27 (2022) 200140

Contents lists available at ScienceDirect

Human Nutrition & Metabolism

journal homepage: www.sciencedirect.com/journal/human-nutrition-and-metabolism

Association of weekend alcohol consumption with diet variables, body mass index, cardiovascular risk and sleep

Mirta Crovetto [a,*], Macarena Valladares [b], Gloria Oñate [c], Macarena Fernández [c], Francisco Mena [d], Samuel Durán Agüero [e], Valentina Espinoza [f]

[a] Departamento de Salud, Comunidad y Gestión. Facultad de Ciencias de la Salud, Centro de Estudios Avanzados, Universidad de Playa Ancha, Avenida Playa Ancha 850, Edificio Puntangeles, Valparaíso, Chile
[b] Centro Integrativo de Biología y Química Aplicada (CIBQA), Universidad Bernardo O'Higgins. Chile, Av. Viel 1497, Santiago, Región Metropolitana, Chile
[c] Universidad Autónoma de Chile, Carrera Nutrición y Dietética, Av. Pedro de Valdivia 425, Providencia, Región Metropolitana, Chile
[d] Universidad de Chile, Estudiante del Programa Doctorado en Nutrición y Alimentos, INTA, Universidad de Chile, Chile
[e] Facultad de Ciencias Para el Cuidado de la Salud, Universidad San Sebastián, Sede Los Leones, Lota 2465, Providencia, Chile
[f] Departamento de Procesos Diagnósticos y Evaluación, Facultad de Ciencias de la Salud, Universidad Católica de Temuco, Temuco, Chile

ARTICLE INFO

Keywords:
Body mass index
Diet
Alcohol consumption
Tobacco
Insomnia
Sleep latency

ABSTRACT

Background: The transition from adolescence to adulthood is a critical stage of the life cycle in which risk behaviors are established or strengthened. The objective of this study is to associate weekend alcohol consumption with Body Mass Index (BMI), diet, sleep quality and tobacco use among Chilean university students, according to their gender.
Methods: For this descriptive, cross-sectional study, a total of 1,455 students from 5 Chilean universities were evaluated. The sample was selected using a non-probabilistic approach. A self-administered questionnaire was used to determine dietary habits and insomnia; the Insomnia Severity Index was also used. An anthropometric evaluation was carried out to measure weight, height and waist circumference.
Results: The sample was mostly female (78.0%) and 26.0% reported weekend alcohol consumption (35.7% of this 26.0% were male and 64.3% female). Students who consume alcohol have an overall higher score for unhealthy diet and insomnia, as compared to non-consumers. Among men, those who consumed alcohol reported a greater consumption of soft drinks, fried food and pizza; on the other hand, women who consumed alcohol had a greater consumption of pizza, fried food and cookies. No relationship was found between alcohol consumption and BMI or abdominal fat for the total sample or by gender.
Conclusion: In our sample of Chilean university students, weekend alcohol consumption was associated with an unhealthy diet and insomnia, however, we did not observe an association with BMI or abdominal fat.

1. Introduction

Changes in lifestyles and conditioning factors such as diet, physical activity, alcohol, tobacco use, and sleep patterns may be protective or risk factors that affect health maintenance and may trigger the development of diseases [1–3]. A risk factor is "any attribute, characteristic or exposure of an individual which increases the likelihood of developing a disease or injury" [4]. The World Health Organization (WHO) has pointed out that the number of premature deaths due to Non-Communicable Diseases (NCDs) should be reduced by one third by 2030, as part of the Sustainable Development Goals (SDGs), in order to prevent diseases and promote changes in risk factors such as the harmful consumption of addictive substances, including alcohol, to "strengthen the prevention and treatment of substance use, including narcotic drug abuse and harmful use of alcohol" [5,6]. Harmful use of alcohol represents 5.9% of total deaths and 5.1% of the global burden of disease (WHO, 2014), with the highest risk for young adults (20–30 years) where the mortality rate is 25% [6]. Alcohol consumption causes death and disability at a relatively young age. In the age group 20–39 years, approximately 13.5% of total deaths are attributable to alcohol consumption [7]. This risk factor, in addition to an unhealthy diet, tobacco use and a sedentary lifestyle, promotes overweight and obesity, high

* Corresponding author.
E-mail addresses: mcrovetto@upla.cl (M. Crovetto), mvalladaresvega@gmail.com (M. Valladares), gloriaonate@gmail.com (G. Oñate), macarena.fernandez@autonoma.cl (M. Fernández), franromebol@gmail.com (F. Mena), samuel.duran@uss.cl (S. Durán Agüero), vespinoza@uct.cl (V. Espinoza).

https://doi.org/10.1016/j.hnm.2022.200140
Received 10 June 2021; Received in revised form 16 December 2021; Accepted 22 January 2022
Available online 29 January 2022

blood pressure, elevated concentrations of blood glucose and increases in blood lipids, generating metabolic diseases and risk of cardiovascular diseases (CVDs), thus increasing premature deaths worldwide [8].

The WHO reported an overall annual alcohol consumption (2016–2018) of 9.1 L per capita in Chile, with large differences by sex (13.9 L for men and 4.4 L for women) [8]. In Chile, the National Health Survey (2016–2017) noted that 11.7% of the population reported risky alcohol use, which was 14.4% among adolescents and young adults (15–24 years). In addition, 39.8% of the population was overweight and 31.2% had obesity, factors that are known to increase cardiovascular risk [9]. On the other hand, changes in diet quality, expressed as increased consumption of processed foods, high in saturated fats, sugars and energy, and changes in sleep patterns have contributed to the burden of disease and quality of life [10–12].

In this context, young adults are an important group to study, whose risk behaviors are strengthened in the transition from adolescence to adulthood, a process that takes place during the professional training stage (i.e., college or trade school). In general, evidence shows that during university, student lifestyles are more oriented to risky rather than healthy habits and behaviors; this include an unhealthy diet, harmful substance use such as alcohol and tobacco consumption, and changes in sleep patterns [13–15].

The objective of this study was to associate weekend alcohol consumption with diet quality (healthy and unhealthy), BMI, cardiovascular risk factor and sleep quality among Chilean university students by gender.

2. Materials and methods

Study design: We conducted a descriptive, cross-sectional study.

Participants: A total of 1,455 students from 5 universities took part in the study, 1,448 were evaluated (those who submitted all the required information); 78.0% were female. Students were enrolled in one of the following universities: Universidad de Antofagasta [Northern Chile (85 men/179 women)], Universidad San Sebastian [Central and Southern Chile (83/543)], Universidad Bernardo O'Higgins [Central Chile (31/175)], Universidad de Playa Ancha [Central Chile (31/116)], Universidad Católica de Temuco [Southern Chile (88/117)]. The sample represented 4.2% of a total of 34,386 undergraduate students from the five included universities and was selected using a non-probabilistic approach. All students who met inclusion criteria were included in the study (all the participants were present at the moment of applying the instruments). Exclusion criteria were as follows: being pregnant, students who were off due to a sick leave, or those who did not provide informed consent.

Ethics: This study was developed according to the guidelines of the Declaration of Helsinki regarding research involving human subjects and was approved by the Ethics Committee of the Universidad Católica de Temuco.

2.1. Questionnaires

A structured survey to assess socio-demographic background was developed by the researchers, in addition to the use of previously validated surveys (to assess diet and sleep); the survey was applied by nutritionists who had been previously trained in the standardization of measurement protocols and instrument application.

2.2. Frequency of dietary habits

A self-administered questionnaire was used to evaluate healthy and unhealthy dietary habits. The first part consisted of nine items regarding consumption of: breakfast, dairy products, fruits, vegetables, fish, pulses, healthy dinner, oatmeal and whole-grain food products, and homemade foods. The questionnaire was based on Chilean dietary guidelines, with a score ranging from 1 (minimum) to 5 (maximum) per question (Likert-type scale), according to the recommended daily or weekly servings, providing a score between 9 and 45 (the higher the score, the better the dietary habits).

The second part included six items about unhealthy food or food groups: soft drinks, fried food, fast food, snacks, adding salt to food without tasting it first and consuming alcohol on weekends (number of alcoholic drinks consumed per weekend day). Five questions had response options that ranged from 1 (do not consume) to 5 (>3 servings a day/week) and, in the case of salt question, responses were from 1 to 3. Thus, the total score ranged from 6 to 28, with higher values representing worse dietary habits. This questionnaire was developed and validated for use among university students [16].

2.3. Body Mass Index assessment

An anthropometric evaluation was carried out to measure weight, height and waist circumference in order to assess cardiovascular risk. Weight measurement was assessed with students wearing light clothing, using a SECA mechanical scale with a maximum capacity of 220 kg and an accuracy of 50 g. Height was measured using a measuring rod integrated into the scale. BMI was calculated and categorized according to the WHO criteria [17]. The waist was measured at the midpoint between the iliac crest and the last rib, and abdominal obesity was classified according to the harmonized ATP III criteria for metabolic syndrome: ≥80 cm in women and ≥90 cm in men [18].

2.4. Insomnia questionnaire or Insomnia Severity Index (ISI)

The Insomnia Questionnaire or Insomnia Severity Index (ISI) is a self-report questionnaire that evaluates the nature, seriousness and impact of insomnia [15,19]. A score from 0 to 7 is categorized as absence of clinical insomnia; 8 to 14 as subclinical insomnia; 15 to 21 as moderate clinical insomnia, and 22 to 28 as severe clinical insomnia.

2.5. Epworth sleepiness scale (ESS)

The Epworth Sleepiness Scale (ESS) evaluates how likely it is for someone to fall asleep in eight different sedentary situations. The answer choices for each item have possible scores ranging from 0 to 3. Responses are summed (total score between 0 and 24), with higher scores representing a higher degree of sleepiness [15]. In addition, data about sleep quantity and sleep latency was provided. In order to collect data about sleep latency and sleep quantity, questions 2 and 4 from the Pittsburgh Sleep Quality Index were used [20].

2.6. Statistical analysis

We used SPSS Statistics 22.0 software to analyze data. The Kolmogorov-Smirnov test was carried out to evaluate the normality of continuous variables. Because data were normal, groups were compared using the Student's T-test. Data were expressed as mean and standard deviation (SD). We used the Chi-squared test for categorical variables. Data were shown as percentages (%). P values of <0.05 were considered statistically significant.

3. Results

Of the total sample, 26.0% reported weekend alcohol consumption. Of these, 35.7% were male and 64.3% female. Students who consumed alcohol had a higher unhealthy diet score, compared to those who did not consume alcohol ($p<0.001$). We observed that alcohol users had a higher score for insomnia (subclinical insomnia), compared to non-consumers ($p=0.029$) (Table 1). No significant differences were found in BMI or waist circumference between groups. When conducting the same comparisons separating by gender, female alcohol consumers had higher unhealthy diet scores compared to female non-consumers

Table 1
General characteristics of the sample.

	Total			Females			Males		
	Regular alcohol consumption	Non-consumers	p-value	Regular alcohol consumption	Non-consumers	p-value	Regular alcohol consumption	Non-consumers	p-value
	(n=377)	(n=1071)		(n=266)	(n=864)		(n=111)	(n=207)	
Age, years	21.8 ± 2.5	21.2 ± 2.6	0.001	21.8 ± 2.4	21.2 ± 2.5	0.002	21.9 ± 2.7	21.7 ± 3.1	0.028
Weight, kg	63.1 ± 11.1	62.0 ± 10.8	0.088	59.6 ± 8.8	59.2 ± 8.7	0.543	71.5 ± 11.7	73.4 ± 11.5	0.162
Height, m	1.63 ± 0.08	1.62 ± 0.07	0.001	1.60 ± 0.06	1.59 ± 0.05	0.081	1.72 ± 0.06	1.72 ± 0.06	0.374
BMI, k/m^2	23.4 ± 3.1	23.4 ± 3.2	0.754	23.1 ± 3.0	23.2 ± 3.2	0.722	23.4 ± 3.1	23.4 ± 3.2	0.214
Waist circumference, cm	77.0 ± 8.8	76.5 ± 10.1	0.499	74.6 ± 7.6	75.0 ± 9.8	0.61	82.7 ± 8.7	82.6 ± 9.5	0.915
Healthy diet score	59.5 ± 9.4	58.7 ± 9.0	0.134	59.9 ± 9.1	58.8 ± 8.8	0.08	58.6 ± 9.9	58.2 ± 9.6	0.773
Unhealthy diet score	16.0 ± 3.4	12.2 ± 3.0	0.001	15.6 ± 3.3	12.2 ± 2.9	0.001	17.1 ± 3.5	12.5 ± 3.3	0.001
Daytime sleepiness score	7.5 ± 5.2	7.6 ± 4.8	0.966	8.4 ± 5.0	8.1 ± 4.8	0.32	5.5 ± 5.2	5.5 ± 4.5	0.908
Insomnia score	10.9 ± 4.6	10.2 ± 4.9	0.029	11.1 ± 4.8	10.2 ± 4.9	0.022	10.4 ± 4.7	10.0 ± 5.2	0.563
Bedtime	24.3 ± 1.4	24.1 ± 1.4	0.086	24.2 ± 1.4	24.1 ± 1.4	0.476	24.6 ± 1.3	24.2 ± 1.5	0.101
Sleep latency, min	30.2 ± 35.0	27.1 ± 30.1	0.12	28.2 ± 35.9	27.1 ± 31.1	0.628	30.2 ± 35.0	27.1 ± 30.1	0.026

Data are expressed as mean and standard deviation (SD); Student's T-test was used.

($p<0.001$).

We observed differences in sleep quality, with a significant difference in insomnia score between alcohol consumers and non-consumers and between regular consumers and non–consumers (Table 1). In the case of male students, there were significant differences in the total unhealthy diet score and sleep latency between alcohol consumers and non-consumers ($p<0.001$ and $p=0.026$, respectively).

No associations were found between alcohol consumption, BMI and waist circumference overall, nor by gender.

A Chi-squared test was performed, by gender, in order to observe if there was an association between alcohol use and food products included in an unhealthy diet, such as soft drinks, fried food, pizza and cookies. Among males (Fig. 1), we observed an association between alcohol use and soft drinks ($p=0.031$), fried food ($p=0.02$), and pizza ($p=0.006$). In the case of females (Fig. 2), an association was found between alcohol use and fried food ($p<0.001$), pizza ($p<0.001$) and cookies ($p=0.036$). In general, and when compared to men, women consumed alcohol together with snacks (fried food, pizza, cookies).

4. Discussion

The most novel result found in our study was the association between weekend alcohol consumption and insomnia by gender. Specifically, female regular alcohol consumers presented statistically significant higher levels of insomnia than non-consumers. This is a particularly unprecedented and relevant result, since historically, studies about alcohol dependence have included few if any women in their samples [6]. On the other hand, among men, alcohol was associated with greater sleep latency. In addition, it can be noted that an unhealthy diet was characterized by the consumption of fried food and pizza. In addition, women reported consuming cookies and men, the consumption of soft drinks. No differences were noted in the BMI and waist circumference among alcohol consumers and non-consumers.

Weekend alcohol consumption has been scarcely studied in the general population and particularly not in Chile, studies have focused on general alcohol consumption in the university population and not associated with sleep quality. Regarding the association observed with insomnia in female alcohol users, the causes could be explained by the fact that females are more likely to have low-quality sleep, greater awakenings, and tend to develop insomnia after puberty [7,8]. Furthermore, evidence indicates bidirectional links between alcohol use and sleep disruption, offering a burgeoning field of research for the study of sex differences in sleep-alcohol interactions [21].

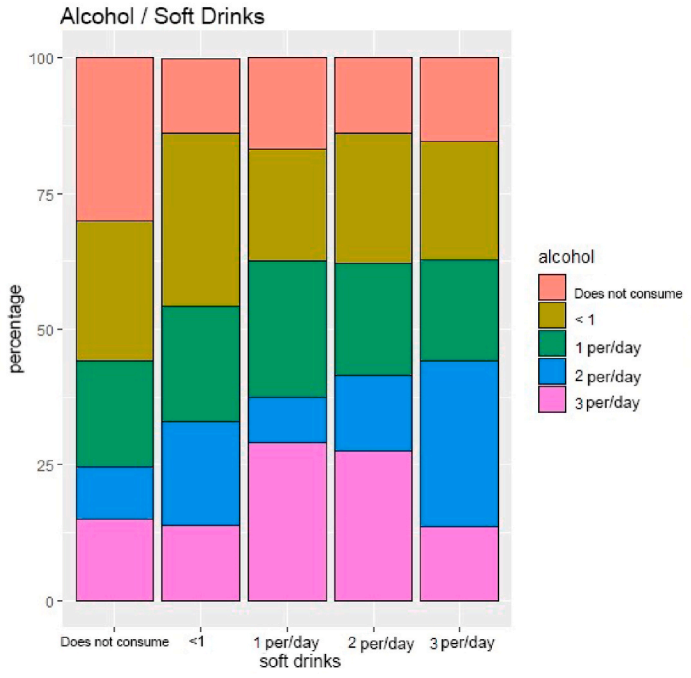
Regarding the association found in men, in which alcohol consumption was associated with higher levels of sleep latency, this has not been previously reported. In general, studies are based on sleep quality rather than on particular aspects of sleep. This result is also consistent with the fact that both alcohol consumption and sleep disturbances have a component that could be determined by sex.

With respect to the association between alcohol consumption with alterations in variables associated with sleep quality (which includes insomnia), our results are in line with different studies in which this relationship is widely described [4,5]. In particular, it has been described that alcohol may initially improve sleep continuity during the first half of the night, but in the second half of the night, it may lead to fragmented sleep (more awakenings) [22].

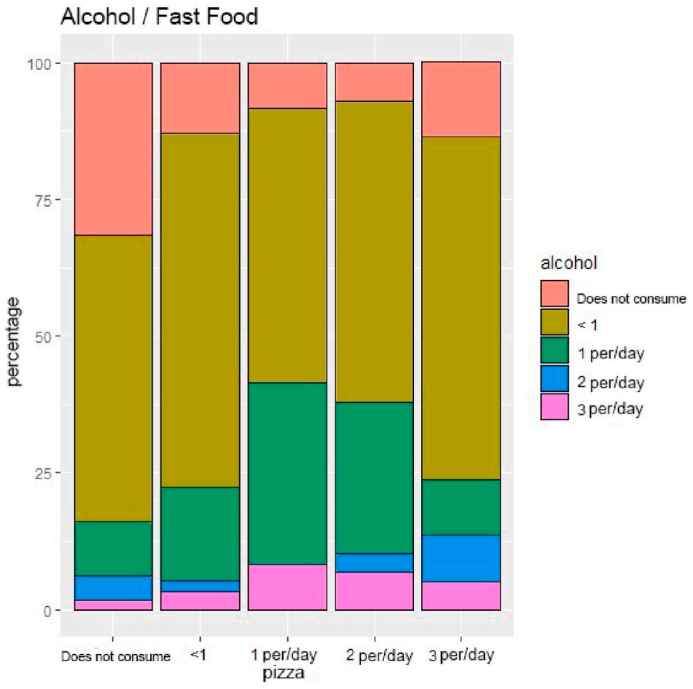
Just over a quarter (26.0%) of our sample of university students reported consuming alcohol, a figure lower than that reported in other studies. This is probably because our study considered weekend alcohol consumption and not weekday consumption, which may have increased consumption rates. The majority of our sample were female (64.3%), a group that has been scarcely reported since, historically, men have presented higher rates of alcohol consumption [13,14]. However, recent studies have begun to report a significant increase in problematic alcohol consumption among women [13,23]. In Latin America, alcohol consumption is 10% higher than in other regions, with the young population presenting the highest volume of consumption per day [8,13]; however, daily consumption was not evaluated in the current study. In Chile, it has been reported that the percentage of consumers who have more than 5 drinks on one occasion increased from 31.5% to 34.2% in the age group 19–25 years (National Service for Prevention and Rehabilitation on Drugs and Alcohol Consumption, SENDA, 2016) [23], which is still higher than the values found in this study, even though a different instrument was used. Additionally, studies conducted in Colombia about alcohol consumption among higher education students showed that 17.8% admitted having consumed more than 4 alcoholic drinks on one occasion [24].

In relation to diet, our results showed the same behavior among both women and men, with statistically significant differences. Alcohol consumers presented higher levels of unhealthy diet, specifically consumption of fried foods and pizza among both males and females. However, there were differences in high consumption of soft drinks (men) and cookies (women) between alcohol consumers and non-consumers, as opposed to studies that reported better nutritional habits in women [25].

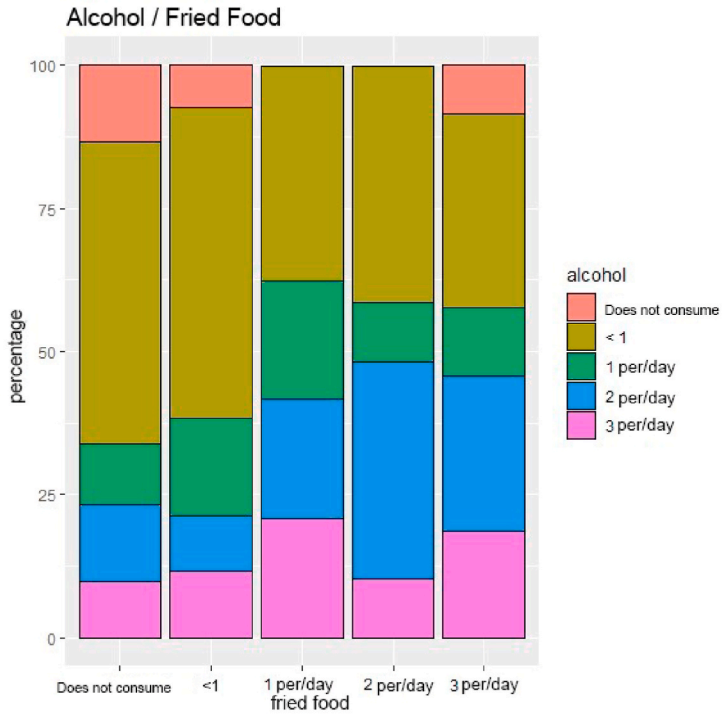
With respect to study weaknesses, we note that we did not measure variables that could influence the observed association between alcohol consumption and sleep disturbances, such as anxiety or stress levels. A self-applied questionnaire was used to evaluate healthy and unhealthy dietary habits and sleep quality, this could generate biased answers,



Chi^2, p-value=0.031

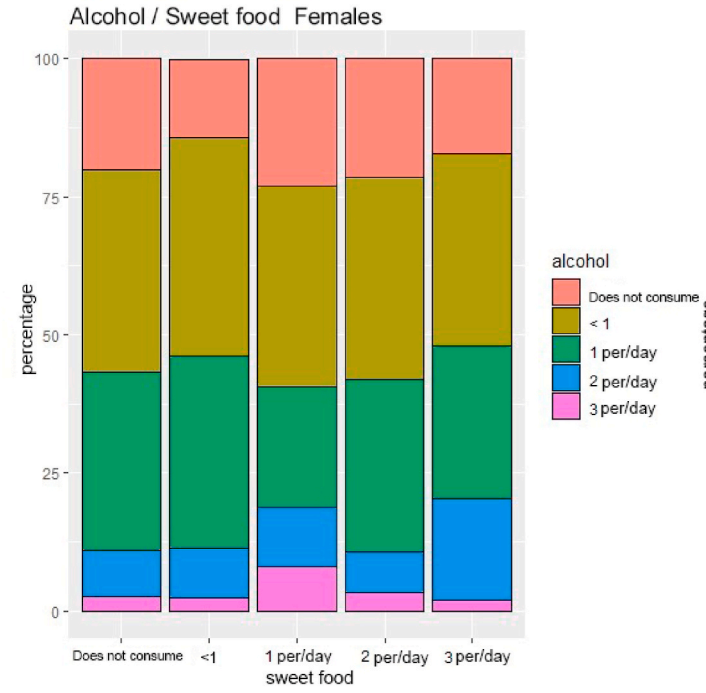


Chi^2, p-value=0.006

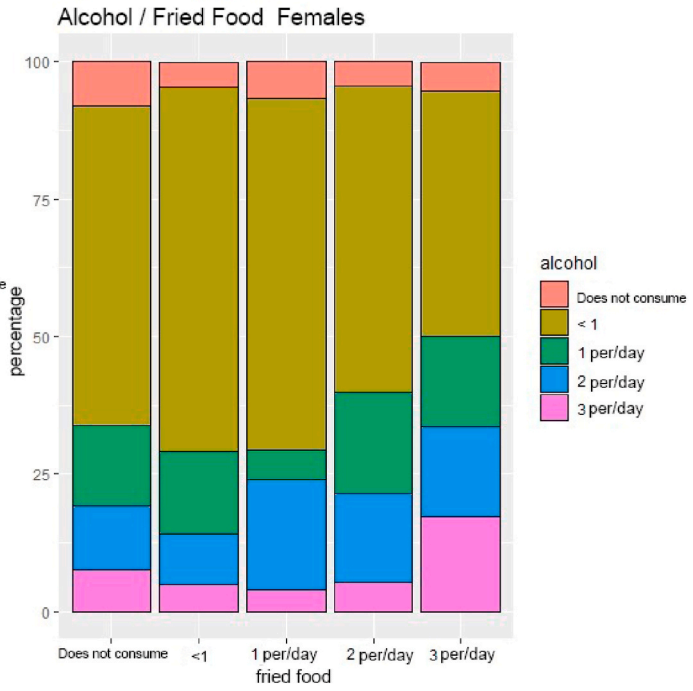


Chi^2, p-value=0.02

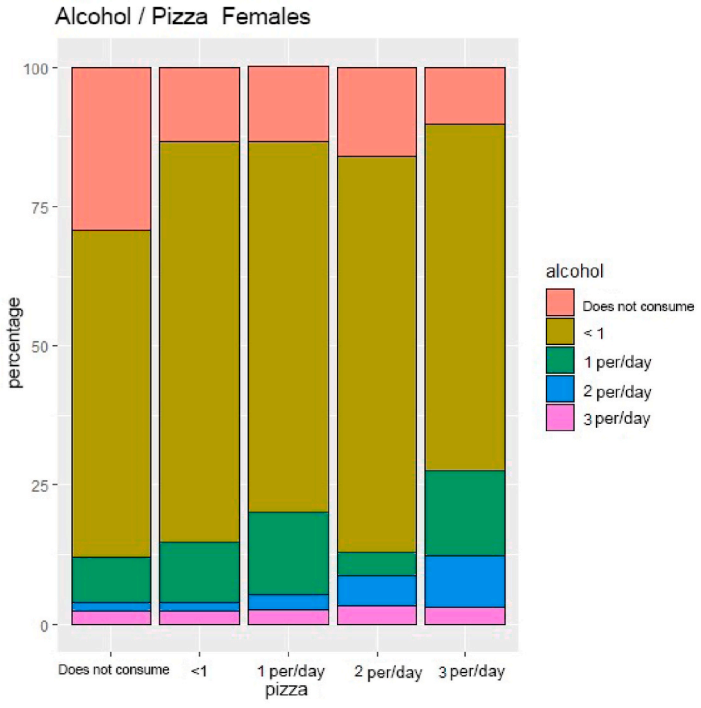
Fig. 1. Association between food and alcohol use in males.



Chi^2, p-value=0.036



Chi^2, p-value=0.001



Chi^2, p-value=0.001

Fig. 2. Association between food and alcohol use in females.

although it was clearly explained and doubts were resolved before each participant answered.

The strengths of the study include the important number of women evaluated, considering that this group has traditionally been absent from studies; this allows us to generate evidence in this group and provide new evidence on sex differences in alcohol consumption. Different sleep quality variables were measured, which allowed a more complete analysis in relation to specific sleep disturbances associated

with alcohol. Finally, this study was carried out in universities in different parts of the country, providing an important level of representativeness in relation to the population of university students.

5. Conclusion

In our sample of Chilean university students, weekend alcohol consumption was associated with an unhealthy diet and insomnia, however, we did not observe an association with BMI or abdominal fat.

The period of professional training is a factor that contributes to the acquisition of risk behaviors related to health conditioning factors. Background information about unhealthy habits and behaviors among this population should be considered when developing health policies in higher education institutions and when implementing public health policies.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] A. Martin, J. Booth, Y. Laird, J. Sproule, J.J. Reilly, D. Saunders, Physical activity, diet and other behavioural interventions for improving cognition and school achievement in children and adolescents with obesity or overweight, Cochrane Database Syst. Rev. 1 (1) (2018) CD009728.

[2] B. Taylor, J. Rehm, When risk factors combine: the interaction between alcohol and smoking for aerodigestive cancer, coronary heart disease, and traffic and fire injury, Addict. Behav. 31 (9) (2006) 1522–1535.

[3] V. Bacaro, A. Ballesio, S. Cerolini, M. Vacca, E. Poggiogalle, L.M. Donini, et al., Sleep duration and obesity in adulthood: an updated systematic review and meta-analysis, Obes. Res. Clin. Pract. 14 (4) (2020) 301–309.

[4] R. Bonita, M. de Courten, T. Dwyer, K. Jamrozik, R. Winkelmann, Surveillance of risk factors for noncommunicable diseases: the WHO STEPwise approach. Summary. Geneva, World Health Organization, Available from: https://www.who.int/ncd_surveillance/media/en/269.pdf, 2001.

[5] World Health Organization, Noncommunicable diseases progress monitor, 2017. Geneva, Licence: CC BY-NC-SA 3.0 IGO. Available from: https://apps.who.int/iris/bitstream/handle/10665/258940/9789241513029-eng.pdf?sequence=1, 2017.

[6] World Health Organization, World health statistics 2017: monitoring health for the SDGs, sustainable development goals. World Health Organization. License: CC BY-NC-SA 3.0 IGO, Available from: https://apps.who.int/iris/handle/10665/255336, 2017.

[7] Pan American Health Organization, Plan of action for the prevention and control of noncommunicable diseases in the americas 2013-2019. Washington, D.C.: PAHO, Available from: https://iris.paho.org/handle/10665.2/35009, 2014.

[8] World Health Organization, Global status report on alcohol and health 2018. World Health Organization, License: CC BY-NC-SA 3.0 IGOO. Available from: https://apps.who.int/iris/handle/10665/274603, 2018.

[9] Encuesta Nacional de Salud 2016-2017 (Primeros resultados) [National Health Survey 2016-2017 (First results)]. Available from: https://www.minsal.cl/wp-content/uploads/2017/11/ENS-2016-17_PRIMEROS-RESULTADOS.pdf.

[10] World Health Assembly, 61, Prevention and control of noncommunicable diseases: implementation of the global strategy: report by the Secretariat. World Health Organization, Available from: https://apps.who.int/iris/handle/10665/23424, 2008.

[11] World Health Organization, Global status report on non-communicable diseases 2014. World Health Organization, Available from: https://www.who.int/nmh/publications/ncd-status-report-2014/en/, 2014.

[12] Organisation for Economic Co-operation and Development (OECD), Reviews of Public Health of the Organisation for Economic Co-operation and Development (OECD): Chile: A Healthier Tomorrow. Assessment and Recommendations, OECD, Published, 2017.

[13] The Food and Agriculture Organization of the United Nations (FAO) and the Pan American Health Organization (PAHO), Latin America and the Caribbean. Panorama of Food and Nutritional Security. Healthy food systems to end hunger and malnutrition. Executive Summary. Santiago, Chile, Available from: http://www.fao.org/3/i6977e/i6977e.pdf, 2017.

[14] N. Rusnac, F. Spitzenstetter, P. Tassi, Chronic sleep loss and risk-taking behavior: does the origin of sleep loss matter? Behav. Sleep Med. (2018) 1–11.

[15] M.J. Ludy, S.Y. Tan, R.J. Leone, A.L. Morgan, R.M. Tucker, Weight gain in first-semester university students: positive sleep and diet practices associated with protective effects, Physiol. Behav. 194 (2018) 132–136.

[16] S. Durán, P. Valdés, A. Godoy, T. Herrera, Hábitos alimentarios y condición física en estudiantes de pedagogía en educación física [Eating habits and physical condition of physical education students], Rev. Chil. Nutr. 41 (3) (2018) 251–259.

[17] Food and Agriculture Organization (FAO), World Health Organization (WHO), Diet, nutrition and the prevention of chronic diseases. Report of a Joint WHO/FAO Consultation. Geneva, Switzerland, Available from: https://www.fao.org/3/ac911e/ac911e00.htm, 2003.

[18] G. Assmann, R. Guerra, G. Fox, P. Cullen, H. Schulte, D. Willett, et al., Harmonizing the definition of the metabolic syndrome: comparison of the criteria of the adult treatment panel III and the international diabetes federation in United States American and European populations, Am. J. Cardiol. 99 (4) (2007) 541–548.

[19] S. Durán, M. Castillo, R.F. Vio del, Diferencias en la calidad de vida de estudiantes universitarios de diferente año de ingreso del Campus Antumapu [Differences in university students' quality of life in the Antumapu Campus throughout 2005-2007], Rev. Chil. Nutr. 36 (3) (2009) 200–209.

[20] D.J. Buysse, C.F. Reynolds, T.H. Monk, S.R. Berman, D.J. Kupfer, The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research, Psychiatr. Res. 28 (2) (1989) 193–213.

[21] F. Baker, M. Carskadon, B. Hasler, Sleep and women's health: sex- and age-specific contributors to alcohol use disorders, J Womens Health (Larchmt). 29 (3) (2020) 443–445.

[22] S. Chakravorty, N. Chaudhary, K. Brower, Alcohol dependence and its relationship with insomnia and other sleep disorders, Alcohol Clin. Exp. Res. 40 (11) (2016) 2271–2282.

[23] El consumo de alcohol en Chile: situación epidemiológica [Alcohol Consumption in Chile. Epidemiological Situation], Available from: http://www.senda.gob.cl/media/estudios/otrosSENDA/2016_Consumo_Alcohol_Chile.pdf.

[24] A. Palacio, L.M. Pérez, M.Á. Alcalá, G. Lubo, A. Gálvez, A. Consuegra, Comportamientos de riesgo para la salud en estudiantes colombianos recién ingresados a una universidad privada en Barranquilla (Colombia) [An assessment of health risk behaviors among first college students at a private university in Barranquilla (Colombia)], Salud Uninorte 24 (2) (2008) 235–247.

[25] P. Valdes-Badilla, A. Godoy-Cumillaf, T. Herrera-Valenzuela, S. Durán-Agüero, The Comparison between food habits and physical condition among physical education and other undergraduate students, Nutr. Hosp. 32 (2) (2015) 829–836.