended answer. The participants reported that the main reason for supplement usage was to maintain the fitness level (37.68%), followed by general health maintenance (30.43%), then to increase in muscle mass (10.87%) and for fast recovery from the previous injuries (10.14%). Only a few athletes reported that the reasons for taking supplements were only to enhance energy level (5.8%), additional nutrition (2.9%), and last but not least was for weight loss purposes (2.17%). However, no significant difference between all the reasons.

Table 4.3 Number and percentage of participants according to the purpose of supplement intake

Purpose of supplements intake	N	Percent (%) ± SD
Fast recovery	14	10.1 ± 37.50
Enhance energy level	8	5.8 ± 32.47
Increase fitness level	52	37.7 ± 38.05
Additional nutrition	4	2.9 ± 8.37
General health maintenance	42	30.4 ± 45.44
Increase muscle mass	15	10.9 ± 37.93
Weight lose purpose	3	2.2 ± 17.67

Values are expressed as means ± standard deviation (SD)

4.4 The most preferred form of supplement use during exercise or training

Descriptive statistics show that the most preferred form of supplements intake is a liquid form with 63 athletes followed by powder, gummies, tablet and bar form. There was a significant higher (p values <0.05) of liquid form compared to tablet and bar forms (Table 4.4a). The popular reason for choosing liquid type is because it is easy to consume and to carry. This reason was significant (p values <0.05) compared to supplement taste and the price.