ABSTRACT: The aim of this study was to assess food behavior, self-image perception and anthropometric indices of college students. This was a cross-sectional study with 54 students in a public university. The lifestyle and self-image perception was collected using a standardized questionnaire tested. Food behavior was evaluated through the Eating Attitudes Test. Body composition was assessed for Body Mass Index (BMI), circumferences, skinfold analysis and bioelectrical impedance (BIA). The statistics tests used were Chi-square and Pearson correlation \((p < 0.05)\). The students had 19 to 27 years old, 96.3% were non-smokers, 46.3% drank alcoholic beverages and 37.0% practiced regular physical activity. Most of the students (75.5%) were considered normal weight (BMI) but the body fat percentage was found to be above average. Regarding self-image perception, 40.7% felt overweight. Observing food behavior results, 12.0% were at risk of developing eating disorders. Positive correlations were verified between BMI with skinfold and skinfold with bioelectrical impedance. It was concluded that a considerable number of the college students assessed had a distorted self-image perception. Many of them had normal weight but with high body fat percentage. This study is relevant to investigate the risk of eating disorders and body image perception as part of the nutritional assessment.

KEYWORDS: Anthropometry; feed behavior; students; body image.

INTRODUCTION

Over the last decades, decrease in underweight prevalence and increase in overweight prevalence have been observed due to the association between excessive caloric consumption and insufficient energy expenditure. The unbalance between physical exercise and food intake is one of the factors contributing to the onset of eating disorders. Studies have indicated that obesity, in general, including obesity in young people, has been increasing over the past years. The World Health Organization (WHO) has declared obesity the new world syndrome since adolescents are at a greater risk of becoming overweight adults and becoming ill. Changes in food pattern and physical exercise, stress, alcohol consumption, smoking and college lifestyle are some of the factors that have made college students more vulnerable to circumstances risky to their health. Another factor is the transition from adolescence into adulthood which is characterized by changes and new choices in social relationships, future career and adoption of new lifestyles. Therefore, this population is more susceptible to pressure by the family, friends and the media to keep fit.

College students experience a period of uncertainty and statements that are strongly influenced by models of new behavior patterns found in university. The college student faces a different schedule of activities, in which time is a limiting factor, what interferes very much in the feeding behavior of the same. In the case of migrant students, or who live outside the family environment, this fact is even stronger because this audience makes new relationships, be mature, develop more critical thinking, search for their identity, both personal and professional, and have to combine study and work in many cases. These may reflect changes in eating habits so that they have less time to feed, feel more free to make their own decisions about when and where to eat. This favors even more the development of eating disorder cases, because due to the less contact, this problem may go unnoticed by parents, extending the search for a treatment, which in turn can damages the remission of such disorders.
Beauty patterns imposed by the media and society seem to have a great effect on women, especially young women. To be accepted and successful, these women often pursue a thinner body to the detriment of their own health.3, 26 Several studies have been carried out to assess university students’ nutritional status and lifestyle. Data in one of these studies emphasize the need for health professionals to develop and implement educational actions and interventions in the nutritional status of these students to promote a healthier lifestyle and prevent future diseases.31

Considering that college students are a vulnerable group, it is of the utmost importance to assess their nutritional status. Anthropometry is regarded as an essential component of such evaluation and an important tool to monitor food behavior-related changes.

Within this context, this study aimed to assess food behavior, self-image perception and anthropometric indices of college students.

MATERIAL AND METHODS

Study Population

Undergraduate freshman students enrolled in Nutrition and Nursing courses at a Brazilian public university for this study. In this context, it was there were a cross-sectional study such students in the second half of 2005. In each semester enrolled 45 students in Nursing and 30 of Nutrition, a total of 75 individuals. Of these, 54 (72.0%) agreed to participate. Most were female (87.0%) aged 19 to 27 years. The participation of students was spontaneous and voluntary, having been informed about the study and signed the written informed consent, and they are also a free option to abandon it when wanted. The study had been previously approved by the Committee of Ethics in Research of the public university.

Data Collection

Information on lifestyle was collected using a standardized, previously tested questionnaire on smoking habits, alcohol consumption and physical activity.

Risk factors for eating disorders were evaluated by the Eating Attitudes Test questionnaire (EAT-26) developed and validated by Garner & Garfinkel,11 and based on 26 food behavior and body image questions (Annex I). The risk for eating disorders was taken into account when a score of 20 or more was obtained. EAT-26 is one of the most used self-applicable tools in epidemiologic studies aiming to elucidate the presence of abnormal food patterns and to evaluate risk factors for eating disorders.11

Information regarding self-image perception was obtained by asking students how they felt about their body weight. The options provided were: very overweight, overweight, normal weight, underweight and very underweight.

Regarding anthropometry, weight was obtained using electronic scales (Plenna ©), with 150kg capacity and divisions of 50g and height measurement was taken using an anthropometer (Exact Height ©), according to standard techniques.14 Using anthropometric measures (weight and height), body mass index (BMI) was calculated to classify the study population using the cut points proposed by WHO.30 Waist- and- hip perimeters was checked using a non-extendable measuring tape. Waist circumference was measured by positioning the measuring tape in the smallest curvature between the ribs and the iliac crest while hip circumference was measured by positioning the measuring tape in the larger gluteal protuberance.19 To determine waist circumference (WC) and waist-to-hip ratio (WHR), the corresponding cut points proposed by WHO were used.29

Triceps, biceps, subscapular and suprailiac skinfolds (DOC) were checked by using the Lange Skinfold Caliper, with three repetitions, in a rotative way each, followed by arithmetic mean calculation.8 The Diet Pro software version 4.0 applying the Durnin &Womersley4 formulae was used to calculate body fat percentage (BF %). Thus, the formulas used were:

\[
D = 1,1549 - 0,0678 \log_{10}(\sum \text{DOC})
\]

In order to avoid measure variation, all the measures were evaluated by the same appraiser.

The BF% was also measured by BIA with a Biodynamics® model 310. To obtain a good accuracy of the measure, it was handed a warning to the participants when we were setting the date of the test (about a week before doing it), which contained the following recommendations: avoid alcohol and caffeine 24 hours before; do not perform physical activity and avoid heavy meal 4 hours before, it also asked to the female students to avoid taking the test when in the premenstrual period.4

In the test it was required that the students took off their shoes, socks and metallic objects. Before applying the electrodes, the skin was gently cleaned with alcohol swab. They remained laid down with their members away from the trunk, two adhesive electrodes were placed on the dorsal surface of the hand and the right foot near the distal metacarpal and metatarsal, respectively. Two other electrodes were placed just above the joint line of the right wrist and a little above the line of the ankle joint.4

BF% evaluation used the cut point developed by Lohman37 for both methods (DOC and BIA).

Statistical Analyses

The software SPSS version 12.0 was used for the statistical calculations. Descriptive statistics was used to characterize the study population and tested for Chi-square. Anthropometric data were expressed as mean ± SD and
were tested using the Pearson correlation. The criterion level for statistical significance was \( p < 0.05 \).

RESULTS

Fifty four freshmen were evaluated, 87.0% female and 13.0% male, at an average age of 21.18 ± 1.84. Among these, 60.7% took Nutrition while 39.3% took Nursing as their major. As for place of residence, 96.3% of the students lived in the Belo Horizonte area with 27.8% of them not living with their parents, which means they lived with relatives, fraternities or apartments kept by their families.

Regarding lifestyle, 96.3% of the students were non-smokers and 46.3% stated they drank alcoholic beverages, with 76.0% of these drinking only on weekends. Regarding physical activity, only 37.0% did aerobic or anaerobic exercises for at least 30 minutes each time more than three times a week.

The EAT-26 identified that 12.0% of the volunteers (85.7% female and 14.3% male) presented eating disorder symptoms. It is noteworthy that all these students were in the nutrition course.

Regarding self-image perception, 40.7% of the students felt they were overweight and 46.3% had been on a diet because they were not satisfied with their appearance.

The students’ mean weight and mean height were, respectively, 57.2kg and 1.64m. Other anthropometric variables mean and standard deviation can be found on Table 1.

According to BMI, the majority of the student population had normal weight (75.5%). However, 15.1% of the students were underweight, 9.4% were overweight and none was classified as obese.

Among the participants presenting eating disorder risk, 71.4% were classified as having normal weight.

When comparing BMI to body image, it was observed that 79.2% of those who considered themselves as having normal weight (n=19) had in fact a normal weight. Out of those who considered themselves to be overweight, 81.0% had normal weight (n=17). However, no statistically significant differences were found between those rates (Figure 1).

Among the physically active students, 75.0% were classified by BMI as having a normal weight, 15.0% as being overweight and 10.0% as being underweight.

The WC and WHR were classified as normal for all the subjects. Regarding BF% using BIA, 45.3% and 43.4% of the students were below and above normal values, respectively. When BF% was assessed by skinfold analysis, 60.4% of the individuals were classified above average values and 11.3% below average values. The risk

<table>
<thead>
<tr>
<th>Table 1 – Mean and standard deviation of anthropometric variables of university students.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean ± SD</strong></td>
</tr>
<tr>
<td>Total Body Weight (kg)</td>
</tr>
<tr>
<td>Height (m)</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
</tr>
<tr>
<td>Waist Circumference (cm)</td>
</tr>
<tr>
<td>Waist-to-hip ratio</td>
</tr>
<tr>
<td>Body Fat Skinfold analysis (%)</td>
</tr>
<tr>
<td>Body Fat Bioelectrical impedance analysis (%)</td>
</tr>
</tbody>
</table>

FIGURE 1 – Relationship between perception of body image and BMI classification of university students.
of obesity-related diseases according to BF% for BIA was 3.8%, and 15.1% for skinfold analysis.

The correlation between anthropometric variables is shown on Table 2.

DISCUSSION

Since they do not live with their parents, about 30.0% of the university students might have limitations in food choices, and this may have an influence on their food habits. Vieira et al., 27 in a study undertaken in another Brazilian public university, found that 89.8% of the students did not live with their parents and this could lead to the adoption of new habits and behaviors that would eventually jeopardize their health.

Studies have shown that people with higher education tend to have a better knowledge of food acquisition, eating a more diversified diet, consisting mainly of fruit and vegetables. It was observed that the higher the educational level of the household head, the higher the intake of cereals, breads, roots, vegetables, fruit, milk and dairy products. 12

Most students’ lifestyles included good habits such as non-smoking and drinking alcohol only on weekends. Even so, the majority did not practice any physical activity. These data were similar to those found by Zacar et al. 31 regarding physical exercise and alcoholic beverage intake but they were different concerning smoking habits, for in the present study, most students were non-smokers. In another study, quite heavy alcohol consumption among university students was found, although most drank only occasionally. 27 The percentage of individuals who practiced physical activity was below the results found by Bosi et al. 2 who investigated Nutrition students and found that 54.6% of them practiced physical activities, similarly to the results of Cota & Miranda. 5

Eating disorder risk results presented in this study are in agreement with those described by Fiates & Salles 10 and by Vitolo et al. 28 who found a greater prevalence of eating disorders in women, especially those working as models, actresses, athletes, dietitians and nutrition students.

Future nutritionists are in constant contact with the food; know that “good looks” may be an important measure of personal value towards a profession of success. They also have quantitative and qualitative knowledge about the foods that practically force them to remain under the strict aesthetic patterns in vogue. These factors may suggest that nutrition students are placed in an environment more conducive to the development of nutritional disorders, enhanced by the fact that most of this course students are female. 10, 26

When American university students from different ethnic groups were taken into account, it was shown, by using the EAT-26 that eating disorder risk prevalence was greater in women (10.9%) than in men (4.0%). 13 Nevertheless, body dissatisfaction among men is increasing. According to O’Brien et al. 24 a growing number of men are seeking changes in their weight for appearance reasons. Among the underweight participants, 28.6% also showed symptoms of eating disorders. However, the majority of the population with eating disorder behavior presented normal weight.

These discoveries indicate the importance of investigating risk of those eating and self-image perception disorders as part of the nutritional assessment.

About half of the volunteers felt they were above the desired weight. Those results corroborate the data of another self-perception study undertaken among nutrition students which showed a 6.2% prevalence of serious self-image distortions in female university students. 2 The number of participants that had gone on a diet was much larger than that found by Dutra et al. 4 who stated that 8.6% of the participants had tried diets to lose weight over the previous three months. The ideal thin look imposed by society prevails since women with normal weight expressed dissatisfaction with their body and were willing to change it in order to fit into the social patterns. Considering that the population in this study consists of future health professionals, the impact of these findings is even more important.

Kakeshita & Almeida 15 related BMI to body image perception of university students and found that most normal weight or overweight women (87.0%) overestimated their body size. Another study with teenagers revealed that overestimation of body weight by women also occurred among obese subjects. 7

The anthropometric data are in accordance with Ramos 26 study with a similar underweight rate (15.0%) being found among the students in the present study. Vitolo et al. 28 found smaller underweight rates and greater overweight prevalence than those found in the present study.

Table 2 – Correlation among different anthropometric variables of university students.

<table>
<thead>
<tr>
<th></th>
<th>BMI</th>
<th>WC</th>
<th>BIA</th>
<th>Skinfold analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>1.000</td>
<td>0.849*</td>
<td>0.235</td>
<td>0.423*</td>
</tr>
<tr>
<td>WC</td>
<td>0.849*</td>
<td>1.000</td>
<td>-0.033</td>
<td>0.074</td>
</tr>
<tr>
<td>BIA</td>
<td>0.235</td>
<td>-0.033</td>
<td>1.000</td>
<td>0.761*</td>
</tr>
<tr>
<td>Skinfold analysis</td>
<td>0.423*</td>
<td>0.074</td>
<td>0.761*</td>
<td>1.000</td>
</tr>
</tbody>
</table>

BMI – Body Mass Index, WC -Waist Circumference, BIA – Bioelectrical impedance.

*Significant correlation (p< 0.05).
study. In a study with nutrition students, Bosi et al.\(^2\) found a 6.3\% prevalence of underweight and 3.7\% prevalence of overweight subjects. Cruz\(^6\) observed overweight and obesity prevalence of around 15.0\% and 25.0\% respectively among teenagers from south Mediterranean cities. In the USA, about 25.0\% of the teenagers were overweight and 30.0\% were obese.\(^21\)

Concerning body fat percentage, the results of the present study are similar to those found by Ramos\(^26\) who compared the results obtained by BIA and skinfold analysis methods, nevertheless, there was positive correlation between the results obtained by BIA and DOC which demonstrates that the skinfolds analysis methods using as instrument a adipometer supply need for cost-effective techniques that accurately percent body fat with more faithfully a possible.

The results found in the present study were in agreement with those by Neovius et al.\(^22\) that evaluated 474 healthy adolescents, and found that BMI and WC presented significant positive correlation (r=0.68-0.73; P<0.0001) with body fat percentage, though weak for WHR (r=0.30-0.41; P<0.0001). Amani\(^1\) recently found significant correlation between BMI and body fat mass (r=0.86; P<0.0001) and also BF\% ( r=0.77; P<0.0001). Dencker et al.\(^7\) observed a significant correlation between BMI and BF\% (r = 0.92) for boys and girls.

In conclusion, a considerable number of the college students assessed had a distorted self-image perception and some presented risk of eating disorders. Many of them had normal weight but with high body fat percentage. It is relevant to investigate the presence of eating and self-image perception disorders risk as part of the nutritional assessment.

We found few references to scientific production-oriented research of eating disorders among college students, so it is expected that this study be replicated in other universities as well as in fitness centers, schools and modeling agencies. These diagnoses may be important to educate responsible departments and the media, aimed at the prevention of eating disorders, including not only college students but also other groups vulnerable to these disorders. Furthermore, greater knowledge of the subject can alert health services to be prepared for dealing with cases that require specific monitoring procedures with a multidisciplinary group as host, support, and guidance on health and nutrition.

Although the sample has been small, these results are important for the development of preventive and corrective educational actions, such as physical activities and proper food habit incentives especially aimed at university students.


RESUMO: O objetivo desse trabalho foi avaliar o comportamento alimentar, a percepção da imagem corporal e os índices antropométricos de estudantes universitários. Tratou-se de um estudo transversal com 54 estudantes de uma universidade pública. O estilo de vida e a percepção da imagem corporal foram coletados utilizando um questionário padronizado e testado. O comportamento alimentar foi verificado por meio do Eating Attitudes Test. A composição corporal foi avaliada pelo Índice de Massa Corporal (IMC), circunferências, dobras cutâneas e bioimpedância elétrica (BIA). Os testes estatísticos utilizados foram Qui-quadrado e Correlação de Pearson (p<0.05). Os estudantes tinham entre 19 a 27 anos, 96,3\% não fumavam, 46,3\% ingериam bebidas alcoólicas e 37,0\% praticavam atividade física regularmente. A maioria dos estudantes (75,5\%) eram eutróficos (IMC), mas o percentual de gordura encontrado estava acima da média. Em relação à percepção da imagem corporal, 40,7\% se sentiam acima do peso. Observando os resultados sobre o comportamento alimentar, 12,0\% estavam em risco de desenvolver transtornos alimentares. Foram verificadas correlações positivas entre IMC com dobras cutâneas e dobras cutâneas com bioimpedância elétrica. Conclui-se que um considerável número de estudantes universitários avaliados tinha distorção da percepção da própria imagem corporal. Muitos deles tinham o peso normal, mas possuíam alto percentual de gordura corporal. Este estudo é relevante ao investigar o risco de presença de transtornos alimentares e da percepção da imagem corporal como parte da avaliação nutricional.

PALAVRAS-CHAVE: Antropometria; comportamento alimentar; estudantes; imagem corporal.

REFERENCES


Annex 1 – Eating Attitudes Test questionnaire (EAT-26).

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Am terrified about being overweight.</td>
<td>A-Always B-Usually C-Often D-Sometimes E-Rarely F-Never</td>
</tr>
<tr>
<td>2. Avoid eating when I am hungry.</td>
<td></td>
</tr>
<tr>
<td>3. Find myself preoccupied with food.</td>
<td></td>
</tr>
<tr>
<td>4. Have gone on eating binges where I feel that I may not be able to stop.</td>
<td></td>
</tr>
<tr>
<td>5. Cut my food into small pieces.</td>
<td></td>
</tr>
<tr>
<td>6. Aware of the calorie content of foods that I eat.</td>
<td></td>
</tr>
<tr>
<td>7. Particularly avoid food with a high carbohydrate content (bread, rice, potatoes, etc)</td>
<td></td>
</tr>
<tr>
<td>8. Feel that others would prefer if I ate more.</td>
<td></td>
</tr>
<tr>
<td>9. Vomit after I have eaten.</td>
<td></td>
</tr>
<tr>
<td>10. Feel extremely guilty after eating.</td>
<td></td>
</tr>
<tr>
<td>11. Am preoccupied with a desire to be thinner.</td>
<td></td>
</tr>
<tr>
<td>12. Think about burning up calories when I exercise.</td>
<td></td>
</tr>
<tr>
<td>13. Other people think that I am too thin.</td>
<td></td>
</tr>
<tr>
<td>14. Am preoccupied with the thought of having fat on my body.</td>
<td></td>
</tr>
<tr>
<td>15. Take longer than others to eat my meals.</td>
<td></td>
</tr>
<tr>
<td>16. Avoid foods with sugar in them.</td>
<td></td>
</tr>
<tr>
<td>17. Eat diet foods.</td>
<td></td>
</tr>
<tr>
<td>18. Feel that food controls my life.</td>
<td></td>
</tr>
<tr>
<td>19. Display self-control around food.</td>
<td></td>
</tr>
<tr>
<td>20. Feel that others pressure me to eat.</td>
<td></td>
</tr>
<tr>
<td>21. Give too much time and thought to food.</td>
<td></td>
</tr>
<tr>
<td>22. Feel uncomfortable after eating sweets.</td>
<td></td>
</tr>
<tr>
<td>23. Engage in dieting behavior.</td>
<td></td>
</tr>
<tr>
<td>24. Like my stomach to be empty.</td>
<td></td>
</tr>
<tr>
<td>25. Enjoy trying new rich foods.</td>
<td></td>
</tr>
<tr>
<td>26. Have the impulse to vomit after meals.</td>
<td></td>
</tr>
</tbody>
</table>

**Scoring Instructions for the EAT-26**

Response & Numerical Score:
- Always= 3
- Usually=2
- Often=1
- Sometimes= 0
- Rarely=0
- Never=0

Garner & Garfinkel"