



THE IMPACT OF HORMONAL, NON-HORMONAL SUPPLEMENT AND TOTAL DAILY ENERGY INTAKE ON BODYBUILDERS' HEALTH DURING OFF-SEASON STRENGTH TRAINING IN SULAYMANIYAH CITY- IRAQ

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Abstract: Nutrition programs, proper guidance, and supplements (hormonal and non-hormonal supplements) that enhance muscle mass could be key factors for bodybuilders to reach their goals with a correct strategy. However, they could involve them in possible adverse health risks.

The suit questionnaire form was designed to collect information about bodybuilders' total daily energy intake and supplements to strengthen and boost their muscle mass. It was used to discover whether they were on the right track regarding required energy intake. Moreover, the impact of hormonal and non-hormonal substances on their health has also been investigated. For that, thirty-one advanced bodybuilders as participants were taken (as volunteers); most of them had a long period of training experience and had a muscular body shape. The rest have at least more than four years of bodybuilding experience.

Results show that the majority of them didn't reach the required total daily calorie intake or exceeded by a great margin (3800 kcal). Surprisingly, they also had an unacceptable amount of administrated anabolic androgenic steroids (AAS), some of which are on the banned list by authorized food organizations. According to sports supplements' dose-related effects and health risks, nutrition program strategy and practising that kind of supplement use may help them build muscle mass but in a very unhealthy way.

Bodybuilders seem to be at the possible risk of practicing incorrect paths, because they may be misguided in terms of proper nutritional programs and using muscle enhancers.

Keywords: Bodybuilder, Energy intake, Health, Muscle mass, Sports Nutrition, Sports supplement.

1. Introduction

Bodybuilding is more about body shape and appearance rather than performance. For bodybuilders, some factors affect muscle growth. However, nutrition is predominant [1]. Muscle growth directly relies on some factors, such as

nutrition, exercise, resistance training, food supplements, rest and sleep...etc., but above all energy intake, particularly energy balance has a crucial and predominant role [2]. This is because a bodybuilder's goal is to build and increase lean muscle mass without adding unnecessary fat mass. To obtain this positive energy balance (the amount of energy consumed is slightly greater than the amount of energy burned) is required and should be maintained [3]. Energy needs and dietary reference intake for the aged and sex-specific groups are well-known in the literature [4]. Nevertheless, since bodybuilders do more work and heavy lifting, they need a significant number of calories compared to other groups (untrained individuals).

The number of calories that come from different macronutrients should vary. This has also been well explained in the literature [3], [5]–[9]. What is more important and will be the case of this study is total daily energy intake (TDEI), and the effective dose of consumed supplements, such as popular supplements and anabolic androgenic steroids (AAS). They could be beneficial when it comes to building muscle mass [10] or harmful in terms of overdose-related health issues.

Creatine is another popular supplement in this field. During strength training, it maximizes the durability of intense exercise by enhancing lean body mass [11]. Creatine is also considered safe. 3-5g/kg/day is recommended to have the best muscle mass effect. A study reported that consuming a dose of <25/day for 5 years seems to be normal [11]. However, contradicted it by reporting the possibility of occurring renal dysfunction by consuming the same dose for 5 days [9], [12]. This means its safety is related to the ingesting dose.

Bodybuilders tried to push their limits by training their muscles with heavy exercise and trying to benefit from the Gymnasium (GYM) time the most. A factor like fatigue is a barrier in the way that they have to train with a lighter weight and rest between sets and exercises [10]. To overcome that, they use a substance like branched-chain amino acid (BCAA) (under different names, such as Xtend, naked BCAA, BCAA 5000, etc.). It reduces tiredness during heavy resistant training, allowing them to train the targeted muscle harder to enhance muscle mass more. That is what makes BCAA another desired bodybuilder's supplement. For BCAA to be effective, 200mg/day for more than ten days is recommended [13]. However, the consumed dose makes bodybuilders vulnerable. It has been reported that ingesting 500mg/kg/day leads to elevating plasma leucine concentration and extraction. Consequently, urinary tract damage might happen [14].

Since amino acids are building blocks of muscle protein, bodybuilders try to choose protein-rich sources. Unfortunately, they often pick supplements (amino is a marketing name) over rich amino acids and food sources. Aminos consist of a pack of essential amino acids necessary for muscle growth and performance [15]. Discoveries show that balanced amino acids in the body are crucial for the complicated biological process to function well and normally. Disrupting that balance by increasing amino acids dietary intake may lead to the risk of toxic, mutagenic and carcinogenic effects [15], [16], (Figure 1).

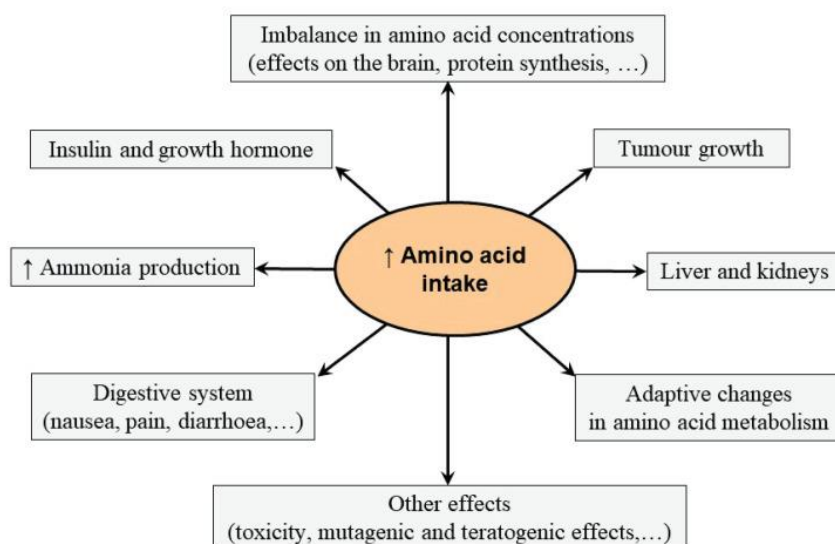


Figure 1. Possible side effects of increased amino acid intake. [16].



Other than these BCAA, the most popular supplements chosen by bodybuilders in this study are glutamine, carnitine, Sustamine, vitamin C, omega-3, clenbuterol...etc. They seem to be less popular supplements because fewer participants use them less frequently.

Hormonal enhancers such as AAS are also involved and used by bodybuilders in this study. Compared to supplements (non-hormonal supplements) AAS are much more effective and designed to have an anabolic effect by a much greater margin, but yet they have a greater health concern [17], [18]. There is a list of banned AASs by no means are they safe, and bodybuilders must not use them even in a low dose (Anabolic Steroid Act 1990). In this study the most popular used AAS are testosterone, boldenone, trenbolone and Winstrol, which the last three on the banned list. However, there is still controversy around testosterone's safety in the literature [19], [20]. If it is considered safe, its administration with high doses for the long term has proven to have some adverse and irreversible health effects [21], [22].

It has been noticed that in this region (Sulaymaniyah city - Iraq), particular nutrition programs and practices used by bodybuilders don't just depend on scientific discoveries, but sometimes even contradict them. In addition, using many dietary strategies and the quality and quantity of dietary supplements are considered to have a direct health impact and raise a major health concern [1]. One crucial question would be "Who should guide bodybuilders" or "Who do they get guidance from". It can be said that most of the personnel who take on these responsibilities don't have the proper qualifications to do so. In other words, most dietary strategies in this area lack scientific support or bodybuilding nutrition guidance does not depend on what is recommended in the literature. Consequently, the desired body shape and expected muscle growth rate might not be according to standards. So, bodybuilders often demand food supplements and other muscle-enhanced substances, such as AAS, to meet their targets rather than a proper nutrition program. For this, unfortunately, scientific investigation hasn't been done yet. It is profoundly important to have the knowledge and track bodybuilders' health here in this region. To reveal the answers to those questions and unknowns, this study is designed to do so. The total daily energy intake was collected and then compared with the standard recommended total daily energy intake. This is to find whether bodybuilders are aware of up-to-date nutrition guidance to get a desired body shape. Both non-hormonal (dietary supplements) and hormonal enhancers (AAS) consumption reported by participants has been recorded. Through this, muscle growth-related effective dose will be revealed to confirm whether bodybuilders are on the right track toward leaner body mass. Moreover, the effect of illegal and overdosed consumed substances on bodybuilders' health will be reported.

2. Materials and Methods

The information has been obtained from thirty-one participants from twelve GYM's in Sulaymaniyah City-Iraq. They were selected to cover most of the city of different socio-economic statuses. All participants were men; most were advanced bodybuilders with an advanced muscular body shape. Some of them who at least have already been training for at least four years and built at least an intermediate muscular body shape. This has been done by filling out the designed questionnaire form (Figure 2). The form consists of two pages, The first page is about some basic and required important information, such as weight, age, bodybuilding history, type of supplement consumed or used, including AAS, and consumed supplement amount per day. The second page is a table designed to collect total daily energy intake (TDEI). Collecting daily energy intake for seven days, the average TDEI for one week was calculated and then converted to TDEI/day. Selecting participants and filling out the form has been done with great caution and emphasis: first, the participants were weighed, and then filling out the required data was done by asking them face to face (first-hand data) rather than filling it by the participant. This is to avoid collecting false information and obtain as accurate data as possible. Finally, the collected data were processed and statically analyzed for discussion and conclusion.

Sports Nutrition

Participant's number: _____

Age: _____

Weight: _____

Type of supplement consumption: _____

Amount/day: _____

Period of training or bodybuilding: _____

Heavy training ☐ or light training ☐

It is a research questionnaire form designed to approach athletes and bodybuilders and acquire information to discover a better and faster result in a healthy way.

	Breakfast	snack	Lunch	snack	Dinner	snack	Total Kcal/day
Sunday							
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							

Figure 2. Questionnaire form to collect required information from participants.

3. Results and Discussion

The effect of some parameters on enhancing muscle mass and bodybuilders' health has been discussed, namely total daily energy intake (TDEI) (figure 3), supplements, such as generally recognized as safe (GRAS),

and dose-related health concern supplements (AAS). (Table 1). However, some substances have not been discussed because of their insignificance. Popular substances that were frequently used by participants were focused on.

Total daily energy intake:

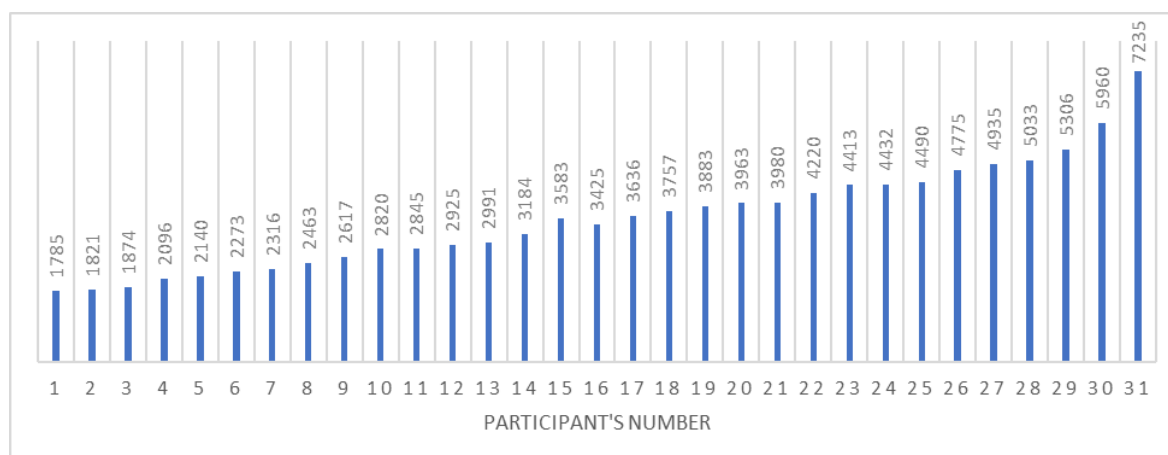


Figure 3. bodybuilders' total daily energy intake (Kcal/person/day) from food (main meals and snacks).

Since resistant training increases the demand for TDEI, bodybuilders obviously should take in more calories than untrained individuals. Regarding this, TDEI has been determined and is well-known in the literature for off-season resistant trainers up to 3800 Kcal/day has been recommended [1].

As can be seen from Figure 4. bodybuilders who participated in this investigation were classified into two main groups according to the recommended TDEI. Group one had a TDEI below 3800 Kcal/day, ranging from 1785 to 3636 Kcal/day, while the second group had higher values than that, ranging between 3980-7235 Kcal/day. Out of thirty participants, only a few had a target TDEI. A study has determined 3800 kcal/day as a recommended TDEI for advanced bodybuilders who perform daily resistance training [1]. Energy intake below recommendation means negative energy balance, which in turn directly affect the anabolic process. In other words, a positive energy balance is required to gain lean body mass [23].

On the other hand, the second group has TDEI above recommendation. It can be said that this also cannot suit bodybuilders when it comes to building a lean body mass. This is because a low or moderate positive energy surplus is far better than a substantial energy surplus. Researchers concluded that in advanced bodybuilders, 200-300 Kcal /day has a greater anabolic impact than 500 Kcal /day, and this is to lower the risk of adding unnecessary fat weight [1]. In this way they can gain lean body mass up to 0.5 kg/week [24]. This result can be achieved by ingesting a slightly energetic meal (10-20% above maintenance calorie intake).

According to the most recent guidelines of TDEI for untrained men aged 31-59 years old is 2200-3000 Kcal /day [9]. In this research, it has been found that nearly 50% of advanced bodybuilders had a TDEI below 3000 Kcal /day, in which 20% of them had even lower end of recommended TDEI for untrained individuals (Table 1). It means they can achieve their goal and clearly lose some weight because of a substantial negative energy balance. It is highly recommended that bodybuilders, during the off-season, should take in 45 Kcal /kg to achieve 0.25-0.5% muscle mass weekly [25]. This is also applied to bodybuilders who ingest much more calories daily >3800 Kcal/day. Around 30% of participants in this research had a greater energy surplus than that, in which several of them had even TDEI above 5000 Kcal /day, including one with above 7000 Kcal /day. Following this eating habit puts them at risk of gaining excess or more fat mass rather than building muscle mass.

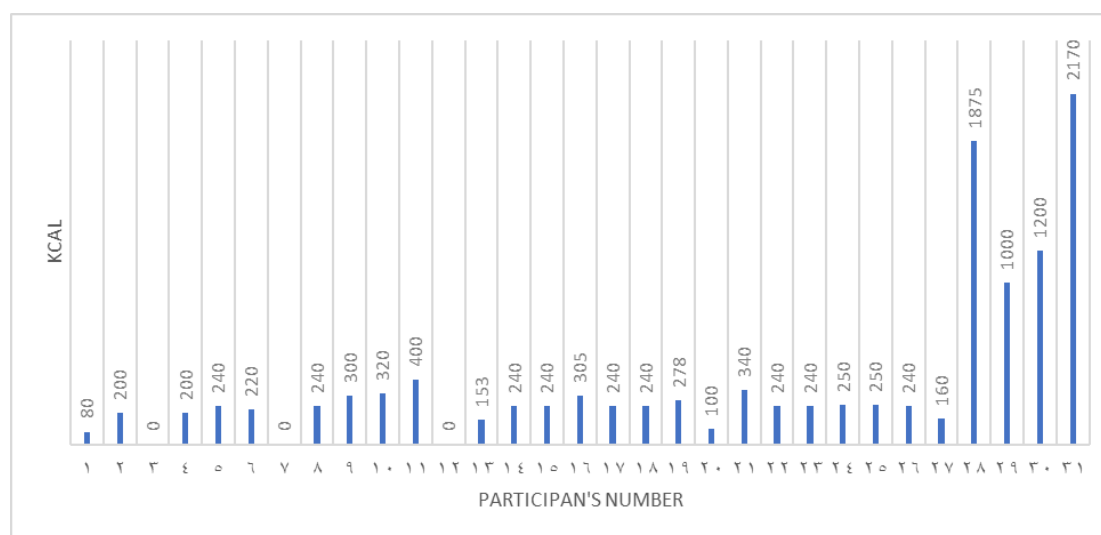


Figure 4. Total daily calorie intake just from protein supplements.

Figure 4. depicts TDEI from protein supplements. It can be noticed that protein supplement was a great contributor to a TDEI. Protein supplement was the most popular supplement among participants. It was consumed to complete insufficient daily protein intake from food and boost anabolic mechanism to gain extra muscle mass. Most participants believe that ingesting protein supplements at different snack times (especially before lunch and before bed at night) will enhance muscle mass. Another study also reported the same information [26]. Apart from a few numbers of participants who did not consume protein supplement, for the majority of them, it contributed 13% of their TDEI, including several of them that protein supplement comprises 1000-2000 Kcal of their TDEI, which is equal to half of their TDEI. This can be why many of them exceed the recommended TDEI (3800 kcal/day) by a great margin.

Supplements consumption: their verity and quantity: It is worth classifying the participants into three main groups: natural bodybuilders, bodybuilders who consumed supplements and those who used AAS. Furthermore, the survey indicated that several participants did not use any supplements, which they are called natural bodybuilders. They comprise just 23% of participants (Table 1). The second group consumed what they are discovered to be Generally Recognized as safe supplements, but they still might be dose-related safety (Table 2). Furthermore, the consumption is based on exercise days. It means participants consume those supplements on days they go to GYM. The third group also consumed some different types of supplements alongside using AAS (Table 3). The AAS use was based on every week. For clarity, it is worth mentioning that only the last two groups were focused on in the discussion.

Table 1. The participant's profile (natural bodybuilders), training history and difficulty level.

Age (Year)	Weight (kg)	Supplement type	Amount/ week	Training history (year)	Heavy/Light training	Total Kcal/day
23	72	-	-	4	H	2316
26	78	-	-	5	L	2402
30	81	-	-	7	L	2500
28	79	-	-	6	L	2840
36	85	-	-	4	L	4200
34	87	-	-	4	L	3936
43	76	-	-	5	H	2925

Note: H=heavy training /L=light training.

Generally recognized as safe (GRAS) supplements: It is well known that bodybuilders consume various substances to enhance their anabolic process to obtain the desired body shape sooner. Those substances can be divided into two main types: food supplements, AAS and their derivatives. Food supplements can also be divided into two classes: GRAS supplements and supplements might affect our health in short and long-term consumption depending on their quality and quantity (dose-related safety).

Table 2 illustrates the range of different supplements consumed by participants. Although some supplements are considered safe even for long-term use, their quantity consumption might have a different effect [11]. The following are the most popular supplements used by participants, which are explained in terms of their safety.

Creatine: It is one of the most popular supplements among bodybuilders. It appears that several of the participants consumed daily ranging from 5-25g of creatine. Even though high dosages (>25 g/day) have no adverse impact on health even for the long term (for 5 years), 3-5g/day was recommended to have an effect [11]. However, long-term use with doses between 5-30/kg/day might have some adverse health impacts, such as renal and liver dysfunction [12].

Branched-chain amino acids (BCAA): Branched-chain amino acids, namely, Leucine, Isoleucine and valine, are other popular supplements that help reduce bodybuilders' fatigue during resistant training by 17% [13]. Table 2 shows most of the participants use BCAA on an exercise-day basis. The range of BCAA consumption was between 10-25g/day. It has been discovered that 20g/day in divided doses for more than ten days might have the highest effect [13]. However, there was a tolerated upper intake limit. One study observed an elevation in leucine excretion and plasma leucine concentration when BCAA was consumed above 0.5g/kg/day. This might have an adverse health effect [14]. From Table 2 it can be said that BCAA consumers in this study are all on the safe side. This is because the highest consumed level was by one 93 kg participant who consumed 25g/day. While the tolerated upper limit for him is 46.5g/day.

Amino acids supplement: This is what is called an amino supplement in the market. It is available in the form of liquid and capsules. Even though it can deliver some interesting benefits, there is controversy around it when it comes to high dosage consumption [16]. Since it causes an imbalance of amino acids concentration due to high doses of certain amino acids, such as arginine and glutamine, it might have some undesirable but mild health effects, such as nausea, abdominal cramps, vomiting and diarrhoea [27]. Other researchers mentioned some frightening adverse health effects, such as toxic, mutagenic and carcinogenic effects [15] (Figure 1). As it can be seen, the majority of bodybuilders in this research used amino supplements with an acceptable dose. However, most consumed at least two different substances, if not more (whey protein, amino, glutamine, arginine and BCAA) (Table 2). In fact, over 30% of them consume at least three of these substances. Ingesting those supplements on exercise day might increase the overall amino acid concentration. Practicing this kind of unsupported use of supplements may have led to those irreversible adverse effects mentioned before.

Table 2. The participant's profile (supplement consumers), training history and difficulty level.

Age	Weight	Type of supplement	Amount per day-exercise	Training history	H/L training	Total Kcal/day	% kcal from protein supplement
18	65	gainer	220g	3 years	L	7235	30
		creatine	10g				
		carbox drink	60ml				
21	85	amino	15g	4 years	H	2991	5
		why	22g				
		arginine					

22	93	Whey protein	50g	4 years	H	1821	11
		creatine	25g				
		BCAA	25g				
25	69	gainer protein	220g	4 years	H	5033	37
		BCAA	10g				
35	88	whey protein	100g	9 years	H	2845	14
		BCAA	20g				
		Creatine	10g				
36	68	whey protein	20g	6 years	H	1785	4
		creatine	10g				
36	76	whey protein	25g	10 years	H	3963	3
38	115	BCAA	10	19 years	H	3883	7
		glutamine	1 tablet				
		amino	20g				
		whey protein	192g				
38	104	whey protein	40g	22 years	H	4935	3
		BCAA	20g				
		glutamine	20g				
		vitamin c	1000mg				
		omega3	1 tablet				
39	84	whey protein	30g	10 years	L	2617	11
41	120	Whey protein	60g	10 years	L	3184	8
		CLA	3 tabs				
		l. carnitine	450mg				
		l. glutamine	10mg				
		arginine	300mg				
		glutathione	1 capsule				
42	95	whey protein	50g	4 years	L	2273	10
		amino acid	5g				
		creatine	5g				
		vitamins	1 tablet multi				
42	120	carnitine	300	12 years	H	2463	10
		CLA	3 tabs				
		arginine	450g				
		Whey pro.	60g				
		glutamine	10g				
		glutathione	1 capsule				
46	82	whey protein	2 scoops	5 years	H	2096	10

Note: H=heavy training /L=light training.

Used Anabolic androgenic steroids (AAS) among bodybuilders: This research has investigated the frequent use of AAS and other prohormone substances among elite bodybuilders. Their safety-related allowed dosage and their legality in the market were discussed. Several certain AAS seem to be popular among bodybuilders in

this research, including testosterone and its derivatives, such as boldenone, Winstrol and trenbolone. Nearly 40% of the participants used at least one of the above substances weekly (Table 3), and almost all of them used at least two substances weekly. It can be said that those kinds of substances can easily be obtained in the market without a prescription, this is confirmed by participants during a face-to-face interview. Testosterone might be the most popular AAS for enhancing muscle growth [28]. Dehydroepiandrosterone (DHEA), androstenedione, and androstenediol are considered a precursor of testosterone that could be converted to testosterone. Since 2005, androstenediol became AAS as The Anabolic Steroid Control Act of 2005 (21 USCS Section 802, amended) included it with 17 other steroids that these kinds of substances must be controlled and sold with a prescription.

Table 3. Participant's profile (supplement consumers and AAS users), training history and difficulty level of training.

weight	Type of supplement	Amount per day-exer- cise	Training history (year)	H/L train- ing	Total Kcal/day
93	whey protein	60g	4	H	3583
	Winstrol	300mg			
	l.amitin	300mg			
	boldenone	500mg			
	Dianabol	50mg			
	trenbolone	400mg			
	amino	10g			
	glutamine	10g			
	carnitine	60mg			
87	testosterone	500mg	4	H	4220
	whey protein	60g			
	BCAA	10g			
82	boldenone	350mg	5	H	4355
	whey protein	60mg			
	creatine	10mg			
104	winstrol	400mg	6	H	4775
	testosterone propio- nate	50mg			
	boldenone	500mg			
	whey protein	60g			
	arginine	450g			
	carnitine	300mg			
102	whey protein	60	7	H	3757
	BCAA	10g			
	glutamine	10g			
	carnitine	300mg			
	testosterone	400mg			
	Winstrol	300mg			
	boldenone	250mg			
	paradol supplement	50mg			

104	whey protein	100g	8	H	5306
	amino	40g			
	glutamine	20g			
	creatine	10g			
	testosterone	1400mg			
90	boldenone	500mg	7	H	4256
	whey protein	50g			
	creatine	10g			
	Winstrol	50mg			
83	sustamine	500mg	7	H	3636
	boldenone	500mg			
	whey protein	60g			
	BCAA	10g			
98	boldenone	400mg	15	H	4480
	testosterone & anavar	500mg			
	steroid				
	BCAA	10g			
	clenbuterol	20g			
	arginine	30g			
	Winstrol	50mg			
	glutamine	10g			
	whey protein	60			

Note: H=heavy training /L=light training.

Testosterone (Effective doses and safety of AAS): It can be seen from Table 3, that nearly all testosterone users administrated 400-500mg, in which one participant administrated 1400mg in one dose. However, two of them used 50 and 250 mg. While the recommended dose by manufacturers is only 100mg [28].

Regarding the dose-related anabolic effect of testosterone, there is a quite contrasting result between market claims and scientific research discoveries. Marketing claims that serum testosterone can be increased by 40-83% by using 50 mg of androstenedione, doubling that dose can increase serum testosterone by 111-237%. Nevertheless, one study revealed that 100 mg didn't make any impact on elevating serum testosterone after 6 hours in men aged 19-29 years old [29]. This was confirmed by other studies on men aged 20-40 years old [30], [31]. Furthermore, studies also reported 200 and 300mg can raise serum testosterone by 15-44%, respectively, which are high and unacceptable doses [32]–[34].

Regarding its safety, while it is legal and can be obtained in the market for personal use, there might be frightening risks. Since testosterone and its precursors might be responsible for hormonal milieu alteration, other adverse health effects, such as prostate cancer, testicular and pancreatic cancer, and heart disease, might also be possible [28]. Despite the fact that there hasn't been any documented case of androgenic-related cases, studies on rats reported a positive relationship between prolonged use of testosterone and physiological effect (causing hypertrophy, the area of the brain that regulates aggression, and reproduction dysfunction in male rats [28], [35]–[37]. Moreover, according to the latest update by The National Collegiate Athletic Association (NCAA), testosterone was included in the list published under the name "NCAA banned substances" on July 14, 2022.

Other AAS: There is a range of other AAS used by bodybuilders in this study, such as Boldenone, Dianabol, Trenbolone and Winstrol (Table 3). Although they were used in different doses during off-season resistance

training, it is preferred not to discuss the safe doses at all. This is because they cannot just be sold with a prescription or considered safe up to a certain limited dosage, but they are completely banned and considered illegal by the Food and Drug Administration [17], [18], [27], [38]–[41]. Boldenone can be produced in a very low concentration in our body [42], [43]. However, irreversible health risks result when used as a muscle growth factor. A study reported a significant decrease in serum testosterone level, seminal volume, sperm mortality, sperm count [17], liver and kidney damage [18] after administrating up to 5 mg/kg body weight twice a week for two months. The amount by some bodybuilders in this study matched that concentration (Table 3). Winstrol, marketed by the name Stanozolol, is another banned AAS. Similarly, boldenone and Winstrol are also popular among this study's participants. Nearly 20% are used a dose between 50-400 mg/week. Although manufacturers recommend 2 mg /day, a published medical case report announced that Winstrol is considered as one of the riskiest AAS in the market in terms of aggression and skin acne symptoms. Furthermore, higher dosage leads to even much more complicated health issues, such as liver damage [38], and renal failure, due to using 50mg for 80 executive days [44]. Another published case reported two heart attacks, which resulted in death [39] and one heart attack survivor [40]. Similar substances, such as Clenbuterol, trenbolone and Dianabol, seem less popular. There is only 1-2 users each in this study, but they are also in the illegally marketed AAS list, even in the lowest doses.

Multiple supplement consumption: It has been found that bodybuilders consume multiple supplements, including AAS (Figure 5). This attempt has been made to find out the effect of taking several different substances on bodybuilders' health. It can be seen from the chart that up to 20% of participants used 4-5 substances, up to 10% of them used 6-8 substances, only 4% used nine substances, and 13% of them used only 0-2 substances, including AAS every week. Different substances have been ingested and administrated (in the case of AAS) with different doses, as mentioned in Tables 1 and 2. This is considered a quite high supplement consumption. The long-term impact hasn't yet been well-known in the literature [45]. This massive range of supplements should be guided and instructed by a sports doctor or a dietitian or a nutritionist. It can be argued that almost all participants in this study used those different supplements without going back to their nutritional status, which is confirmed by participants. Findings suggest that athletes might benefit from supplements depending on their nutritional status. For example, athletes benefit from a supplement the most when there is a deficiency in a certain micronutrient or vigorous training makes the body need a certain micronutrient that cannot be compensated for by the diet [45]. This unguided supplement consumption might be harmful, resulting in undesired health outcomes due to the non-utilization of overloaded supplements or the interaction between supplements and other nutrients, such as calcium and iron [46]. In terms of AAS use, it has been found that it is shockingly surprising that some participants use multiple AAS, in which at least one is banned. This certainly endangers them with a great risk of getting an irreversible adverse health outcome.

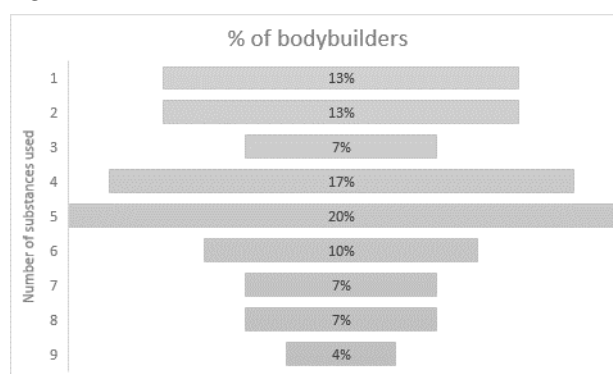


Figure 5. Multiple substances are consumed (in the case of supplements) and used (in case of AAS) by bodybuilders every week.

Conclusion:

Bodybuilders desire an attractive body shape, and their temptation toward it is thriving. However, safety and health must come first, and these demands are in their hands. Although they can decide on their own life, the one who guides them should be responsible since they are not specialists when it comes to nutrition. Since there isn't any nutritional consultation centre and a branch in hospitals here in this region (Iraq-Sulaymaniyah city - Iraq), GYM coaches are the most popular bodybuilder's guidance. Although they might be experienced in resistance training techniques, they cannot be compared with a nutrition specialist or sports doctor. Most of them reported receiving supplement and nutrition guidance from GYM coaches, including type, dose and time of substance that should be consumed or used to significantly enhance exercise and lean body mass. This misguidance was also reported by athletes in several developing countries. One of the main concerns of this study is that bodybuilders should focus on a healthy diet program to compensate for their energy and micronutrient needs and consume supplements independently. Furthermore, the decision to use AAS must depend on some factors, such as the type of AAS (except a banned list), and the dose must not lead to an adverse health complication, even for long-term use. All that must be prescribed by a sports doctor or nutritionist.

Supplementary Materials:

No Supplementary Materials.

Author Contributions:

A. I. Abdalla and R. M. Rashid; methodology, writing—original draft preparation, K. A. Bayz ; writing—review and editing, R. R. Mohammedsalih; paraphrasing. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement:

The study was conducted in accordance with the protocol authorized by the University of Sulaimaniyah, Ethics Committee.

Informed Consent Statement:

No Informed Consent Statement.

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The authors declare no conflict of interest.

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