# Assessment of the Side Effects of Random Weight-loss Diet Programs (protein-based) on Health in a Saudi Community

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## ABSTRACT

Background: Many people attempt to decrease their body weight for health purposes, such as reducing the risk of cardiovascular and other chronic diseases like diabetes mellitus and hypertension. Also, young people, especially females, strive to lose weight for better satisfaction with their body shape. Objective: This study investigated the effect of random weight loss diet programs on health parameters among Qassim University members. Methods: We developed and validated a questionnaire that was manually completed by Qassim University students to ensure the credibility of the collected data. Results: A total of 1882 questionnaires were collected from students of Qassim University. About 43.62% of respondents were following diet programs, of which 24.1% were following different protein programs. About 52% of the protein-diet-based followers had encountered side effects, with a high percentage reporting being tired, nervous, and moody. Conclusion: The findings of this study suggested the need for strategies and coordinated efforts at all levels to reduce the tendency to use random diet programs without the supervision of physicians or dietitians. Comprehensive education on the risks of random diet programs is highly recommended, especially for young adults.

**Key Words:** *Random diet, weight loss, dietitians, Qassim University, Student.*

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## INTRODUCTION

Obesity has long been socially deprecated and has caused many people embarrassment and anxiety because of a desire to look slim, not obese or overweight [1, 2]. Today, despite the widespread pursuit of slimming activities, it has become a major issue, particularly among young adults, where the percentages of overweight or obese have risen significantly [3–5]. Identifying efficient policies to reduce overweight and obesity is challenging but essential for public health [6]. Loss of weight is a public health crisis occurring as a result of measures against obesity that could lead to such ailments as cardiovascular diseases, hypertension, diabetes mellitus, and dyslipidemia [7–9].

A variety of diet approaches have demonstrated positive effects in accomplishing mild to moderate weight loss in many individuals [10, 11]. However, some dietary interventions fail to achieve even mild weight loss in a significant minority of people [12]. Difficulty adhering to dietary guidelines is frequently thought to be linked to intermediate weight loss and weight recovery after weight loss [13].

Studies have shown that following a controlled diet program with reduced caloric intake combined with physical activity and good sleep is an effective and highly acceptable method to decrease body weight in obese patients [14]. On the other hand, many individuals follow random or self-help weight loss programs without adequate medical guidance. Besides the absence of evidence of the long-term effectiveness of these programs, severe health

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issues can arise from very small caloric intakes or dietary imbalances [15, 16].

Avoiding the adequate consumption of certain foods such as meat, fish, dairy, eggs, beans, peas, lentils, nuts, and seeds may trigger a deficiency of many nutrients, including protein, calcium, biotin, thiamine, vitamin A, and magnesium, which eventually could lead to loss of muscle, hair thinning, and brittle nails. Also, consuming fewer calories than needed to cover the basic body functions (the basal metabolic rate, BMR) may disturb the levels of estrogens and testosterone hormones, resulting in decreased bone formation and increased risk of fractures [17].

Furthermore, severe calorie restriction may disorder the reproductive system of female dieters and decrease their fertility. Decreased calories in a woman's diet can suppress ovulation by decreasing LH concentrations to less than 22–42% of that needed for weight maintenance [18]. Regardless of the significant spread in the society of multiple weight-loss diet programs in Saudi Arabia, particularly among the young, the impacts of these diet programs on health have been poorly explored in published studies. Consequently, this research was designated to assess the harmful consequences of random diet programs among students of Qassim University as a representative sample of Saudi Arabian students of the Qassim region. Also, this study would help to assess the adherence of participants to their weight-loss/-diet programs.

## MATERIALS AND METHODS

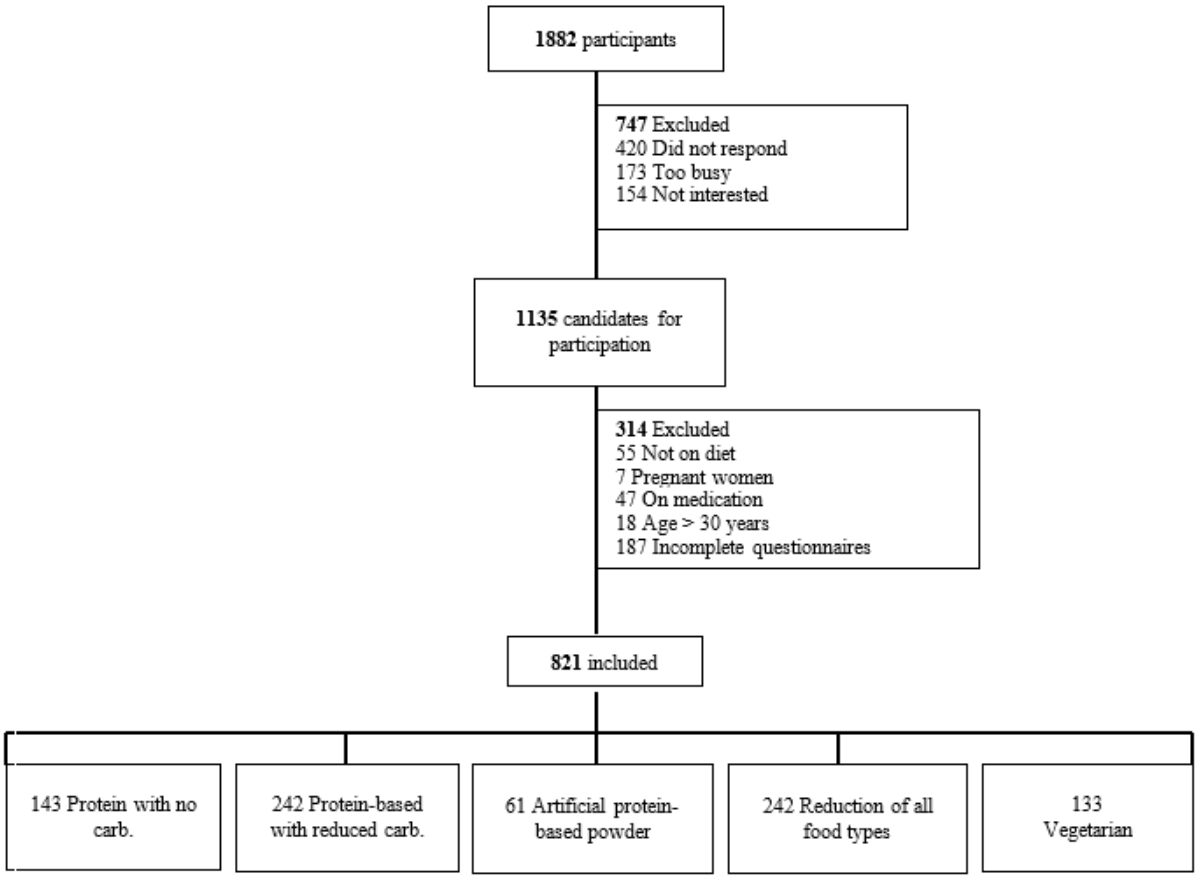


**Fig. 1.** Study flow diagram of participants.

### Study design

This study is a cross-sectional descriptive study using a self-administered inspection. The study was conducted from January to August 2019.

### Study setting and population

The study was conducted at Qassim University, Qassim, Saudi Arabia. According to the data obtained from Qassim University in 2018, The estimated number of students was 70,000. This study targeted the colleges of the southern sector of Qassim University. The study population comprised undergraduate students from the following schools: Applied sciences, arts, engineering, and medicine and medical sciences.

### Inclusion criteria

- Saudi Arabian citizenship.
- Participants must be members of Qassim University.
- Aged between 18 and 30 years.
- Taking no medications except for weight-loss purposes.

### Exclusion criteria

- Persons not undergoing any diet program.
- Aged less than 18 and above 30.
- Pregnant women.
- Not a student.
- Persons suffering from any diseases.

### Questionnaire development and validation

- **Question development**

Questions were produced based on a literature review of comparable research and conversations with field specialists [19].

- **Questionnaire validation and reliability**

The validity of the questionnaire was confirmed by selecting and inviting eight undergraduate students from different colleges to provide us with feedback about the questionnaire. Also, to ensure content validity, the draft questionnaire was reviewed by two experts in the field of public health. All the comments and corrections were taken into consideration in the final draft of the questionnaire.

A pilot study was performed among 30 respondents (all excluded from the final analysis) to guarantee the questionnaire's reliability. Their responses were analyzed and the internal consistency reliability of the questionnaire was determined using Cronbach's alpha.

- **Questionnaire format**

The questionnaire includes questions related to participants' sociodemographic characteristics, like gender, age, and marital status. Other questions included those related to clinical information such as the source, components, and duration of the weight-loss diet program, height and weight before and after starting the diet, rate of weight reduction, personal reasons for following the weight-loss diet program, estimation of their basal metabolic rate (BMR) and daily consumed calories, duration of exercise and physical activities per day or week, side effects (temporary or permanent signs) and symptoms related to nutrient deficiency, and health and medications.

Body mass index (BMI) calculated as weight in kilograms divided by the square of height in meters. The normal BMI range is between 18.5 and 24.9 kg/m$^2$. Overweight was considered as BMI $\geq$ 25 kg/m$^2$, and obese as BMI $\geq$ 30 kg/m$^2$ [20].

### Ethical approval

This work was a part of a study titled "Assessment of the side effects of random weight-loss diet programs(protein-based) on health in a Saudi community" that approved by a subcommittee of health research ethics, Qassim University Committee No. (5-4-2018).

### Statistical analysis

Data were analyzed using the Statistical Packages for Social Sciences (SPSS), version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as frequencies, percentages, and means were used to describe the participants' characteristics and their answers for each item of the questionnaire. Descriptive data were expressed as means ± standard deviations (SD) and others presented as numbers and percentages. Paired *t*-tests were used to compare body weights before and after the diet. The overall significance level was set at $p < 0.05$.

## RESULTS

In the present study, 821 volunteers (573 [69.8%] male, 248 [30.2%] female) from the colleges of the southern sector of Qassim University participated in this study. They were divided into five groups according to the diet programs they followed: protein without carbohydrates, 143 (17.42%); protein with reduced carbohydrates, 242 (29.48%); artificial protein, 61 (7.43%); reduction of all food types, 242 (29.48%); and vegetarian, 133 (16.20%). Demographic data regarding age, gender, and material status and information on the diet followed, such as the type and duration of diet, purpose of following the diet, family income, BMI, motivation, advisor, follow-up with physician, side effects, and sports activities, are presented in Table 1 as numbers and percentages.

Only 65 (7.92%) were married, whereas 756 (92.08%) were single. Family income for most participants was less than 10,000 SR (28.0–33.1%) for all diet groups except the artificial diet group, which exhibited the lowest percentage of family income less than 10,000 SR (26%). The highest rates of family income exceeding 20,000 SR were found in the artificial protein and reduced-all-food groups, while the lowest was found in the protein with reduced carbohydrate group. The percentages of people using diets to lose weight ranged between 21.3–55.4%, with the highest percentage found in the group using protein with reduced carbohydrates.

Most of the participants dieting to maintain their weight were using artificial protein (59.0%), while a few participants stated that they were under a diet to increase their weight, with the lowest percentage found in the protein and reduced carbohydrate group (7.8%). All the groups showed comparable percentages of participants aiming to increase their weight, which ranged between 18.6–21.0%.

Regarding the duration of the participants' diets, most participants fell in the second category (1–3 months), with percentages ranged between 27.3–40.6%. Few participants were found to be under diets for periods ranging between 10–12 months or > 12 months, and they were concentrated in the groups following diets with reductions of all food types and vegetarian diets. In the current study, the

motivator for dieting varied widely among all the diet groups. A healthy lifestyle was found to be the highest motivator for participants to diet, while the lowest percentages of participants were dieting because they had hypertension. Thyroid problems and sports were found to be the highest motivators for the participants using proteins with reduced carbohydrates, with high percentages of 17.8% and 46.7%, respectively.

On the other hand, it was noted that the physicians or friends showed the lowest percentages as advisors for participants' diet programs, while the highest percentages consulted dietitians or used special diet programs. Most participants in all groups were not subject to direct and continued follow-up with a dietitian. The group using protein with no carbohydrate consumption showed the highest level in following a sports program alongside the diet program (49.1%), followed by the artificial protein (42.6%), a protein with low carbohydrates (33.5%), vegetarian (32.3%), and all-food reduction groups (25%).

The percentages of participants who were not following the sport program ranged between 14.01–27.1% depending on the diet group. Significant numbers of participants rarely implemented a sports program alongside their diet program. About a quarter of participants following protein with no carbohydrate diets suffered from general weakness, while the lowest percentage of weakness was found in groups using proteins with reduced carbohydrates. The highest proportion of moody people was found in the vegetarian group and the lowest in the group consuming artificial protein. Low concentration, pains in the limbs, loss of hair, and joint pain were rarely observed in all tested diet groups, with percentages ranging between 1.4–8.3%. Pain in the throat was found among all groups, with the highest numbers in the vegetarian group followed by the artificial diet group, and the lowest in the group using protein with no carbohydrate (0.7%). As for continuous medical checkups with important laboratory tests, most of the participants were not seeking medical check-ups, with percentages ranging between 74.1–88%.

**Table 1: Numbers and percentages, socio-demographic characteristics, lifestyle, physical activities, and side effects of participants using different diet programs.**

| | Protein & no carbohydrates | Protein & reduced carbohydrates | Artificial protein | Reduction of all food types | Vegetarian |
|---|---|---|---|---|---|
| **Gender** | | | | | |
| Female | 79 (55.2%) | 185 (76.4%) | 38 (62.3%) | 178 (73.6%) | 93 (69.9%) |
| Male | 64 (44.8%) | 57 (23.5%) | 23 (27.7%) | 64 (26.4%) | 40 (30.1%) |
| **Marital status** | | | | | |
| Single | 130 (90.9%) | 228 (94.2%) | 58 (95.1%) | 220 (90.9%) | 120 (90.2%) |
| Married | 13 (9.1%) | 14 (5.8%) | 3 (4.9%) | 22 (9.1%) | 13 (9.8%) |
| **Family income** | | | | | |
| <5000 SR | 32 (12.4%) | 54 (22.3%) | 11 (18.0%) | 50 (20.7%) | 28 (21.1%) |
| < 10000 SR | 40 (28.0%) | 69 (28.5%) | 16 (26.0%) | 62 (25.6%) | 44 (33.1%) |
| < 15000 SR | 20 (14.0%) | 38 (15.7%) | 9 (14.8%) | 32 (13.2%) | 20 (15.0%) |
| < 20000 SR | 24 (16.8%) | 41 (16.9%) | 11 (1.6%) | 42 (17.2%) | 15 (11.3%) |
| > 20000 SR | 27 (18.9%) | 40 (16.5%) | 14 (23.2%) | 56 (23.1%) | 26 (19.5%) |
| **Aim** | | | | | |
| Decrease weight | 42 (29.4%) | 134 (55.4%) | 13 (21.3%) | 75 (31.0%) | 42 (31.6%) |
| Maintain weight | 71 (49.7%) | 89 (36.8%) | 36 (59.0%) | 122 (50.4%) | 64 (48.1%) |
| Increase weight | 30 (21.0%) | 19 (7.8%) | 12 (19.7%) | 45 (18.6%) | 27 (20.3%) |
| **Duration** | | | | | |
| < 1 month | 43 (30.1%) | 65 (26.9%) | 11 (17.6%) | 54 (22.3%) | 31 (23.3%) |
| 1–3 months | 39 (27.3%) | 72 (27.8%) | 25 (41%) | 85 (35.1%) | 54 (40.6%) |
| 4–6 months | 15 (10.5%) | 40 (16.5%) | 4 (6.6%) | 27 (11.2%) | 11 (8.3%) |
| 7–9 months | 8 (5.6%) | 23 (9.5%) | 5 (8.2%) | 15 (6.2%) | 8 (6.1%) |
| 10–12 months | 5 (3.5%) | 16 (6.6%) | 3 (4.9%) | 7 (2.9%) | 27 (20.3%) |
| > 12 months | 32 (22.4%) | 22 (11.3%) | 13 (21.3%) | 54 (22.3%) | 2 (1.6%) |
| **Motivator** | | | | | |
| Friends | 34 (23.8%) | 30 (12.4%) | 11 (17.6%) | 29 (12.0%) | 16 (12.0%) |
| Physician | 9 (6.3%) | 18 (7.4%) | 7 (11.5%) | 19 (7.4%) | 20 (15.0%) |
| Diabetes | 15 (10.3%) | 17 (7.0%) | 5 (8.2%) | 13 (5.4%) | 7 (5.3%) |
| Pressure | 1 (0.7%) | 8 (3.3%) | 1 (1.6%) | 1 (0.4) | 1 (0.8%) |
| Thyroid problems | 2 (1.4%) | 43 (17.8%) | 11 (17.6%) | 3 (1.2%) | 4 (3.0%) |
| Sport | 21 (14.7%) | 113 (46.7%) | 14 (24.5%) | 45 (18.6%) | 22 (16.5%) |
| Healthy lifestyle | 56 (39.2%) | 12 (5.4%) | 9 (14.4%) | 123 (50.8%) | 51 (38.3%) |
| Others | 5 (3.5%) | 1 (0.4%) | 3 (4.8%) | 9 (3.7%) | 12 (9.0%) |

| | | | | | |
|---|---|---|---|---|---|
| **Advisor** | | | | | |
| Friends | 22 (15.4%) | 23 (9.0%) | 8 (13.1%) | 27 (11.2%) | 7 (5.3%) |
| Dietitian | 39 (27.3%) | 59 (24.4%) | 18 (29.5%) | 24 (9.9&) | 35 (26.3%) |
| Physician | 8 (5.8%) | 7 (2.8%) | 4 (6.6%) | 8 (3.3%) | 7 (5.3%) |
| Internet | 31 (21.7%) | 44 (18.2%) | 14 (23%) | 32 (13.2%) | 27 (20.3%) |
| Special program | 43 (30.1%) | 109 (45.4%) | 17 (27.9%) | 151 (62.4%) | 57 (43%) |
| **Dietitian Follow-up** | | | | | |
| Yes | 33 (23.1%) | 35 (14.5%) | 14 (23%) | 12 (5%) | 18 (13.5%) |
| No | 76 (53.1%) | 148 (61.2%) | 36 (59%) | 201 (83.1%) | 100 (75.2%) |
| Rarely | 34 (23.8%) | 59 (24.4%) | 11 (18%) | 29 (12%) | 15 (11.3%) |
| **Sport** | | | | | |
| Yes | 71 (49.1%) | 81 (33.5%) | 26 (42.6%) | 61 (25%) | 43 (32.3%) |
| No | 23 (16.1%) | 34 (14.01%) | 15 (24.6%) | 50 (20.7%) | 36 (27.1%) |
| Rarely | 49 (34.3%) | 127 (52.5%) | 3 (32.8%) | 131 (54.1%) | 54 (40.6%) |
| **Side effect** | | | | | |
| Weak | 35 (24.5%) | 20 (8.3%) | 13 (21.3%) | 37 (15.3%) | 20 (15%) |
| Moody | 19 (13.3%) | 38 (15.7%) | 6 (9.8%) | 36 (14.9%) | 23 (17.3%) |
| Low concentration | 8 (5.6%) | 8 (3.4%) | 4 (6.6%) | 17 (7%) | 11 (8.3%) |
| Pain in limbs | 2 (1.4%) | 20 (8.3%) | 2 (3.3%) | 6 (2.5%) | 3 (2.3%) |
| Hair loss | 7 (4.9%) | 9 (3.7%) | 6 (9.9%) | 6 (2.5%) | 7 (5.3%) |
| Joint pain | 5 (3.5%) | 8 (3.1%) | 2 (3.3%) | 10 (4.1%) | 8 (6%) |
| Throat pain | 1 (0.7%) | 4 (2.8%) | 22 (36.1%) | 9 (3.7%) | 52 (39.1%) |
| Other | 66 (46.2%) | 139 (57.4%) | 6 (9.8%) | 121 (50%) | 9 (6.8%) |
| **Lab investigations** | | | | | |
| Yes | 37 (25.9%) | 33 (13.6%) | 14 (23%) | 29 (12%) | 26 (19.5%) |
| No | 106 (74.1%) | 209 (86.4%) | 47 (77%) | 213 (88%) | 107 (80.5%) |

Table 2 shows the average BMI and initial and final weights as well as the average weight loss of each group. The average duration ranged between 3.1–4.6 months, while the average BMI ranged between 20.95–27.12 (kg/m²). The average initial and final body weights ranged between 63.31–71.36 and 61.89–59.46, respectively. The averages of weight loss ranged between 3.55–7.89, with higher reduction rates in the group using a protein/low-carbohydrate diet program. Significant reductions in body weight were observed in all tested groups.



**Table 2: Average duration times, body mass index, initial and final weights, and weight loss under different diet programs.**

| No. | Diet Type | Average duration | BMI | Average initial weight | Average final weight | Average weight loss | *P*-value |
|---|---|---|---|---|---|---|---|
| 1 | Protein with stop carb. | 4.5±0.31 | 26.72±2.34 | 71.36± 6.62 | 65.57± 8.67 | 4.79±0.40 | 0.001 |
| 2 | Protein with reduces carb. | 4.6±0.42 | 27.12±6.44 | 68.35± 7.92 | 61.89±7.85 | 7.89±0.35 | 0.001 |
| 3 | Artificial protein | 4.5±0.33 | 20.95±4.11 | 63.31± 5.67 | 59.46±8.66 | 3.55±0.23 | 0.05 |
| 4 | Reduction of all foods | 4.1±0.26 | 21.68±.85 | 69.07±7.10 | 63.37±6.88 | 5.78±0.21 | 0.001 |
| 5 | Vegetarian | 3.1±0.21 | 21.79±4.93 | 67.88±5.84 | 62.93±7.93 | 4.79±0.36 | 0.01 |

Data presented as mean±SD. BMI; body mass index.

## DISCUSSION

Many studies previously have focused on the side effects and complications associated with overweight and obesity, but very few studies have evaluated the side effects that might occur as a result of using any of several random diet programs [9, 21, 22]. This study is, to the best of our knowledge, the first study conducted in Saudi Arabia to evaluate the side effects on people's health of using random diet programs.

The current study showed that many students at Qassim University are under diets due to widespread overweight or obesity among the Saudi community. Also, various health problems resulting from nutritional deficiencies were detected in people who follow random weight loss programs without proper medical supervision. The group following a protein/reduced-carbohydrate diet and that

following diets with reductions of all food types constituted about 29.48% of the participants, while the fewest followed an artificial protein diet (7.0%).

The percentages of male participants (69.8%) were higher than females (30.2%) in this study although the prevalence of overweight and obesity was higher among female than male students in Saudi Arabia, as reported previously [23]. This finding reflects improvements in the knowledge and awareness of the Saudi community of the consequences of these diseases, as most of them had been losing traditional food habits and consumed unhealthy fast food.

About one-third of the participants in all diet groups in this study reported family incomes less than 10,000 SR, while around 20% of the participants in all groups reported family incomes greater than 20,000 SR. Around 50% of the participants were dieting to maintain their weight, whereas about 30% of them (mostly in the vegetarian, protein/no carbohydrate, and reduction of all food groups) were following a diet to lose weight. Among participants using protein with reduced carbohydrates, 55.4% were seeking to decrease their weight.

The study showed that the percentages of participants following a diet for more than one year make up about 20% except in the group using protein with reduced carbohydrates (11.3%) and the vegetarian group (1.6%), which confirms that knowledge of the beneficial effects of diet programs is lacking.

A healthy lifestyle was found to be the most effective motivator behind the use of diet programs and about a fifth of the participants obtained diet programs from the Internet and was not following up with physicians or dietitians.

Despite dietitians being consulted by many participants regarding any of the diet programs, most of the participants did not regularly follow up with the dietitians. High percentages adhering to sports activities when following diet programs were noted in the artificial protein and protein without carbohydrate groups, while most of the participants in all diet groups rarely practiced sports. The highest proportion of participants suffering from weakness was found in the group following diet programs including proteins only without carbohydrates. This shows that the absence of important nutrients in our food is a highly important factor that may markedly affect body health.

The most significant finding in this study is the clear correlation between following a balanced diet (proteins and fewer carbohydrates) with the minimum occurrence of side effects among the people following this diet program. The vegetarian group, meaning no consumption of proteins at all, manifested several serious side effects, reporting that they suffered from weakness, moodiness, and throat pain.

In the present study, although all the diet programs resulted in significant decreases in body weight, the diet consisting of protein with low carbohydrates was found to be safe and effective and to have minimal side effects on those following it. Consequently, we conclude from this study that following a balanced diet with proteins and reduced carbohydrates at certain levels under the supervision of and follow-up with physicians or dietitians and continuous sports activities is optimal for keeping healthy and active.

The information obtained from this study is very important for community health professionals and decision-makers to devise health education programs to avoid these disorders throughout the young, who are at the most productive ages in society. Currently, the number of people wanting to lose weight has increased dramatically in our community, since obesity is high. They want fast and easy ways to reach their optimal weight regardless of the possible side effects. Authorities should monitor companies that offer commercial diet programs and halt those that introduce meals as powders and others based on certain types of foods while restricting or prohibiting others. This issue should be discussed widely by decision-makers to prevent or reduce access to such unhealthy random diets in our community. On the other hand, greater education about the risk of these diets on health, including self-help weight loss programs, should be spread widely in our community.

## CONCLUSION

Significant numbers of Qassim University students were found to be following random diet programs regardless of the resulting side effects. Diet programs involving proteins and reduced carbohydrates were found to be the most effective and safest of all the programs examined, while vegetarian diet programs were found to cause serious side effects and are not recommended before further use. We hope that the findings of this research highlight several critical points regarding the random use of diet programs. Further experimental studies to assess the effect of random diets on bodily functions are ongoing.



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