Consumption of Dietary Supplements Among Undergraduate Students: Perceived Knowledge and Usage

Consumo de Suplementos Dietéticos por Estudantes do Ensino Superior: Conhecimento Percebido e Utilização

Goreti Botelho[1*], Ana Rita Melo[2], Marco Aguiar[3]

ABSTRACT

Introduction: The use of dietary supplements in European countries has been increasing due to the growing interest in nutrition and health concerns.

Objectives: The aim of this study was to assess the knowledge and dietary supplements consumption pattern of undergraduate students.

Methodology: The data collection was performed through a self-administered questionnaire to 505 undergraduate students, mean age: 22.2±6.3 years, 65.0% females and 35.0% males.

Results: The questions concerning the knowledge on dietary supplements showed that almost every student knew or had heard about dietary supplements (94.1%). Despite this high percentage, only half of those students had taken supplements and females revealed to consume more dietary supplements. The main reasons to consume the dietary supplements were different between genders, being the proximity of exams for females and medical reasons/proximity to sport events for males. The categories most recognised by students were vitamins followed by products to enhance academic performance. Pills and capsules were the most known supplement forms, being pills and liquid ampoules the most used product forms.

Conclusions: The knowledge and pattern of dietary supplements consumption of undergraduate students was determined and revealed differences between genders. Some students revealed misunderstanding about medicines and supplements that they consumed. Future public health monitoring and nutrition intervention about dietary supplementation among undergraduate population is needed.

KEYWORDS: Undergraduate students, Questionnaire, Dietary supplements, Consumption pattern

RESUMO

Introdução: O uso de suplementos dietéticos nos países europeus tem vindo a aumentar devido ao crescente interesse em nutrição e às preocupações com a saúde.

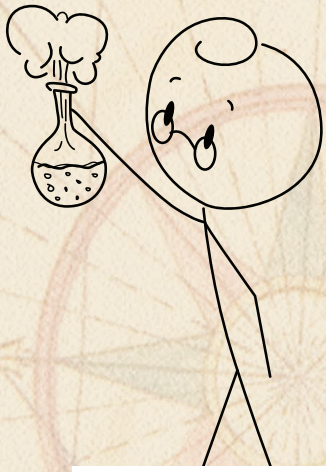
Objectivos: O objectivo deste estudo foi avaliar o conhecimento e comportamento de consumo de suplementos dietéticos de estudantes a frequentar o ensino superior.

Metodologia: A recolha de dados foi realizada através de um questionário auto-administrado a 505 estudantes: idade média 22,2±6,3 anos, 65,0% do sexo feminino e 35,0% do sexo masculino.

Resultados: As questões relativas ao conhecimento sobre suplementos dietéticos mostraram que quase todos os alunos conheciam ou tinham ouvido falar sobre suplementos dietéticos (94,1%). Apesar desta elevada percentagem, apenas metade desses estudantes tinham tomado suplementos e foram as raparigas que revelaram consumir mais suplementos dietéticos. As principais razões para consumir os suplementos dietéticos foram diferentes nos dois sexos, sendo a proximidade dos exames para as raparigas e razões médicas/proximidade de eventos desportivos para os rapazes. As categorias mais reconhecidas pelos estudantes foram as vitaminas seguidas de produtos para melhorar o desempenho académico. Comprimidos e cápsulas foram referidas como as formas de suplementos mais conhecidas, sendo os comprimidos e as ampolas de líquido, as formas de produto mais utilizadas.

Conclusões: O conhecimento e o padrão de consumo de suplementos dietéticos de estudantes do ensino superior foram determinados e evidenciaram diferenças entre géneros. Alguns estudantes revelaram confusão entre medicamentos e suplementos consumidos. É necessária a futura monitorização de saúde pública e intervenção nutricional sobre a suplementação dietética entre a população estudantil que frequenta o ensino superior.

PALAVRAS-CHAVE: Estudantes de licenciatura, Questionário, Suplementos dietéticos, Padrão de consumo



[1]Assistant Professor and Researcher in CERNAS Research Unit, Coimbra College of Agriculture, Polytechnic Institute of Coimbra, Bencanta 3045-601 Coimbra, Portugal

[2]Scholarship Student (BII, CERNAS, FCT) in Department of Food Science and Technology, Coimbra College of Agriculture, Polytechnic Institute of Coimbra, Bencanta 3045-601 Coimbra, Portugal

[3]PhD Student University of Trás-os-Montes e Alto Douro, Apartado 1013 5001-801 Vila Real, Portugal

Corresponding to Goreti Botelho: Department of Food Science and Technology, Coimbra College of Agriculture, Polytechnic Institute of Coimbra, Bencanta 3045-601 Coimbra, Portugal goreti@esac.pt

Recebido a 21 de Maio de 2013
Aceite a 23 de Outubro de 2013

INTRODUCTION

Many dietary supplements are showing positive effects, but they have the potential to cause multiple problems if people who use supplements are undereducated or misinformed. By this, recommendations for the use of dietary supplements should be based on individual's nutritional needs (1-3).

Group comparisons of dietary changes showed that, since starting University, students living away from home developed more unfavourable eating habits than students living in their family home (4). Moreover, when students begin to feel that the lack of nutrients in their body affect their life, some of them consider the possibility of taking nutrient supplementation. Little et al. (5) conducted a research that showed that a short-term nutrition education program can significantly improve nutrition and sport supplement knowledge in high school students of low socioeconomic status. Moreover, healthcare professionals consider high doses of nutrient supplements, herbs, and extreme diets to be dangerous due to the possibility of contamination and drug interactions (6). Therefore,

people should be encouraged to keep a balanced diet from food before considering dietary supplements (7).

In Portugal, there is a lack of knowledge about dietary supplements consumption behaviour and/or prevalence. As far as we know, the present research will be the first focusing on this issue in undergraduate students. Thus, this study was designed to evaluate the knowledge about dietary supplements and to determine the consumption pattern of undergraduate students, with a comparison between male and female gender.

MATERIALS AND METHODOLOGY

Participants

The present cross-sectional study was conducted through the application of an original self-administered questionnaire focused on the undergraduate students of the Coimbra College of Agriculture (ESAC, a higher education institution of the Polytechnic Institute of Coimbra) during 2010.

Procedures of the questionnaire application

In order to obtain the authorization to conduct the present study, a formal letter including the purpose and a brief description of the questionnaire was sent to the Head of the Directive Board of ESAC and the study was approved by the Ethics Committee of ESAC. Student recruiting process was conducted orally in student classes by one of the members of the project who explained in detail the objective, the background, and the questionnaire and asked for voluntary participation.

Population and sample characterisation

Overall, from the 1191 students that attend the three years of the seven degrees at the time of the study, 505 (42.4% of population, both genders, mean age: 22.2±6.3 years) participated in the study filling the questionnaire. The sample size was always above 10% of the total number of students of each year and degree under study. According to different authors (8, 9), it is very important to respect the use of this criterion in order to reach representative samples from the population under study.

Data collection

Afterwards, information was collected through the application of the self-applied questionnaire. The questionnaire, written in Portuguese, consisted of multiple choice and open questions. The classification of Body Mass Index (BMI) according to World Health Organization (WHO) was based on weight and height self-reported in the questionnaires.

Statistical analysis

Statistical analysis procedures were conducted using SPSS (Statistical Package for the Social Sciences, SPSS for Windows, Chicago, Illinois) version 17.0. Pearson correlation and Cohen's kappa test were used to evaluate the reliability of the questionnaire. One-way ANOVA was applied to the data obtained from the student's answers with the aim of determining whether there were significant differences (at 5% level) between male and female students. Descriptive statistics such as the means, percentages and frequencies were used to summarize data.

Procedure to conduct the test-retest reliability study of the questionnaire

To assure the test-retest reliability, 47 students (28.7% of sample), completed two series of questionnaires with the time span of one week. The application of a pre-test allowed the definition of the time needed to fill the whole questionnaire. This procedure had also confirmed that the given time of 15 min was adequate to fulfil each questionnaire. Between the pre-test and the test some questions were modified or added to the questionnaire and because of this, the answers from the pre-test questionnaires were not included in the final study.

The test-retest results revealed that the developed questionnaire present high reliability and provides a useful, low cost and friendly instrument to assess undergraduate students dietary supplements knowledge and consumption patterns.

RESULTS

Knowledge about dietary supplements

To the question "Do you know or have you ever heard about dietary supplements" 94.1% of the students answered "yes" (Table 1). From the 94.1% who gave "yes" as an answer, only 0.6% classified their knowledge on the subject as "very high"; 51.7% classified their knowledge as "medium" and 29.1% as "low". The distribution of students who already had taken dietary supplements is quite similar to the one who had not taken any ever (46.3% and 48.1%, respectively).

When the analysis of knowledge about dietary supplements data is focused on gender (Table 1), it is very interesting to verify that, despite the greater percentage of females (96.0%) that assume to know or have heard about dietary supplements compared with males (90.3%), are the males who classify, in a major percentage, their level of knowledge regarding dietary supplements as "high" (11.4% males against 2.4% females) and even "very high" (1.1% males against 0.3% females). The higher percentage

TABLE 1: Answers about dietary supplements knowledge and consumption habits of the undergraduate students

Questions	Answers	Male (% to total of males)	Female (% to total of females)	*p*	Frequency (males and females)	Percentage (%) (males and females)
Do you know or ever heard about dietary supplements?	NA[a]	0.0	0.0		0	0.0
	Yes	90.3*a*	96.0*b*	0.034	475	94.1
	No	9.7	4.0		30	5.9
How do you classify your level of knowledge regarding dietary supplements?	NA	9.1	3.7		28	5.5
	Very low	8.0	7.3		38	7.5
	Low	23.9	31.8		147	29.1
	Medium	46.6	54.4		261	51.7
	High	11.4	2.4		28	5.5
	Very high	1.1	0.3		3	0.6
Do you take or have ever taken dietary supplements?	NA	9.1	3.7		28	5.5
	Yes	39.2*a*	49.8*b*	0.021	234	46.3
	No	51.7	46.5		243	48.1
If never taken, why?	NA	50.0	54.7		269	53.3
	Dislikes	5.1	3.1		19	3.8
	No need	39.8	36.7		190	37.6
	High price	1.1	1.2		6	1.2
	No trust	2.3	2.1		11	2.2
	Because of the side-effects you think it has	0.6	0.6		3	0.6
	You do not have enough information	0.0	0.9		3	0.6
	Lack of personal interest	1.1	0.6		4	0.8
Would you take dietary supplements in the future?	NA	46.0	52.3		254	50.3
	Yes	26.1a	22.9*a*	0.218	121	24.0
	No	27.8	24.8		130	25.7

[a]NA = No Answer

Values followed by different letters, in the same line, are significantly different ($p \leq 0.05$)

of subjects who "take or ever have taken dietary supplements" belong to female gender (49.8% females against 39.2% males). However, when considering the possibility of taking supplements in the future, the percentage of female (22.9%) who answered "yes" is lower than that for males (26.1%).

Knowledge about dietary supplement categories

Considering the students who already took supplements, Table 2 shows that, the categories most known

TABLE 2: Answers of the undergraduate students to the question: "Which dietary supplement category(ies) do you know?"

Questions	Answers	Male (% to total of males)	Female (% to total of females)	p	Frequency (males and females)	Percentage (%) (males and females)
Know weight loss products	NA[a]	79.0	73.4	0.019	379	75.0
	Yes	21.0*a*	26.6*b*		126	25.0
Know vitamins	NA	67.0	61.5	0.083	319	63.2
	Yes	33.0*a*	38.5*a*		186	36.8
Know minerals	NA	76.1	72.8	0.043	372	73.7
	Yes	23.9*a*	27.2*b*		133	26.3
Know products to boost athletic performance	NA	72.7	82.9	0.016	400	79.2
	Yes	27.3*a*	17.1*b*		105	20.8
Know products to increase academic performance	NA	73.1	60.6	0.003	326	64.7
	Yes	26.9*a*	39.4*b*		178	35.3
Know products to lower the cholesterol level	NA	100	99.7	0.762	504	99.8
	Yes	0.0*a*	0.3*a*		1	0.2
Know products to increase sexual performance	NA	100	99.7	0.064	503	99.6
	Yes	0.0*a*	0.3*a*		2	0.4
Know products to stimulate the appetite	NA	100.0	99.1	0.441	502	99.4
	Yes	0.0*a*	0.9*a*		3	0.6
Know products to recover from tonsils operation	NA	100.0	99.6	0.461	376	99.7
	Yes	0.0*a*	0.4*a*		1	0.3
Know diuretics	NA	100.0	99.1	0.300	350	99.4
	Yes	0.0*a*	0.9*a*		2	0.6
Know products to lower fatigue and stress	NA	100.0	99.5	0.475	312	99.7
	Yes	0.0*a*	0.5*a*		1	0.3

[a]NA = No Answer
Values followed by different letters, in the same line, are significantly different (p≤0.05)

TABLE 3: Answers of the undergraduate students to the questions about behaviour and dietary supplementation advisors

Questions	Answers	Male (% to total of males)	Female (% to total of females)	p	Frequency (males and females)	Percentage (%) (males and females)
How often do you consume dietary supplements?	NA[a]	85.7	52.3		289	57.2
	Throughout the year	0.0	2.3		15	3.0
	During limited periods of time with no regularity	14.3	36.4		152	30.1
	During limited periods of time with regularity	0.0	9.1		49	9.7
Own initiative	NA	85.7	77.3	0.753	415	82.2
	Yes	14.3*a*	22.7*a*		90	17.8
Classmates/friends	NA	85.7	90.9	0.259	469	92.9
	Yes	14.3*a*	9.1*a*		36	7.1
Doctor	NA	100.0	75.0	0.000	395	78.2
	Yes	0.0*a*	25.0*b*		110	21.8
Family	NA	85.7	79.5	0.201	449	88.9
	Yes	14.3*a*	20.5*a*		56	11.1
Other health professionals	NA	85.7	90.9	0.000	467	92.5
	Yes	14.3*a*	9.1*b*		38	7.5
Coaches	NA	85.7	97.7	0.007	484	95.8
	Yes	14.3*a*	2.3*b*		21	4.2
Publicity	NA	100.0	90.9	0.707	496	98.2
	Yes	0.0*a*	9.1*a*		9	1.8

[a]NA = No Answer
Values followed by different letters, in the same line, are significantly different (p≤0.05)

were vitamins (36.8%), followed by products to enhance academic performance (35.3%), minerals (26.3%), weight loss products (25.0%) and products to boost athletic performance (20.8%). Statistically significant differences between genders for four different dietary supplements categories were found: weight loss products, minerals, products to boost athletic performance and products to enhance academic performance.

The most known supplement forms were pills (36.6%) followed by capsules (34.5%). The students were also familiar with liquid ampoules (32.1%) and powder sachets (24%).

Consumption behaviour

A total of 59 distinct commercial brands were referred by participants. The most used product forms are pills (20.2% of students), liquid ampoules (14.1% of students), capsules (8.5% of students), powder (4.8 % of students), tablets and syrup (2.6% and 2.4% of students, respectively).

The question "What are the reasons that lead you to consume dietary supplements?" was answered by 43.8% of students who had indicated the following reasons for taking dietary supplements: because supplements make them feel good in cases of tiredness, fatigue or stress (20% of students); to prepare for exams (19.4% of students); to strengthen the body and prevent problems (16.6% of students); as a dietary supplement (15.8% of students); to concentrate (15.0% of students) and for medical reasons/health care (11.3% of students). A greater percentage of female students than male students stated that they took dietary supplements when they "need to prepare for exams" (22.0% in the total of females against 14.2% males in the total of males) and when they "need to concentrate" (18.7% of total females against 8.0% males of total males).

To the question "How often do you consume dietary supplements?" 57.2% of the students did not answer and 30.1% answered "during limited periods of time with no regularity" (Table 3). Doctors and other health professionals are the main advisors of the students (21.8%), followed by the students themselves (17.8%), family (11.1%) and classmates/friends (7.1%).

DISCUSSION

When referring to the main reasons to take dietary supplements, the results from the present study revealed the following order of reasons: 1st "because it makes you feel good in cases of tiredness, fatigue or stress"; 2nd "when you need to prepare for exams"; 3rd "to strengthen the body and prevent problems"; 4th "as a nutritional supplement"; 5th "when you need to concentrate"; 6th "for medical reasons/health care"; 7th "because you have lots of physical activity"; 8th "to improve your appearance (hair, nails, etc)"; 9th "to lose weight" and "to keep your weight". These results can be compared with those which were found in U.S.A. by the Dietary Supplement Barometer Survey (10). It is very interesting to verify that, although we are comparing data from two different populations and countries (in Portugal the sample are undergraduate students and in U.S.A. the sample was the general population) the first and the last reasons ranked in the hierarchies are just the same: the more important reason to take dietary supplements for all people is "to feel better" and the least important is "to lose or manage weight".

The majority of the students presented normal nutritional status (76.2%). A total of 10.9% males and 9.1% females was classified as pre-obese and obese ones. These BMI deviations can be explained by an inadequate eating behaviour or a lack of a healthy lifestyle. Unfavourable dietary habits and health behaviour among undergraduate students were previously reported in different countries (4, 11-16).

It is important to underline that 6.2% of the students seemed to not knowing the difference between medicines or drugs/herbal drugs and dietary supplements. In fact, from the 59 commercial brands mentioned as dietary supplements consumed by the students, 12 are medicines.

Santos et al. (17) studied the population in Lisbon and Vale do Tejo (Portugal) and they concluded that the majority (25.7%) of individuals that choose herbal medicines and/or supplements looked for a sedative effect, with the herbal drugs and/or supplements being preferred over others due to their natural origin.

We can underline the differences between male and female students about dietary supplements consumption pattern and who they had taken advice from. In fact, 36.4% of female students (in the total of females) state that they consume dietary supplements "during limited periods of time with no regularity" against 14.3% of male students (in the total of males). When we focus our attention on advisors, 22.7% of female students (in the total of females) answer that they take supplements on their "own initiative" against 14.3% of male students (in the total of males). It is quite alarming that male students state that they did not use "doctors" as advisors, while 25.0% of female students answered that they did, and this difference between genders is statistically significant. Conversely, male students have their personal trainers, coaches or other exercise professionals as advisors: 14.3% (in the total of males) against 2.3% (in the total of females) with a statistically significant difference between genders. Finally, student females seem to be more influenced by publicity since 9.1% (in the total of females) against 0.0% (in the total of males) stated that they used publicity as advisor about dietary supplementation.

We consider that the understanding of dietary supplements intake should be supervised and educational interventions should be made to alert students to the advantages and disadvantages of dietary supplements consumption.

CONCLUSIONS

Female students consume more dietary supplements than male students. The main reasons to take the dietary supplements was different between genders, being the proximity of exams for females and medical reasons/proximity to sport events for males. The categories most recognised by students were vitamins followed by products to enhance academic performance. Pills and capsules were the most known supplement forms, being pills and liquid ampoules the most used product forms. From the 59 commercial brands mentioned as consumed by the students, 12 are medicines, revealing confusion about medicines and supplements. Further studies are required within a nationally representative population.

ACKNOWLEDGMENTS

The authors would like to thank the collaboration of ESAC students for their availability in collaborating in the survey for the present research study. The authors wish to thank Noémia Bárbara for her proofreading of the English manuscript. Goreti Botelho also wishes to thank the financial aid from CERNAS Research Unit that is supported by National Funds through the FCT – Fundação para a Ciência e a Tecnologia - under the project "PEst-OE/AGR/UI0681/2011". Ana Rita Melo wishes to thank the fellowship [CERNAS/BII/2009] of the FCT.

REFERENCES

1. Thompson C, Diekman C, Fragakis AS, Meerschaert C, Holler H, Devlin C. Guidelines regarding the recommendation and sale of dietary supplements. Journal of the American Dietetic Association 2002; 102: 1158-1164

2. American Dietetic Association. Position of the American Dietetic Association: vitamin and mineral supplementation. Journal of the American Dietetic Association 1996; 96: 73-77

3. Hunt JR. Tailoring advice on dietary supplements: an opportunity for dietetic professionals. Journal of the American Dietetic Association 2002; 102: 1754-1755

4. Papadaki A, Hondros G, Scott JA, Kapsokefalou M. Eating habits of university students living at or away from home in Greece. Appetite 2007; 49: 169-176

5. Little JC, Perry DR, Volpe SL. Effect of nutrition supplement education on nutrition supplement knowledge among high school students from a low-income community. Journal of Community Health 2002; 27: 433-450

6. Lee Y, Georgiou C, Raab C. The knowledge, attitudes, and practices of dieticians licensed in Oregon regarding functional foods, nutrient supplements, and herbs as complimentary medicine. Journal of the American Dietetic Association 2000; 100: 543-548

7. FAO/WHO. Guidelines for vitamin and mineral dietary supplements. Codex Alimentarius Commission. CAC/GL 55 2005

8. Fortin MF. O processo de investigação - da concepção à realização. Lusociência edições técnicas e científicas, Lda 2009

9. Hill M, Hill AB. Investigação por questionário. Sílabo Ed 2008

10. Molyneaux M, Marra JJ. American consumers and dietary supplements: launch of the dietary supplement information bureau. Complementary Health Practice Review 2001; 7: 131-132

11. Colić BI, Satalić Z, Lukesić Z. Nutritive value of meals, dietary habits and nutritive status in Croatian university students according to gender. International Journal of Food Sciences and Nutrition 2003; 54: 473-484

12. Huang TT, Harris KJ, Lee RE, Nazir N, Born W, Kaur H. Assessing overweight, obesity, diet, and physical activity in college students. Journal of American College Health 2003; 52: 83-86

13. Perez-Cueto F, Verbeke W, Lachat C, Remaut-De Winter AM. Changes in dietary habits following temporal migration. The case of international students in Belgium. Appetite 2009; 52: 83-88

14. Racette SB, Deusinger SS, Strube MJ, Highstein GR, Deusinger RH. Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. Journal of American College Health 2005; 53: 245-251

15. Soriano JM, Moltó JC, Mañes J. Dietary intake and food pattern among university students. Nutrition Research 2000; 20: 1249-1258

16. Steptoe A, Wardle J, Cui W, Bellisle F, Zotti AM, Baranyai R, Sanderman R. Trends in smoking, diet, physical exercise, and attitudes toward health in European university students from 13 countries 1990-2000. Preventive Medicine 2002; 35: 97-104

17. Santos AC, Oliveira S, Águas S, Monteiro C, Palma ML, Martins AP, Costa MC. Recolha de dados sobre consumo de medicamentos e/ou suplementos à base de plantas medicinais numa amostra da população de Lisboa e Vale do Tejo. Revista Lusófona de Ciências e Tecnologia da Saúde 2008; 5: 128-141