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Research Article

CONSUMPTION STUDY OF SUPPLEMENT ON MEMBER OF GYMS IN BANDUNG AND QUALITATIVE ANALYSIS OF STEROID IN SELECTED SUPPLEMENT

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ABSTRACT

Sports supplements are popular commodity among bodybuilders. Unfortunately, a lot of bodybuilders use supplements with the addition of steroids. Therefore, the study of knowledge level and identification of steroid in supplements were needed. Hence, the aim of the present study was to measure knowledge of supplement in members of gyms and compare to the 4th year pharmacy students from the Bandung Institute of Technology. Furthermore, selected supplements from the previous study are then tested for steroids. The study was conducted in 2 gyms in Bandung (PK-A and PK-B) and Bandung Institute of Technology. Total 300 data of subjects were then statistically analyzed. Selected supplements were then tested for its content of steroid using Liebermann-Burchard method. The test was started with the determination of limit of detection. Further, qualitative analysis of steroid in 9 supplements was carried out. There was as much as 56% (PK-A) and 51% (PK-B) subjects who consumed bodybuilding supplement on a regular basis. A total of 49, out of 56 subjects, were in the range of 17-45 years of age (PK-A). While it was 48 out of 51 subjects in the range of 17-35 years of age at PK-B. Most of the subjects consuming supplement were either private employees (17 in PK-A; 10 in PK-B), entrepreneurs (20 in PK-A), or college students (12 in PK-A; 35 in PK-B). At PK-A, 40 out of 56 subjects has been a member since at least 3 years ago. While in PK-B, it was distributed rather evenly. Cumulatively, it was also observed most subjects consuming supplement were regularly exercising 4-5 times a week in PK-A (33) and PK-B (21). From the study, it was obtained that PK-A subjects (41.07%) have a higher percentage of subjects with above the average knowledge in comparison to the pharmacy students (34%). Based on the study, it was found that there is no significant difference at $p>0.05$ of the knowledge of members at PK-A and a lower percentage of average knowledge at PK-B in comparison to pharmacy students of the Bandung Institute of Technology. From 3 of the 9 samples showed positive results.

Keywords: Knowledge, Liebermann-Burchard, Gyms, Steroid, Supplement.

INTRODUCTION

In this modern era, there are two things which are the main focus of the majority of human: Health and esthetic. The need for health and esthetic [1] originates from the basic need of human being as stated in the needs hierarchy theory [2]. Sports that used to be solely for the purpose of health, for nowadays, it serves another purpose which is to improve the esthetic such as straightening the body, broadening the shoulders, increasing the integrity of gluteus, and other purposes [3,4]. One of the sports that help someone to achieve those two purposes is bodybuilding. Bodybuilding began its popularity from the Sandow Era, which is named after the father of bodybuilding, Sandow himself. Since then, the popularity of bodybuilding has increased substantially over the years and has become a way of life [5].

For bodybuilders, both amateurs, and professionals, the supplement is a primary need to achieve both purposes above [6]. These supplements contain ingredients such as creatine, caffeine, protein, amino acid, insulin, glucosamine, or ephedrine which sometimes are consumed as a daily product.

Recently, the demand of consumer looking to get a better body, empower themselves and increase their well-being through bodybuilding has been increased especially in fitness center [5-7]. This supplement can be obtained through online or even through social media in which very vulnerable to the addition of steroid to enhance and accelerate the body forming. However, until now, there is still a lack of study about the knowledge level of steroid in supplement and identification of steroid in supplement especially in Bandung, Indonesia. Therefore, the aim of the present research was to measure knowledge level of supplement in members of gyms and compare to the known-well health student (4th year Pharmacy Bandung Institute of Technology) and identify the present of steroid in selected supplement.

MATERIALS AND METHODS

Materials

Validated questionnaires, chloroform, anhydride acetic acid, concentrated sulfuric acid (95-98%) were obtained from Merck Chemical. Prednisone, methylprednisolone, betamethasone, hydrocortisone, dexamethasone, cortisone acetic, ethinyl estradiol, etisterone, estrone, estradiol, progesterone were obtained from the National Agency of Drug and Food Control in reference materials Grade, amino acids (alanine, aspartic acid, glutamate acid, phenylalanine, isoleucine, glycine, histidine, leucine, arginine, lysine, tyrosine, treosine, valine, methionine, and serine) were obtained from Sigma in the Analytical Grade. All of the samples was bought from the internet, local store, social media, in which the product selected from questionnaires result (four samples of free-market products, three multilevel marketing products, one multivitamin product, and one unregistered product).

Methods

Bodybuilding supplement consumption pattern

Place

The data are acquired from two gyms in Bandung, which are chosen based on the specific criteria. The criteria are a middle-high class gym (namely, PK-A) and middle-low class gym (namely PK-B). The difference of the gym criteria is based on the monthly fee as members. PK-A requires their member to pay a minimum fee of Rs. 300.000, each month, while PK-B requires their member to pay a minimum fee of Rs. 60.000.

Respondent

The questionnaire is given to the active members of 2015 in the related gym as respondents. There is no limitation to the criteria of the respondents. The target of respondents is 100 for each gym.

Questionnaire

The questionnaire consists of four parts: The identity of the respondent, exercise regimen, supplements, which are consumed, and the knowledge of the supplements.

The knowledge level

Above the average knowledge (ATAK) method

We proposed ATAK method to determine the knowledge comparison between respondents in different gyms. ATAK is acquired by accumulating the score (>1) from part 4 of the questionnaire. The score is given based on Table 1. The accumulation of the score is then compared to the score of School of Pharmacy 4th year student as the control group.

Qualitative analysis of steroid substance

Reagent and sample preparation

Standard solution

Prednisone and betamethasone were dissolved in chloroform with a concentration of 10, 5, 1, 0.5, and 0.1 mg/mL. Meanwhile, a solution of methylprednisolone in chloroform was prepared with the concentration of 5, 1, 0.5, and 0.1 mg/mL. The solution is used to determine the limit of detection (LOD) of Liebermann-Burchard steroid test (LBST).

Powder sample

About 2 g of sample is weighed and dissolved in three milliliters of chloroform. The chloroform is then filtrated and vaporized at room temperature until the solution reached 1/3 of the initial volume.

Tablet and biscuit sample

The sample is crushed using mortar. Then, the sample is dissolved in chloroform. The solution is then filtrated and tested using LBST.

RESULTS

From the 100 questionnaires acquired in PK-A, 56 of respondent stated that they are using the supplement, and the other 44 is not currently using supplements of any kind. PK-B, as much as 51 respondents, is using supplements while 49 of them are not using supplements of any kind (Fig. 1). The respondents who are using supplements from each gym consist of 45 males, 11 females (gym A) and 46 males, 5 females (gym B) (Figs. 2 and 3).

Based on the data collected on occupancy, the supplement usage is popular among private employee (17 person), entrepreneur (20 person), and college students (12 person) in PK-A. Meanwhile in PK-B, as much as 10 private employee and 35 college students are using the supplement. (Fig. 4).

Most of the respondents using supplements are among people with bachelor's degree (27 person) or are still taking the bachelor's degree (11 person) in PK-A. Other than that, 10 gym members who are using supplements have master's degree. In PK-B, 24 supplement users are college students, and 18 have bachelor's degree (Fig. 5).

Based on the frequency of training, the majority of supplement users exercise 4-5 times each week (33 person) in PK-A, while in PK-B majority of the supplement users exercise 1-3 times each week (30 person) or 4-5 times each week (21 person) (Figs. 6 and 7).

Table 1: ATAK

Criteria	Score		
	0	1	2
Regulatory knowledge			
Know but is wrong	•		
Know and correct		•	
The knowledge of the dangerous substances (%)			
<25	•		
25-49	•		
50-74		•	
75-100			•
The knowledge of steroid side effects (%)			
<25	•		
25-49	•		
50-74		•	
75-100			•

ATAK: Above the average knowledge

DISCUSSION

Bodybuilding supplement consumption pattern

The research to study the supplement consumption pattern and knowledge among gym members is done by giving out questionnaire among respondents in gyms. The questionnaire is distributed in two different places to study the consumption pattern. The places are PK-A and PK-B. To study the gym members' knowledge, the questionnaire is also distributed to the 4th year pharmacy students at the Bandung Institute of Technology.

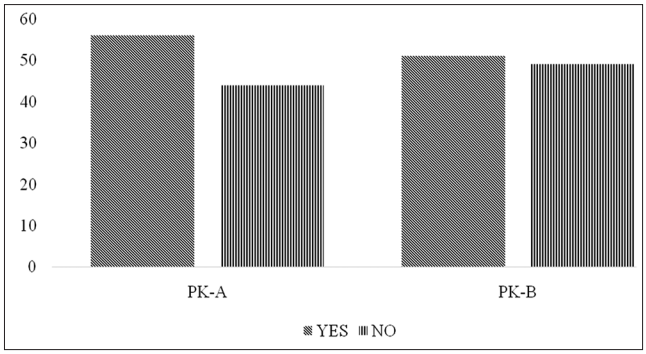

Fig. 1: Supplement consumption on PK-A and PK-B (n=100)

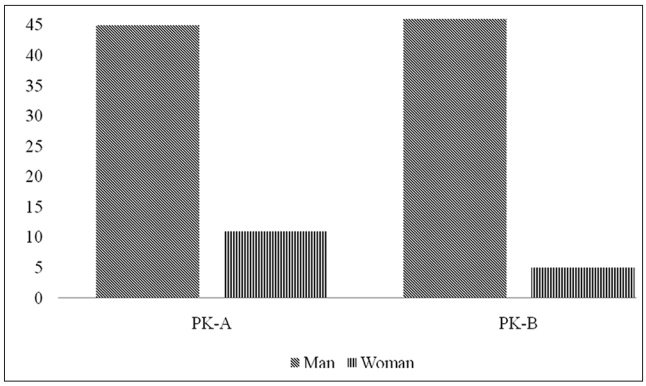

Fig. 2: Gender comparison for PK-A fitness and PK-B fitness that consumes supplement for fitness

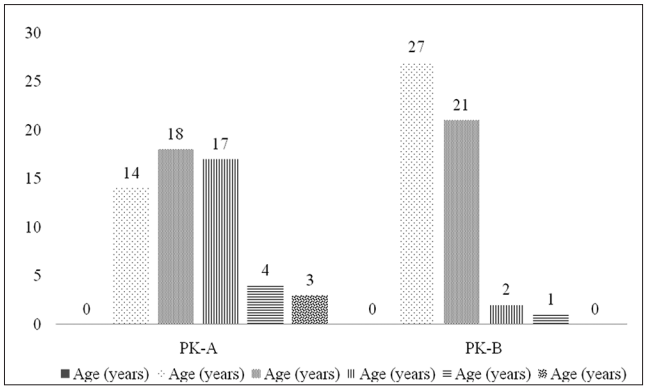

Fig. 3: Distribution of age (years) of supplement-consumer on PK-A and PK-B

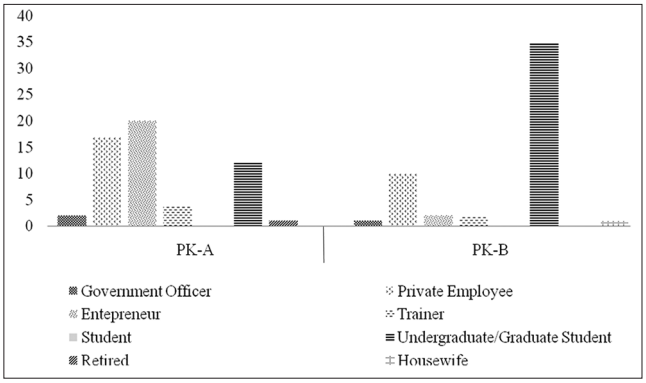

Fig. 4: Personal occupation of supplement consumer from PK-A and PK-B

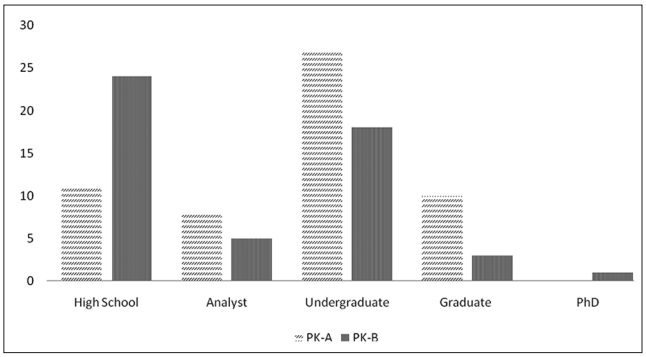

Fig. 5: Educational background of supplement consumer on PK-A and PK-B

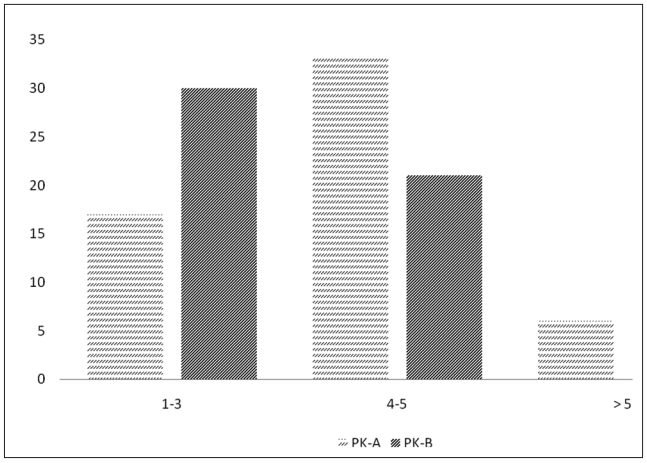

Fig. 6: Comparison of Exercise frequency between supplement consumer on PK-A and PK-B

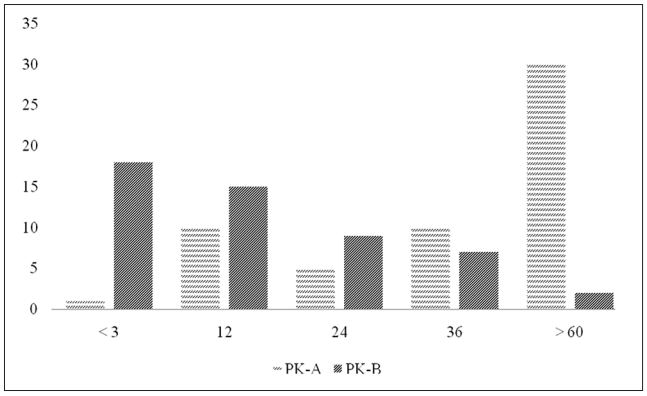

Fig. 7: Comparison of duration member of supplement consumer on PK-A and PK-B

The purpose of distributing to the pharmacy students is to acquire a set of control group data as a comparison since the pharmacy students received sufficient knowledge about supplement products. Therefore, it is implied that the students will have a higher level of knowledge about supplements than those of commoners.

Based on the age and the other data, there is a pattern of supplement usage in PK-A, which is popular among gym members age 17-45 years old (Fig. 3). While from PK-B, the data show that supplement usage is popular among gym members age 17 through 35 years old (Fig. 3). Based on these finding, it can be observed that the majority users are still in their productive and active years. This is the possible reason behind the big numbers of supplement usage in the particular range. The other reason being that they are aware of their health and aware that supplement can help their health.

Based on the occupancy (Fig. 4), the three majority profession that is using supplement is college students, entrepreneur, and private employee. The possible reason behind this pattern is that the profession is either being funded or has a steady income. Either of those reasons means that the gym members are financially secured, so they are able to pay the monthly fee at the gym. They are also flexible enough time wise.

It was also founded and observed that the supplement users in PK-A are slightly more active compared to the supplement users in PK-B. The further reason could be the monthly fee which is higher in PK-A. This serves as a factor that pushes the members to work out more because they have to pay more. Furthermore, PK-A provides much better equipment, both quantitatively and qualitatively. Being a long active member can also contribute to the frequency of exercise. The longer someone has exercised, the less effective the exercise is. Therefore, for those who has exercised since a year ago or more is going to have exercise more than the one who has just started (NSCA, 2007) [10]. The purpose of exercise can also determine the frequency. This is true in comparing amateurs to professionals. Bodybuilders who train for competition is going to need a higher frequency of exercise than those that exercises just to have good health (Raudenbush, 2003) [11].

Bodybuilding supplement related knowledge level

Besides studying the consumption pattern, the knowledge level of respondents in various gyms compared to that of pharmacy 4th year students was also assessed. The focus of this study is bodybuilding supplement user because the risk of side effects and toxicity is much higher in frequent user who exercises. The risk is both physiological and psychological. In this case, the knowledge of regulatory concerns, dangerous substances, and side effects have to be evaluated.

Based on the questionnaire, there are more pharmacy students (54 person) that know about the regulatory committee than the members in PK-A (34 person) and PK-B (29 person). But based on the percentage of supplement user, PK-A has the highest percentage of respondent namely 60.71%, in which knows about the regulatory committee. From the total of the respondent that knows about the regulatory committee, as many as 30 respondent in PK-A answered NFDC (BPOM) as the official regulatory committee, and four answered NFDC and FDA. While in PK-B, only 23 respondent thinks that NFDC is the official regulatory committee, Department of Health (1 person), NFDC and Department of Health (3 person), NFDC, Ministry of Health and Department of Trade (1 person) and NFDC, Ministry of Health, Department of Trade and FDA (1 person).

It was obtained that respondent in PK-B has a more variant answer compared to the answer given by respondents in PK-A. The

Table 2: ATAK score result for respondents in gym A, B, and SF-ITB

Category	Gym A	Gym B	SF-ITB
Total supplement user	56	51	100
Total supplement user with ATAK score >1	23	5	34
Percentage	41.07	9.80	34.00

ATAK: Above the average knowledge

Table 3: LBST results for standards solution at different concentration for LOD determination

Active pharmaceutical ingredient	Concentration (mg/mL)					
	10	5[a]	1	0.5	0.1	Blanko
Prednisone	+	+	+	+	-	-
Methylprednisolone		+	+	+	+	-
Betamethason	+	+	+	+	+	-

LOD: Limit of detection, LBST: Liebermann-Burchard steroid test

reason behind is the lack of knowledge enforced in PK-B. As PK-A is a middle-high class gym, they also embrace the importance of knowledge. In that context, the trainers in PK-A encourage and educate the bodybuilders, so they know more and be independent in choosing their training regime and supplements. Other than that, the respondent in PK-A has a higher number of respondents in answering FDA. This is thought to be caused by the amount of exposure to import supplement which is mostly approved by FDA.

From the pharmacy student respondent, as many as 42 answered NFDC as the regulatory committee, Ministry of Health (1 person), NFDC and Ministry of Health (5 person), NFDC and Department of Trade (3 person) and NFDC, Ministry of Health and Department of Trade (1 person).

From ATAK calculation, it was acquired that as many as 23 out of 56 gym member that was using supplements score >1 for ATAK in PK-A and 5 out of 51 in PK-B. While the pharmacy students scored 34 out of 100 (Table 2). Therefore, it can infer that PK-A respondents have a higher knowledge level than those of PK-B and pharmacy students. However, after it is analyzed using χ^2 statistical analysis considering the Yates factor, there is no significant difference between respondent in PK-A and pharmacy student. While the same statistical analysis of PK-B showed a significant difference between results of respondent in PK- B and pharmacy students. This means that the respondent in PK-B might have a lower knowledge than those of pharmacy students (0.05 confidence interval and freedom degree of 1).

Qualitative analysis of steroid substance

LBST is used to test supplement sample which is chosen from the questionnaire. Before testing, there were the determination of LOD and standard testing of a standard substance. The LOD determination was done by three steroid substances with different concentration. The three substances are prednisone, methylprednisolone, and betamethasone. Prednisone and betamethasone are tested at 10, 5, 1, 0.5, and 0.1 mg/mL. Meanwhile, methylprednisolone is tested at 5, 1, 0.5, and 0.1 mg/mL. Every concentration of every substance is tested in 2 mL of chloroform solution. The results were all positives, except for the 0.1 mg.mL prednisone since this is the LOD of prednisone using LBST (Table 3).

The substances used in this test as positive control were hydrocortisone, dexamethasone, cortisone acetic, ethinyl estradiol, etisterone, estrone, estradiol, and progesterone. All of the standards were dissolved in chloroform with a concentration of 10 mg/mL and all standard showed positive results (Table 4). Sample testing was done toward 9 samples that were acquired from bodybuilding supplements which were popular among bodybuilders. The supplement products are product

Table 4: LBST results for standard solution

Standard	Result
Hydrocortisone	+
Dexamethasone	+
Cortisone acetic	+
Ethinyl-estradiol	+
Etisterone	+
Estrone	+
Estradiol	+
Progesterone	+

LBST: Liebermann-Burchard steroid test

Table 5: LBST results for sample solutions

Sample	Result
A	+
B	+
C	-
D	-
E	-
F	+
G	-
H	-
I	-

LBST: Liebermann-Burchard steroid test

A, B, C, D, E, F, G, H, and I. Three out of nine products showed positive results in LBST (Table 5).

CONCLUSION

PK-A subjects (41.07%) have a higher percentage of subjects with above the average knowledge in comparison to the pharmacy students (34%). Based on the study, it was found that there is no significant difference at $p>0.05$ of the knowledge of members at PK-A and a lower percentage of average knowledge at PK-B in comparison to Pharmacy Students of Bandung Institute of Technology. Based on the laboratory observation, 3 of the 9 samples showed positive results.

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