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Tendency to Consume Anabolic Steroids and Body-Building Supplements in the General Population: An Ecological Study

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Abstract

Background: Anabolic steroids and bodybuilding supplements are products that are readily available in the market and are increasingly being used by young people and athletes. This trend has become a social issue worldwide.
Objectives: The purpose of this study is to examine and determine the changes in the prevalence and trends of anabolic steroid usage in Iran.
Methods: This ecological study utilized the Google Trends database as its primary source. Initially, we searched for specific keywords related to "anabolic steroids (AS)", "Body-building supplements (BBS)", and "COVID-19" among all searches conducted using GTs from January 2017 to December 2022. Subsequently, Spearman's correlation coefficient was employed to assess the association between the keywords "AS" and "BBS" with the term "COVID-19" during various years.
Results: The preference for consuming protein (58.19 ± 15.24) was highest among BBS, while recovery (12.14 ± 17.09) was the lowest. In the case of AS, the highest search frequency was related to Testosterone (56.64 ± 9.57), while the lowest was related to Primobolan (13.72 ± 8.21). In early 2020, we observed a significant impact of the COVID-19 pandemic on the inclination to use BBS and AS, leading to a substantial decrease in willingness to use. However, we did not observe a statistically significant correlation between keyword searches for COVID-19 and AS & BBS.
Conclusions: The trend of AS and BBS usage in Iran is on the rise. The indiscriminate use of supplements is a cause for concern and calls for educational interventions.

Keywords: Supplements, Anabolic Steroids, Protein Supplement, Testosterone, COVID-19, Google Trends

1. Background

One of today's social problems in many countries is the consumption of sports supplements, which is a problem for many people (1). The use of these materials has become a big industry in the world. In 2019, this industry had a turnover of 11.6 billion dollars, which will increase to 2025. 4/24 billion dollars will reach (2). Due to the wide variety of these products, the lack of careful monitoring of their distribution, and attention to the numerous advertisements about the effectiveness of these materials for consumers it is presented at different levels of society, the control of these materials for managers and it has made it very difficult for the health policymakers of the country (3). Body-building supplements (BBS) usually contain natural and herbal ingredients such as protein, creatine, amino acids, and vitamins that help muscles recover and grow (4). These supplements are usually used to supplement the nutrition of athletes and their purpose is to increase performance and improve body strength and endurance (5). Anabolic steroids (AS), as chemical products, are artificially added to the body's muscles and significantly accelerate muscle growth and strengthening (6). AS usually contain the hormone testosterone, which is naturally produced in the body. By using AS, muscles grow faster and more, and the body's endurance increases (7). Various media reports that the ideal body for men is muscular, which causes dissatisfaction with the body type to increase among them, and these issues cause an increase in the consumption of energizing substances (8). This dissatisfaction with the body type and the desire to change it is one of the critical factors in the use of AS (9). Their consumption usually increases muscle mass and improves the body's appearance (10).

A meta-analysis found a global lifetime prevalence of AS use of 3.3%. Its prevalence is higher in men(6.4%) than in women(1.6%) (11). The use of AS is relevant because it has many side effects, such as lipid metabolism disorders, high blood pressure, coagulation disorders, cardiomyopathy, liver disorders, infertility, aggression, depression, and mania (12, 13). Despite the potential consequences of AS use for individuals and the larger population, insufficient information is available on the prevalence of AAS use in communities due to the stigma and stigma associated with AS use (14, 15). Evaluating internet searches is a way to investigate changes in health events in the community. The internet and its data are now recognized as an alternative tool for collecting data on disease patterns and population estimates in epidemiology (16, 17). The phrases searched on Google and their trends can help understand the public's interests and views on a specific issue and the progress and spread of diseases (18). Google is the largest search engine used in the world. The phrases searched on Google and their trends can help understand the public's interests and views on a specific issue and the progress and spread of diseases (19). The usefulness of this source of information in epidemiological research has been shown in many studies (18-20).

2. Objectives

This study aims to investigate and identify changes in the extent and patterns of AS and BBS use in Iran.

3. Methods

It is an ecological study conducted in the Google Trends (GT) database. We obtained the types of BBS and AS used through a literature review. We first searched for users' specified search terms related to "BBS (protein, creatine, weight gain, increase volume, weight loss, energy and recovery)" and "AS (Testosterone, Nandrolone, Metha, Dianabol, Sustanon, Trenbolone, Winstrol, Boldenon, Primobolan, And Proviron)," and COVID-19," among all searches performed using GTs, from January 2017 to December 2022. The volume ranges from 1 to 100, where 100 represents the peak of popularity, and a score of 0 indicates that the phrase is below 1% of its peak (21). To check and make the graphs more understandable, the trend in this study for both BBS and ES, we selected only cases where the relative average of search volume was more than 30 to check the trend over time.

3.1. Data Analysis

Statistical analyses were performed using SPSS and Microsoft Excel, with the Spearman correlation coefficient calculated in SPSS. We assessed the trend over time by examining the data and utilizing GT visuals.

4. Results

The BBS with the highest average are protein (58.19 ± 15.24) and creatine (54.07 ± 12.82), while the lowest is related to recovery (12.14 ± 17.09). Among AS, Testosterone (56.64 ± 9.57) and Winstrol (48.76 ± 22.53) are the highest, and Primobolan (13.72 ± 8.21) is the lowest (see Table 1 & Figure 1).

Table1. Relative Average of Body-Building Supplements and Anabolic Steroids in Iran During Six Years (2017 - 2022)

	RSV, Mean ± SD
BBS	
Protein	58.19 ± 15.24
Creatine	54.07 ± 12.82
Weight gain	24.29 ± 6.99
Increase volume	17.44 ± 8.50
Weight loss	22.93 ± 15.59
Energy, producer	34.89 ± 23.57
Recovery	12.14 ± 17.09
AS	
Testosterone	56.64 ± 9.57
Nandrolone	16.11 ± 4.86
Metha	30.51 ± 15.52
Dianabol	15.06 ± 5.07
Sustanon	32.47 ± 27.66
Pro-hormone	15.24 ± 14.39
Trenbolone	26.85 ± 10.38
Winstrol	48.76 ± 22.53
Boldenon	19.13 ± 9.07
Primobolan	13.72 ± 8.21
Proviron	30.24 ± 17.66

Abbreviations: BBS, body-building supplements; AS, anabolic steroids.

4.1. Tendency to Consume BBS in Iran

The consumption trend of BBS over six years shows that the consumption of all BBS has decreased in 2020, which was the beginning of the COVID-19 pandemic, and in 2021, protein and creatine have increased, but the energy of the trend is still decreasing (Figure 2).

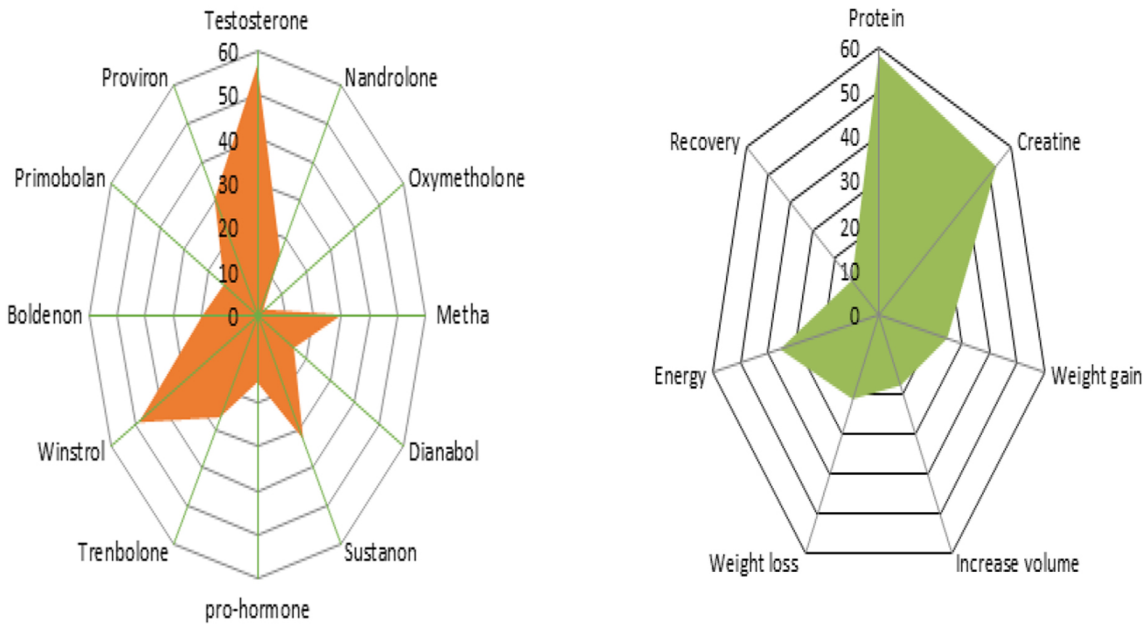

Figure 1. Frequency (RSV Google Trends) of search terms for all kinds of AS and BBS in Iran.

4.2. Tendency to Consume AS in Iran

The trend of the consumption tendency for AS shows that all AS had a decreasing trend at the beginning of the COVID-19 pandemic (2020), except Metha, which had an increasing trend (Figure 3).

4.3. Correlation Between AS, BBS, and COVID-19

There is a non-significant negative correlation between the word BBS and COVID-19 (R2 = -0.42, P = 0.16) in Iran in 2020. (Table 2)

Table 2. Time Series Correlation Coefficients for Three Years Displaying Relationships Between Search Terms Steroid, BBS, and COVID-19. We used Spearman's Rank Correlation Coefficient

COVID-19	AS	BBS
Total [a]		
R2	-0.09	-0.29
P-value	0.96	0.07
2020		
R2	0.03	-0.43
P-value	0.25	0.16
2021		
R2	-0.31	0.005
P-value	0.31	0.98
2022		
R2	-0.26	-0.18
P-value	0.41	0.56

[a] All the years.

5. Discussion

This study has examined the general inclinations of Iranian society towards AS and BBS. The inclination to use AS and BBS is substantial in Iran. From 2017 to 2020, there was an initial increase, followed by a decrease, and then another increase in 2021. Protein supplements had the highest search frequency among BBS in Iran. Similarly, in a study conducted in Canada, protein supplements were found to be the most commonly used BBS (22). In general, the consumption of BBS is more in men than in women (23), male were more likely to use protein powders and ergogenic supplements, commonly associated with increased muscle mass. In contrast, females were more inclined to consume vitamins and mineral supplements usually related to improved health (24). Although more studies on gender in are needed, it is tempting to conclude that supplement use by gender appears to be correlated with supplement type (e.g., creatine vs. vitamins) and athletic personality and culture are related to durability vs. aesthetics (25).

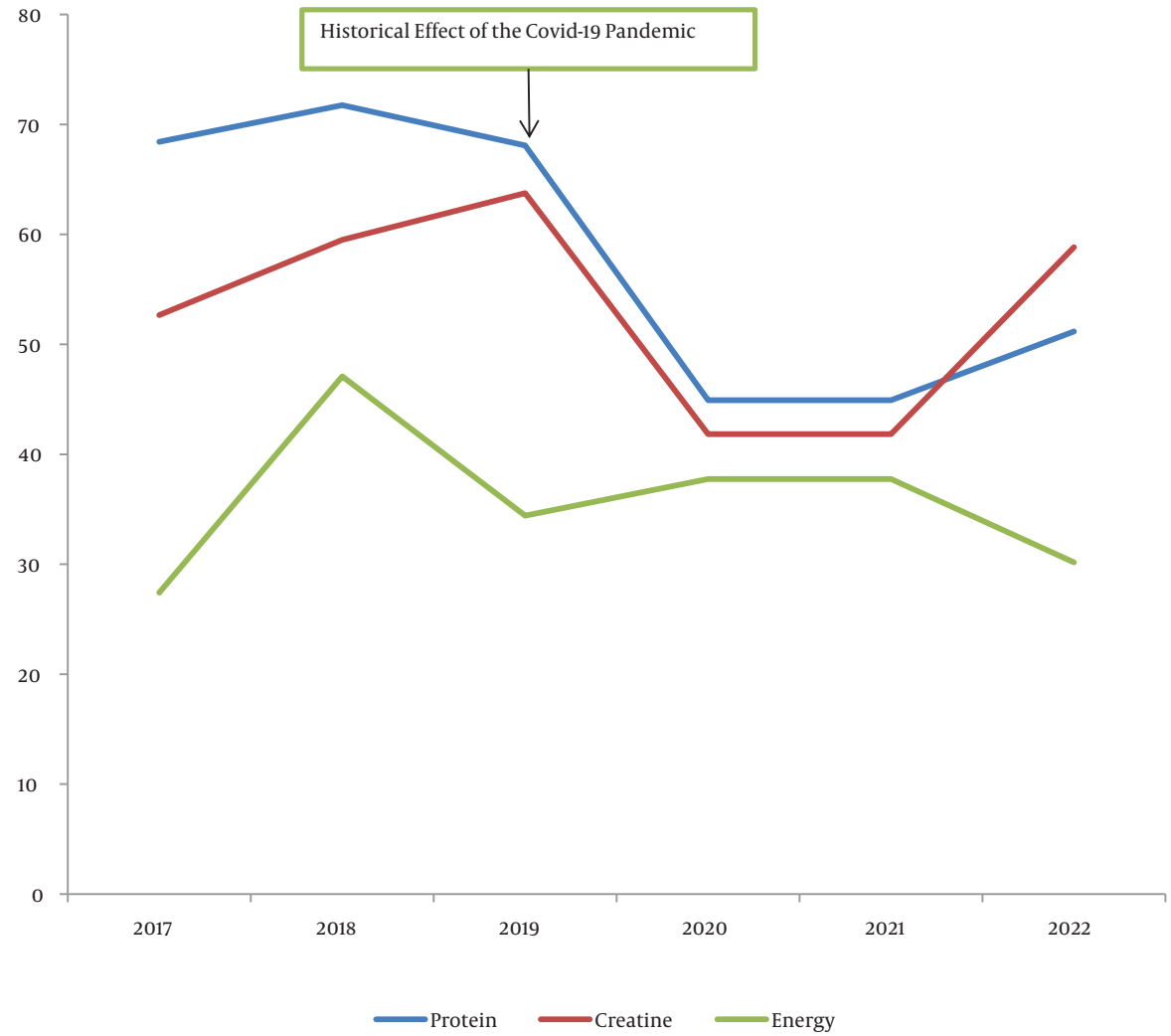

Figure 2. Frequency (RSV Google Trends) of search terms for all kinds of BBS in Iran from January 2017 to December 2022.

The use of supplements is viewed negatively and associated with stigma, with a focus on reducing the prevalence and protection against the use of supplements that may be harmful to health. However, supplements may be necessary at some stages of life or for some athletes with nutritional challenges, such as an athlete who is a vegetarian or has a specific medical condition (26, 27).

In this study, the average search volume of Testosterone was higher than other AS, in the study conducted by Ronde and Smit (28) in 2020 in the Netherlands, Testosterone was the most popular AS used, in the survey conducted in 2014 by McVeigh et al. (29), Testosterone and Sustanon were among the most commonly used anabolic AS. In a study conducted by Eskandarion (30), Testosterone was the most widely used anabolic steroid among athletes. With the start of the COVID-19 pandemic, the tendency to use BBS and AS has decreased.in 2020, there was a correlation between the use of body-building supplements and the COVID-19 pandemic. Zoob Carter et al. showed in England that the COVID-19 pandemic has reduced the use of anabolic steroids among athletes (31), which could be because the use of anabolic steroids aggravates the symptoms of COVID-19 or the curtailment measures and closure of sports clubs during the COVID-19 pandemic (32, 33).

AS, such as Testosterone, can only be acquired through a pharmacy with a doctor's prescription. However, as most physicians are hesitant to prescribe AS for performance

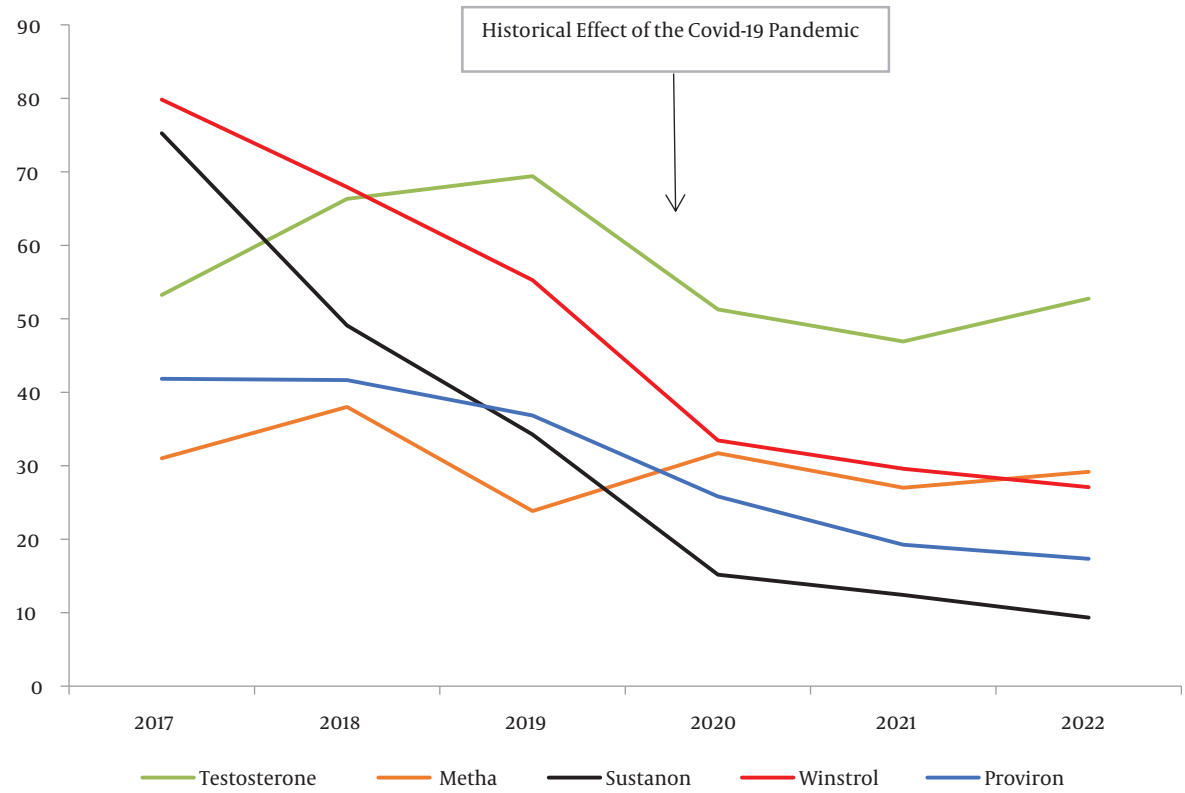

Figure 3. Frequency (RSV Google Trends) of search terms for all kinds of AS in Iran from January 2017 to December 2022.

and image enhancement purposes, many steroid abusers resort to illegal suppliers. Obtaining illegal AS appears to be relatively effortless, with numerous websites on the internet selling and shipping AS worldwide. While most AS users rely on the internet as a source of information, they typically obtain the products through local dealers (28). Therefore, using Google Trends can be an excellent tool to investigate the trend and trend of AS consumption.

5.1. Limitations

The quality of these data sources must be taken into account. Data quality is a multi-dimensional concept that pertains to the ability of data to be swiftly and effectively utilized for informing and evaluating decisions. Issues with data quality, such as significant measurement errors, can impact model parameter estimation and lead to inefficiencies. It is crucial to acknowledge that Google Trends alone may not adequately capture the full spectrum of global behavioral characteristics, and it should be complemented with other sources of information (24, 25).

5.2. Conclusions

The trend of using AS and BBS is increasing in Iran. Among the supplements, protein and AS, Testosterone is the most consumed in Iran. Indiscriminate use of supplements is a concern and calls for educational interventions at an early age for athletes, coaches, and parents/family members. Finally, young people are the most internet users. On the other hand, most people who use AS and BBS are young (18 - 34 years). It can be concluded that GT is suitable for investigating willingness to use AS and BBS.

Footnotes

Authors' Contribution: Conceptualization: Mohammadreza Rabiee, methodology: Masoumeh Sadat Mousavi, validation: Masoumeh Sadat Mousavi, Mohammadreza Rabiee, formal Analysis: Masoumeh Sadat Mousavi, investigation: Masoumeh Sadat Mousavi, resources: Mohammadreza Rabiee, data curation: Masoumeh Sadat Mousavi, writing-original draft preparation: Mohammadreza Rabiee, writing-review

and editing: Masoumeh Sadat Mousavi, visualization: Mohammadreza Rabiee, supervision: Masoumeh Sadat Mousavi , project Administration: Mohammadreza Rabiee, funding acquisition: Masoumeh Sadat Mousavi.

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Ethical Approval: The authors have observed ethical issues (including plagiarism, data fabrication, and double publication). This study was accepted by the ethics committee of Shahrekord University of Medical Sciences as a research project (ID: IR.SKUMS.REC.1401.054).

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