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Sports Supplements Used by Bodybuilders Attending Sport Centers in Khartoum State, Sudan University of Bahri - Khartoum, Sudan

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Abstract: ***In Sudan, sport nutrition and use of supplements have been recently introduced; along with scarce studies and information on the area of sports supplements. Objective: The study was conducted to investigate the sports supplements use among bodybuilders in Khartoum state with regards to the prevalence of use, knowledge about the sports supplements benefits and adverse effects, and the sources that impact the choices of athletes about sports supplements. Methodology is a descriptive and cross-sectional study. Hundred bodybuilder athletes were participated from nine sport centres/ gyms across the state. An interview questionnaire was used to obtain the needed data. The result indicated a low prevalence of sports supplements among studied group (23%). The most common type used were whey protein and serious mass (18.6%), followed by (BCAA's) (16.3%). Bodybuilders showed low level of knowledge regarding supplementation (40%). Furthermore, the primary source of nutritional information were coaches and the internet (36.6% and 32.4% respectively). A strong significance was detected between the level of training and the use of supplements (P <.05). Low prevalence of sports supplements use were observed. The researchers recommended further large scale studies to be conducted in order to enrich the country's data base.***

Keywords: Sport nutrition, Bodybuilders, Sports supplements, Sport centers/ gyms

1. Background

Sudan is one of the developing countries where sport nutrition and use of supplements have been recently introduced. Some supplements have an adverse effect on both health and performance, and some are considered as illegal to be used. The sports supplementation patterns in athletes are unknown. However, athletes have a unique set of nutritional needs to balance the needs for growth and development, and to optimize their performance. A large number of athletes consider sports supplements as a requirement to give them a competitive edge, and believe that a normal diet will not be sufficient. Furthermore, Knowledge can be delivered by different providers including: coaches, athletic trainers, sport dieticians, nutritionists, sport scientists, and medical practitioners. Athletes also obtain information from other sources; such as: school or tertiary-education programs, books, sport-specific magazines and mass media [(1, 2)]. Nutritional supplements are classified as nutritional aids which serve to increase muscle tissue, muscle energy supplies, and the rate of energy production in the muscle [(3)],

In Sudan, the ministry of youth and sports represents the executive and legislative authority for each young athletes; considering that youth are corresponded to 40% of the state's population as said by the statistics of (2008). There are two sectors within the ministry of youth and sports: the sport sector, concerning: the sport federations, sport clubs, playgrounds and stadiums, football subsidiary unions, volleyball local federations, squares and fields… etc. The second one is the youth sector which involves the youth centers and organizations. In regard to bodybuilding, there are about 12 public centers and 120 private gyms having bodybuilding activity[(4)].

The researcher was interested by this area and tried to investigate the use of sports supplements among bodybuilders in Khartoum state, Sudan. The scarcity of studies and lack of information on the area of sports supplements in Sudan attracted the researcher to study the different types of sports supplements used by bodybuilders

2. Body Building

In order to be successful, athletes should maximize their muscular size, shape, symmetry, and definition by including both large and small muscle groups[(5, 6)]. During bodybuilding competitions, athletes are assessed on their bodily or 'aesthetic' appearance and are typically required to express an excessive degree of muscularity and symmetry, as well as low levels of body fat. Cautious attention to nutrition and exercise conditioning is undoubtedly important to become 'competition ready'. There are numerous methods used frequently in the preparation for contest such as: chronic energy restriction, dehydration (water manipulation), sporadic eating and inappropriate use of diuretics and supplements of anabolic steroids and 'fat burners' [(7)]

3. Nutrition for Bodybuilding

Sports nutrition refers to the specialized branch of nutrition that studies food with significance to athletic performance. The

importance of Sports Nutrition lies in the fact that it has short-term and long-term effects on: body composition, metabolism, and eventually the performance abilities of athletes. According to the International Olympic Committee (IOC), the 2010 IOC Consensus Statement was "Diet significantly influences athletic performance. A diet that provides adequate energy from a wide range of commonly available foods can meet the carbohydrate, fat, and, micronutrient requirements of training and competition."[8].

Concerning bodybuilding, numerous nutrition practices are experimented and practiced by bodybuilders to maintain greater consistency in nutrition and training habits throughout the year.[5] Bodybuilders nutritional needs vary during the off-season and pre-contest phases. During the off-season (i.e.: no competitive events), they attempt to increase muscle mass. Thus, it is valuable for the bodybuilder to be in positive energy balance to ensure extra energy availability for muscle anabolism. Additionally, adequate protein must be available to provide amino acids for protein synthesis. In contrast, during the pre-contest phase for 6–12 weeks prior to competition, bodybuilders attempt to retain muscle mass and reduce body fat to very low levels[9].

4. Nutritional Supplements for Bodybuilding

There are considerably a lot of supplements that are used by bodybuilders and sold on the market[10].Bodybuilding has two distinct phases: bulking phase (the systematic attempt to gain weight and muscularity) and cutting phase (removing body fat and minimizing muscle loss to achieve a defined aesthetic physique). Fat burners were more popular in the cutting phase than any other supplement [11]. Current research also shows that fat burners are still the most prevalent supplement used when attempting a cutting phase[12]. Other supplements used by bodybuilders to burn fat during the cutting phase include choline and inositol.[11]. More recently, diuretics has been documented to be commonly used as a cutting agent by both unprofessional and professional bodybuilders in the efforts to lose weight[13].

Creatine Supplement and Bodybuilding:

Creatine is endogenously produced at an amount of about 1 g/d. it is Synthesized predominately in the liver, kidneys, and to a lesser extent in the pancreas[14]. The remains available creatine to the body is obtained from the diet at about 1 g/d for an omnivorous diet. 95% of the body's creatine is stored in the skeletal muscle whereas the remaining 5% is distributed in the brain, liver, kidney, and testes (14). It is also used as an ergogenic aid for improving health and sports performance in athletes. As an oral supplement, the most widely used and researched form is creatine monohydrate (CM) [15].Creatine monohydrate (CM) considered as the most ergogenic and safe supplement that is legally available[16]. Supplementation of healthy adults has not resulted in any reported adverse effects or changes in liver or kidney function [17]. Numerous studies have found significant increase in muscle size and strength resulted from adding creatine monohydrate (CM) to a strength training program[10]. Among many of these studies, 1-2 kg increases in total body mass were observed after loading of 20 g/day of creatine monohydrate (CM) for 4–28 days[18].

Whey protein

Milk contains two fractions of protein: whey protein (WP) and casein protein[19].Whey protein (WP) powder and casein powder have two different types of uses. Whey protein (WP) powder is best used as a meal supplement, while casein is best used for overnight recovery formula. Whey protein (WP) powder has more benefit than casein when comparing overall results on muscle growth and recovery[20].

Recent publication documented that, when combined with exercise, whey protein (WP) supplementation was highly effective at reducing visceral adipose tissue mass and increasing lean body mass (LBM)[21].

Beta-Alanine (BA) Supplement and Bodybuilding

Harris et al (2006)[22]indicated that consumption of 6.4 g of beta-alanine (BA) for four weeks on daily basis has been shown to increase muscle carnosine levels by 64.2%. Other studies suggested that supplementation with beta-alanine (BA) for 4–10 weeks has been shown to improve workload and time to fatigue during high intensity cardio, improve muscle resistance to fatigue during strength training, increase lean mass by approximately 1 kg, and significantly reduce perceptions of fatigue [23]. Presently, the only known side effect of beta-alanine (BA) is the unpleasant symptoms of parasthesia reported after consumption of large dosages; which can be lessen through consumption of smaller dosages throughout the day [22]

Beta-Hydroxy-Beta-Methylbutyrate (HMB) supplement and Bodybuilding

Majority of studies with longer-duration have shown that beta-hydroxy-beta-methylbutyrate (HMB) appears to be effective in the more intense, periodized training protocols. Therefore, it may be beneficial to bodybuilders, especially during planned over-reaching phases of training[24].

It also may enhances hypertrophy, strength, and power following chronic resistance training, and prevents decrements in performance following the overreaching[25].

Branched Chain Amino Acids (BCAA's) Supplement and Bodybuilding

The most widely used supplements among bodybuilders are branched chain amino acids (BCAA's). They make up 14-18% of amino acids in skeletal muscle proteins [26]. Among the branched chain amino acids (BCAA's), leucine is known to have a particular interest because it stimulates protein synthesis to an equal extent as a mixture of all amino acids [10]. Balage & Dardevet (2010) [27]pointed out that all three amino acids need to be consumed to prevent plasma depletion of any

one of the branched chain amino acids (BCAA's) as the ingestion of leucine alone can lead to depletion of plasma valine and isoleucine. The safe upper limit of leucine was set recently at 550 mg/kg bodyweight/day in adult men [(28)].

Citrulline Malate (CitM) Supplement and Bodybuilding

Citrulline (Cit) is a non- essential amino acid that synthesized mainly from glutamine (Gln), glutamate and proline endogenously. It can also be synthesized from arginine (Arg) and ornithine[(29)].

Helms et al (2014) [(10)]suggested that supplementation with citrulline malate (CitM) for 15 days has been shown to be beneficial both during and after exercise. During exercise, it has been shown to increase the production adenosine triphosphate (ATP) by 34%. While after exercise, it increases the phosphocreatine (Pcr) recovery rate by 20%, and reduces perceptions of fatigue.

Glutamine (Gln) Supplement and Bodybuilding

A studies found that glutamine (Gln) supplementation has not significantly improve exercise performance and buffering capacity, help maintaining immune function, or reduce muscle soreness after exercise [(30)].Other long-term supplementation studies included glutamine (Gln) in cocktails along with creatine monohydrate (CM), whey protein, branched chain amino acids (BCAA's), and/or citrulline malate (CitM) were found to be beneficial. They have shown 1.5 – 2 kg increases in lean mass and 6 kg increase in 10 repetition maximum bench press strength [(31, 32).]

5. Methodology

It is a descriptive, cross-sectional study. It is carried out on bodybuilders in Khartoum state. The design is analytical and descriptive to accomplish specific objectives.

The Site of the Study: Khartoum state is the most populous state of the Sudan with an estimated population of about 8 million people. It constitutes about (25%) of the total population of Sudan. The state lies between latitudes 15-16 North and longitudes 31,5- 34 East, at an altitude of 412 m above sea level in an area about 22.736 km2. It is located at the confluence of the White and Blue Niles where both rivers form the Nile River. Khartoum consists of three cities: Khartoum, Omdurman and Khartoum North. (Anon, 2016; Central Bureau of Statistics Republic of Sudan, 2013; Un, 2016). A random sample was collected from nine public and privet sports centers across the state. The centers were randomly selected using simple random samplingand the bodybuilders were selected by means of convenience sampling method during the period of the study.

The research included a sample of 100 bodybuilders age 17-52 years. The sample size was determined using Slovin's Formula:[n= N/1+Ne2].Statistical analyses were done using; the Statistical Package for the Social Sciences program (SPSS) version 21.

6. Results

The results of this descriptive and cross sectional study were presented in tables, charts, and figures using SPSS version 21 and Microsoft Excel 2007. Data were also analyzed by means of chi-square test whereas P-value less than 0.05 was considered significant.

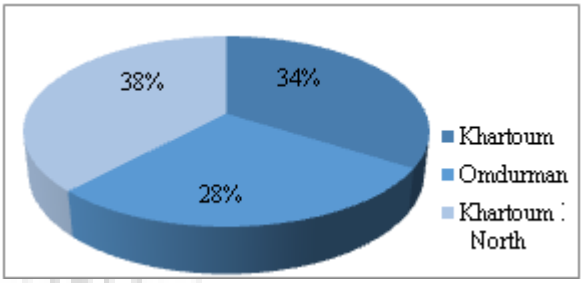

Figure 1: Distribution of Bodybuilders among the three localities

The majority of the bodybuilders were from Khartoum North locality (38%), and Khartoum locality (34%).

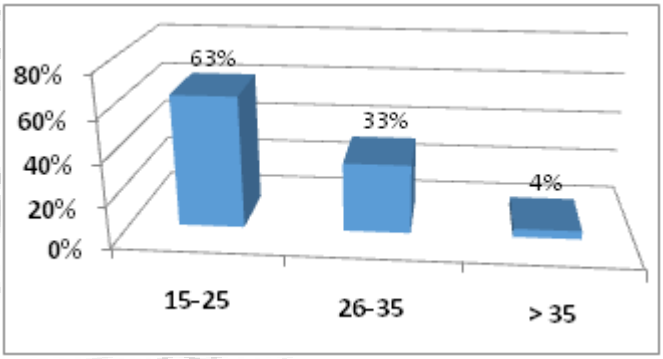

Figure 2: Age of Participants

Figure (2) represented the age of participants. Most of the participant's age were between 15-25 years (63%).

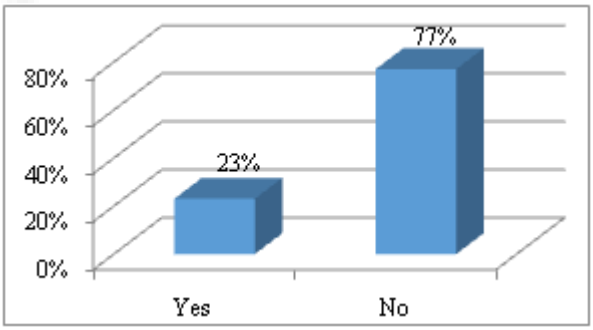

Figure 3: Prevalence of Supplements Use among Bodybuilders

Figure (3) indicated low prevalence of supplements use among the studied bodybuilders by (23%)

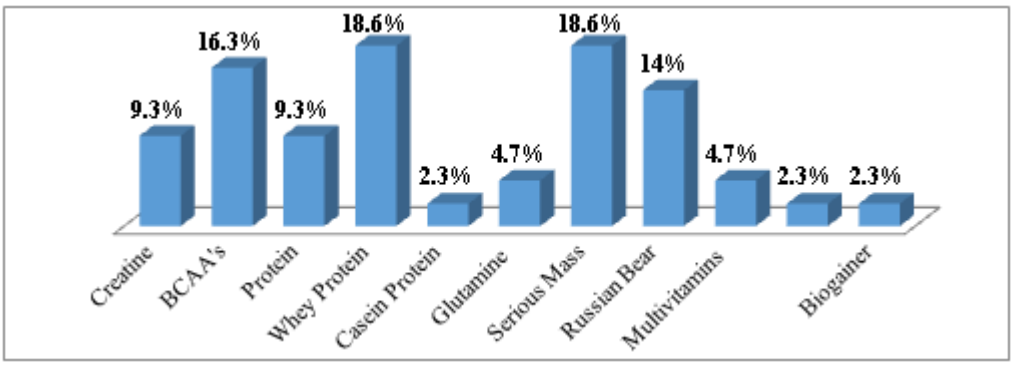

Figure 4: Types of Supplements Used by Bodybuilders

Figure (4) displays that the most common types of supplements used by bodybuilders were whey protein and serious mass by (18.6%).

Table 1: Supplement Dose Used by Bodybuilders

	Frequency	%
As Recommended	23	23%
Don't Use	77	77%
Total	100	100%

Table (1) indicated that all the bodybuilders were used supplements in accordance to the instructions of use by (23%).

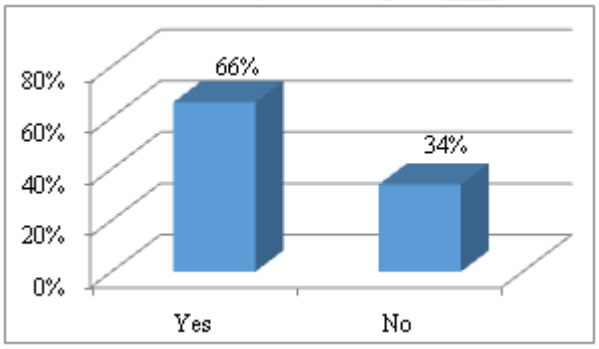

Figure 5: Special Dietary Regimen for Bodybuilding

As illustrated by figure (5), about two thirds of the bodybuilders (66%) were following a special dietary regimen for bodybuilding.

Table 2: Existence of Nutritionist at the Center/ Gym

		Frequency	%
Nutritionist Existence at the center/ gym	Yes	11	11%
	No	89	89%
Total		100	100%

Table (2) disclosed that only (11%) of the bodybuilders reported that there were a nutritionist in the center/gym while the majority (89%) reported otherwise**.**

Table 3: Role of Nutritionist in the Center/ Gym

		Frequency	*%*
Role of Nutritionist	Take Anthropometric Measurements	6	18.8%
	Assess the Nutritional Status	8	25%
	Calculate the Nutritional Requirements	3	9.4%
	Plan the Diet	7	21.9%
	Advice and Counsel	8	25%
Total		23	32

Table (3) demonstrated the role of nutritionist in the sport center/ gym. Quarter of the respondents reported that the role of nutritionist is to assess the nutritional status (25%). (21.9%) stated that the Nutritionist is taking the anthropometric measurements while only (9%) assured that he/ she is calculating the nutritional requirements.

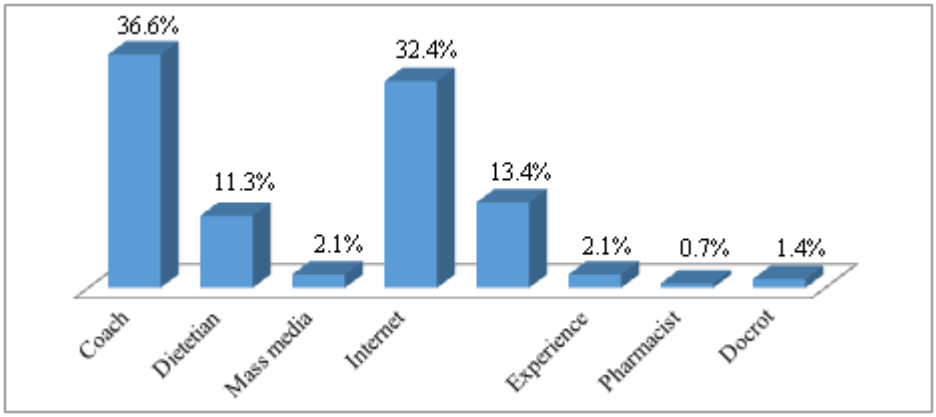

Figure 6: Source of Nutrition and Supplements Information

Figure (6) illustrated that the majority of the bodybuilders (36.6%) were referred to their coaches as source of information concerning nutrition and supplements.

Table 4: Reasons for not consulting a Nutritionist/ Dietician

	Frequency	*%*
Not available	29	34.7%
Not qualified	5	5.9%
Expensive	5	5.9%
I don't need them	38	45.2%
I don't know about them	1	1.2%
I don't have time	6	7.1%
Total	84	100%

Table (4) displayed the reasons beyond not referring to dieticians/ nutritionist as the source of nutritional information. As shown in the table (45.2%) of the respondents assured that they don't need them followed by (34.7%) who reported that they were not available.

Table 5: Chi- Square Testα= 0.05

	p. value	Chi-square	Decision
Age will influence the use of supplement	0.392	1.874	Reject
Level of training will influence the Use of supplement	0.011	11.108	Accept

As the p. value= (0.39) which is greater than (α= 0.05), therefore the researcher rejected the null hypothesis: age of bodybuilder will affect the use of supplements. As the p. value= (0.011) which is less than (α= 0.05), therefore the researcher accepted the null hypothesis: level of training will affect the use of supplements.

7. Discussion

This study is designed to assess the prevalence of sports supplements used by bodybuilders in Khartoum state using an interview questionnaire. The groups under investigation were randomly selected from Khartoum North locality (38%), Khartoum locality (34%), and Omdurman locality (28%). A Total of hundred bodybuilders were participated in this study.

Considering the use of sports supplements among bodybuilders, this study indicated low prevalence of supplements use (23%) comparing to other research that demonstrated 100% use of supplements by bodybuilders[(33)]. About (61%) of the studied group believed that supplements were not needed and may harm health. On the other hand, about (2%) stated that supplements were not available. The majority of bodybuilders (10%) used supplements to increase their muscle mass, while (9%) were used them for performance enhancement. In Canada, athletes declared use of supplements to stay healthy, increase energy, immune system, recovery, and overall performance[(34)]. Another study has reported that (65%) of elite athletes believed that nutritional supplements may enhance performance[(35)].

The most common types of supplements used by bodybuilders were whey protein and serious mass (18.6%). Serious mass is a protein powder weight gainer which supports the growth of lean muscle mass[(36)]Ibanez *et al*. (2014) reported a high use of protein powders(82.5%) among resistance-trained men. Moreover, a high use of protein powder were observed among male collegiate athletes and college students (69% and 40% respectively)[(37)]Rosenbloom & Murray, 2015, [(38)] Gokaya *et al*. 2014 stated that whey protein is the most popular ergogenic aid consumed by athletes. Interestingly, all bodybuilders (23%) reported using supplements in accordance to the instructions of use in this study.

Regarding the availability of the sports supplements, the majority of the respondents (20%) claimed getting the supplements from outside. On the contrary to this, Aljaloud & Ibrahim 2013[(39)] declared that (65.3%) of the Saudi professional athletes were buying supplements from trainers or physicians, and less than (5.1%) were purchasing supplements from online stores and other sources. Most of the bodybuilders were decided to use the supplements based on their own point of view as stated by (9%) and only (1%) were advised by dietician/ nutritionist. According to Wiens *et al*. (2014)[(34)], athletic trainers were more likely to influence strength athletes supplement choices

Approximately, two thirds of the bodybuilders (66%) were following a special dietary regimen for bodybuilding. The majority of these bodybuilders (89%) reported that there was no nutritionist available in the center/gym while only (11%) stated otherwise. Quarter of the respondents accounted that the role of nutritionist is to assess the nutritional status (25%). (21.9%) stated that the nutritionist is taking the anthropometric measurements while only (9%) assured that he/ she is calculating the nutritional requirements.

The largest part of bodybuilders (36.6%) were referred to their coaches as the source of information concerning nutrition and supplements. Additionally, a considerable dependency on the internet for obtaining the needed information were asserted by (32.4%) of the bodybuilders along with a low referral to dieticians (11.3%). These findings were fairly in conjunction with several studies. Castell *et al*. (2015) [(40)]considered coaches as an important source of information on dietary supplements.. Also, the main sources of information for Canadian athletes were family, friends, coaches, and athletic trainers. Conversely to this study, (48%) of the Canadian athletes were met a dietician[(34)]. On the other hand, most Saudi professional athletes (45.9%) stated that their main source of information on dietary supplements was a physician, followed by nutritionist (28.5%) and coach (11.2%) while less than (10%) referred to journals, magazines, and online resources [(33)]. Bodybuilders who did not refer to dieticians as a source of information were asked for their reasons. (45.2%) of the respondents assured that they don't need them while (34.7%) reported that they were not available.

A strong significance was detected between the level of training and the use of supplements (P= 0.01).

Correspondingly, most surveys found that supplement use were reported by (80%- 90%) elite athletes around the world[37]. Weak significance was observed between age and use of supplements. Similarly, younger Danish athletes were more prevalent in using supplements[41].

8. Conclusions

The prevalence of sports supplements use among bodybuilders was found to be low (23%).The most commonly supplements used were: whey protein, and serious mass (18.6%).(40%) and have a low level of nutritional knowledge regarding supplementation. Low availability of nutritionists/ dieticians in the sport centers/ gyms were found in this study. Coaches were the main source of information concerning nutrition and sports supplements.

Very few athletes (11.3%) have access to dietetic/nutrition professional for dietary evaluation and nutritional counseling. Level of training was significantly influence the use of supplements (P= 0.01)

Large scale studies were recommended to be conducted in order to enrich the country's data bases should be supported by collaboration and coordination between different sectors and authorities.

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