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Relation between insufficient physical activity, smoking, inadequate food, and alcohol consumption among university students in Minas Gerais, Brazil

Relação entre atividade física insuficiente, tabagismo, alimentação inadequada e consumo de álcool em universitários de Minas Gerais, Brasil

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Abstract – The aim of this study was to investigate the combinations between insufficient physical activity, smoking, inadequate food and alcohol consumption, as well as sociodemographic and university affiliation characteristics associated with aggregations among university students at a higher education institution in Minas Gerais, Brazil. This is a cross-sectional study that was carried out with university students attending undergraduate courses at a federal institution. Data were obtained through questionnaires. Risk behaviors (insufficient physical activity, smoking, irregular fruit/vegetable consumption, and alcohol consumption) were classified into 16 combinations and the ratios between observed and expected prevalences were analyzed. The outcome was the aggregations of health risk factors that exceeded the expected prevalences. The prevalence ratios (PR) estimated by Poisson regression, the crude and adjusted analyses were used to verify the presence of associations. The significance level was 5%. Participated 1,110 university students. Of the 16 combinations, two exceeded values, the absence and presence of all behavioral risk factors. There were stronger associations for the absence of risk factors for university students in the health area (PR= 2.07; 95%CI: 1.43–2.99) and a lower occurrence for students in the daytime study period (PR = 0.63; 95%CI: 0.43-0.96). It is concluded that there were higher prevalences above the expected for the combinations of four risk behaviors among university students and regarding the absence of the studied behavioral factors. There was an association with a higher occurrence of absence of risk factors for students of Health Sciences and a greater combination of risk factors on daytime college students.

Key words: Risk factors; Student; Health promotion.

Resumo – *O objetivo deste estudo foi investigar as combinações entre atividades físicas insuficientes, fumar, consumo alimentar e de álcool inadequados, e as características sociodemográficas e de vínculo com a universidade associadas às agregações em universitários de uma instituição de ensino superior de Minas Gerais, Brasil. Este é um estudo transversal que foi realizado com universitários dos cursos de graduação presenciais de uma instituição federal. Os comportamentos de risco (prática de atividades físicas insuficientes, fumar, consumo irregular de frutas/hortaliças e álcool) foram classificados em 16 combinações e foram analisadas as razões entre as prevalências observadas e esperadas. Os desfechos foram as agregações dos fatores de risco à saúde que excederam as prevalências esperadas. As medidas de associação foram as razões de prevalências (RP), ou seja, ao estimar via de regressão de Poisson, nas análises brutas e ajustadas. O nível de significância foi de 5%. Participaram deste estudo 1.110 universitários. Das 16 combinações, duas excederam valores acima do esperado, referente à ausência e à presença de todos os fatores de risco comportamentais. Foram associados com maiores chances da ausência dos fatores de risco os estudantes da área da saúde (RP: 2,07; IC95%: 1,43–2,99) e com menores chances da ausência os estudantes do período de diurno (RP: 0,63; IC95%: 0,43–0,96). Houve elevadas prevalências acima do esperado para as combinações referentes à ausência e à presença dos fatores comportamentais estudados, associando-se com maior ocorrência para a ausência, os estudantes das Ciências da Saúde, e com menores chances os universitários do período de estudo diurno.*

Palavras-chave: *Fatores de risco; Estudante; Promoção da saúde.*

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INTRODUCTION

An inappropriate lifestyle is considered harmful to health and contributes to the occurrence of diseases or prevents recovery from it[1]. According to the World Health Organization (WHO), a set of modifiable risk factors is one of the main responsible factor for many deaths caused by chronic non-communicable diseases (NCDs)[2]. Physical inactivity, smoking, excessive alcohol use, and unhealthy eating represent behavioral health risk factors[2].

These risk factors contribute to the appearance of health problems, especially cardiovascular diseases, diabetes, and cancer[3] and thus bring numerous damages to health[4,5]. There is an emphasis on behavioral risk factors in isolation[6], however, evidence indicates that behaviors tend to aggregate simultaneously[7] and the co-occurrence of risk behaviors can increase the chances of health risks[8], as the exposure of one habit can influence the presence of another[9].

Studies investigating the co-occurrence of these risk factors are found in adolescents[10], adults[11], and the elderly[7]. Regarding the university population, there is still limited information on this theme. Studies with university students on the co-occurrence of risk factors, varieties of cluster analysis are found. Students from Libya in Africa and England, clusters of behavioral risk factors and the association with academic performance and self-rated health were analyzed[12,13]. In Germany, the risk behaviors of students just entering university were analyzed[14].

In Brazil, studies on co-occurrence with university students analyzed the prevalence and behavioral risk factors for NCDs[15], such as cardiovascular diseases (CVD)[16,17]. It was observed the investigation of different behavioral risk factors, as the aggregation between physical inactivity, low consumption of fruits and vegetables[18], and physical inactivity, smoking habit, alcohol use and unhealthy diet[19].

It is noteworthy that university students may be subject to daily situations that lead to behavioral changes, like family distancing, greater autonomy, and a sense of freedom. The university environment can provide new social relationships, which can lead to habits that are mostly unhealthy, making the students more vulnerable to health risk behaviors, which can continue throughout life, or long enough to affect the health of students.

In this context, the pattern of behavior in the university environment has been increasingly changing in a way that is harmful to health, however, it is considered that the university is a favorable place for the development of health programs and intervention strategies and educational actions developed for the adoption of a healthy lifestyle. Given the above, the aim of this study was to investigate the combinations between insufficient physical activity, smoking, inadequate food and alcohol consumption, and sociodemographic and university affiliation characteristics associated with aggregations among university students at a higher education institution in Minas Gerais, Brazil.

METHODS

This is a cross-sectional study, with university students enrolled in the first semester of 2018, at the *Universidade Federal do Triângulo Mineiro (UFTM)*, in the city of Uberaba from Minas Gerais, Brazil. The data are of the survey, lifestyle profile, and quality of life of UFTM students. The study was approved

by the Ethics and Research Committee of the Federal University of Triângulo Mineiro, CAAE 77869617.10000.5154, and the volunteers previously signed an informed consent form for participation.

To determine the sample size, which was estimated considering the target population (N=5.952), 95% confidence level, acceptable sampling error 3 percentage points, a prevalence of 50%, plus 20% for losses and another 10% to control confounding factors in association studies in which led to a sample of 1.195 university students. Refusals of those who had no interest in participating were replaced.

The sampling process included the proportionality distribution of university students from the institution's 25 courses. As an inclusion criterion, students aged 18 years or over, who signed the informed consent form participated, regardless of gender and physical condition. After tabulating the data, the exclusion of university students belonging to distance learning courses, students with a higher education diploma, who enrolled in undergraduate courses, and those from technical courses and not belonging to the Uberaba Campus, were made, due to the possibility of a different profile from the other university students in the sample.

Data collection was carried out between April and July 2018 by 11 applicators, which consisted of university students and post-graduate students in Physical Education from UFTM, previously selected and who underwent training during March 2018. A questionnaire for data collection was used, applied with the presence and assistance of an evaluator in the classrooms, individually or in groups of up to 30 students. The average time to complete it was 15 minutes.

The questionnaire consisted of questions from the Academic Health Indicators and Quality of Life Questionnaire (ISAQ-A), validated for application in university students[20], the International Physical Active Questionnaire (IPAQ), short version[21] and sociodemographic and university-related questions.

For the present study, information was used regarding the four health risk behaviors such as alcohol consumption, cigarette smoking, insufficient physical activity, and irregular consumption of fruits and vegetables. Eating habits were classified as irregular, referring to consumption within 4 days a week of both foods; insufficient physical activity was considered as practice for <150 minutes per week, at moderate to vigorous intensity, the minutes of vigorous physical activity being multiplied by two; university students who reported smoking one or more cigarettes a day were considered smokers; the alcohol abuse was considered by consumption of four doses or more for women and five or more doses for men, in the last 30 days (dose was considered a half a beer bottle, or a beer can, or a wine glass, or a shot of whiskey, brandy, cachaça or vodka).

The aggregations of health risk factors were built based on the four risk behaviors, making up 16 combinations, which ranged from the absence to the presence of all factors. Of these combinations, those that presented observed prevalence (OP) that exceeded the expected prevalence (EP) values were grouped into a new variable, with the outcome of this study was all combinations with higher OP. To identify the combinations that exceeded the EP, the ratios between OP and EP were calculated, complemented by 95% confidence intervals (95%CI). The combinations that presented lower limits of 95%CI above one was considered above the EP.

To obtain the EP, the probabilities (P) of each isolated risk factor [number (n) of the outcome sample divided by the total sample] were calculated, for example,

for the combinations referring to the absence of insufficient physical activity and the presence of irregular consumption of fruits and vegetables, presence of smoking and presence of alcohol consumption, the following equation was used: 1 – P for insufficient physical activity x P for irregular consumption of fruits and vegetables x P for smoking habits x P consumption of alcoholic beverages[11].

The independent variables in this study were gender (male and female); age group in complete years categorized as 18 to 24 years and 25 years or more; marital status (with and without a partner); area of study, dichotomized into Health Sciences and Others (Exact and Earth Sciences, Biological Sciences, Engineering, Agricultural Sciences, Social and Applied Sciences, Human Sciences and Letters); study period, categorized into day and night; and university time in years, rated up to 2 years and 3 years or more.

The information was tabulated in Excel, version 2013, and data analyzes were performed in the SPSS Program for Windows, version 24. Absolute and relative frequency analyzes were used, along with estimated mean (standard deviation), minimum and maximum values to characterize the sample. As a measure of association, Prevalence Ratios (PR) were used, together with 95%CI through Poisson Regression in the crude and adjusted analyses, in relation to the combinations that exceeded the OP. In the adjusted analysis, the backward variable selection method was used, with the variables with a *p*-value <0.20 in the Wald test remaining in the adjustment. Association was determined by the significance level of 5%.

RESULTS

A total of 1,156 university students participated. Three were excluded for being under 18 years of age and forty-three for entering the university with a higher education diploma, leading to a final sample of 1.110 students. There was no statistical difference between the study sample and the target population, according to the number of university students in each course (data not shown).

The mean age of the university students was 21.48 (SD: 4.2; minimum 18; maximum 56), with the majority being female, without a partner, from courses in other areas of study not related to the Health Sciences and daytime students. It could be found that approximately 47.8% consumed fruits or vegetables up to 4 days a week, one in 10 college students smoked cigarettes, about 28% were considered insufficiently active and 68.6%, reported occasional excessive alcohol consumption (Table 1).

Table 2 presents the ratios between OP and EP, with the respective 95%CI for the 16 possible combinations involving the assessed risk behaviors. It was observed prevalences above the expected, for the combinations referring to the absence of all behavioral risk factors (O/E = 1.25; 95%CI: 1.02 - 1.48), and for the presence of all risk behaviors combined (O/E = 1.91; 95%CI: 1.16 – 2.66).

Table 3 shows the associations between the exploratory characteristics and the combination that showed the absence of all risk behaviors. In the crude analysis (Table 3), women and students in the Health Sciences area were associated with the outcome. In the adjusted analysis (Table 3), university students in the Health Sciences area were associated with the absence of co-occurrence of all risk behaviors. Daytime students were associated with a lower prevalence of presenting absence of health risk factors.

Table 1. Sample distribution considering sociodemographic, university-affiliations and behavioral variables in university students in Uberaba, MG. 2018.

Variables	n	%
Gender		
Male	422	38.2
Female	683	61.8
Age group in years		
18 to 24	978	88.1
25 or more	132	11.9
Marital status		
With companion	43	3.9
Without companion	1067	96.1
Study area		
Others	761	68.6
Health sciences	249	31.4
Study period		
Night	291	26.2
Day	818	73.8
University time in years		
Up to 2 years	566	51.1
3 or more years	541	48.9
Irregular consumption of fruits and vegetables	527	47.8
Smoking	114	10.3
Occasional binge drinking	759	68.6
Insufficient physical activity	303	27.7

Note. % Frequency.

Table 2. Observed and expected prevalences for combinations of risk behaviors among university students in Uberaba, MG. 2018.

Comb.	Nº RF	FV	SMO	DRINK	PA	O P (%)	EP (%)	O/E (%)	95%CI
01	0	-	-	-	-	13.2	10.57	1.25	1.02 – 1.48
02	1	-	-	-	+	3.8	4.06	0.94	0.52 – 1.35
03	1	-	-	+	-	23.4	23.17	1.01	0.86 – 1.16
04	1	-	+	-	-	0.2	1.22	0.16	-1.27 – 1.60
05	1	+	-	-	-	8.8	9.73	0.90	0.64 – 1.17
06	2	-	+	-	+	0.3	0.47	0.64	-0.75 – 2.03
07	2	-	+	+	-	3.2	2.67	1.20	0.71 – 1.69
08	2	+	-	+	-	19.9	21.32	0.93	0.77 – 1.10
09	2	-	-	+	+	6.9	8.90	0.78	0.49 – 1.07
10	2	+	+	-	-	0.3	1.12	0.27	-0.95 – 1.49
11	2	+	-	-	+	4.6	3.74	1.23	0.83 – 1.64
12	3	-	+	+	+	1.1	1.02	1.07	0.26 – 1.89
13	3	+	+	+	-	3.2	2.45	1.30	0.81 – 1.80
14	3	+	+	-	+	0.2	0.43	0.47	-1.14 – 2.07
15	3	+	-	+	+	9.0	8.19	1.10	0.82 – 1.37
16	4	+	+	+	+	1.8	0.94	1.91	1.16 – 2.66

Note. Comb.: combinations. RF: risk factors. +: presence of factor. -: absence of factor. FV: irregular consumption of fruits and vegetables. SMO: smoker. DRINK: consumption of alcoholic beverages. PA: insufficient physical activity. P: prevalence. O: observed. E: expected. O/E: Ratio between observed and expected prevalence. 95%CI: Confidence Interval at 95%.

Table 3. Factors associated with the combination of the absence of all risk behaviors that exceeded the expected prevalence in university students in Uberaba, MG. 2018.

Variables	Co-occurrence of the combination of the absence of all risk behaviors				
	n (%)	Crude analysis PR (95%CI)	p	Adjusted Analysis PR (95%CI)	p
Gender			0.03		0.13
Male	411 (69.8)	1.00		1.00	
Female	670 (68.5)	1.42 (1.02 – 1.99)		1.28 (0.92 – 1.08)	
Age group in years			0.32		0.43
18 to 24	959 (70.2)	1.00		1.00	
25 or more	126 (59.5)	0.76 (0.44 – 1.30)		0.80 (0.47 – 1.38)	
Marital status			0.85		0.81
With companion	41 (58.5)	1.00		1.00	
Without companion	1.044 (69.3)	1.08 (0.47 – 2.50)		1.10 (0.47 – 2.56)	
Study area			<0.01		<0.01
Others	737 (70.0)	1.00		1.00	
Health sciences	348 (66.7)	1.76 (1.30 – 2.39)		2.07 (1.43 – 2.99)	
Study period			0.70		<0.03
Night	274 (59.9)	1.00		1.00	
Day	810 (72.1)	0.93 (0.66 – 1.32)		0.63 (0.42 – 0.96)	
University time in years			0.39		0.54
Up to 2 years	554 (69.1)	1.00		1.00	
3 or more years	528 (68.8)	0.87 (0.64 – 1.21)		0.91 (0.67 – 1.23)	

Note. PR: Prevalence Ratios. 95%CI: 95% Confidence interval.

Table 4 shows the analyzes between the exploratory characteristics and the combination for the presence of all risk behaviors. After the crude and adjusted analysis, it was observed that there was no association.

Table 4. Factors associated with combinations of the presence of all risk behaviors that exceeded the expected prevalence in university students in Uberaba, MG. 2018.

Variables	Co-occurrence of the combination of the presence of all risk behaviors				
	n (%)	Crude analysis PR (95%CI)	p	Adjusted Analysis PR (95%CI)	p
Gender			0.51		0.34
Male	411 (38.0)	1.00		1.00	
Female	670 (62.0)	0.75 (0.31 – 1.79)		0.65 (0.27 – 1.56)	
Age group in years			0.37		0.14
18 to 24	959 (88.4)	1.00		1.00	
25 or more	126 (11.6)	0.40 (0.05 – 2.97)		0.25 (0.03 – 1.63)	
Marital status			0.15		0.07
With companion	41 (3.8)	1.00		1.00	
Without companion	1.44 (96.2)	0.35 (0.08 – 1.47)		0.31 (0.08 – 1.12)	
Study area			<0.25		0.67
Others	737 (67.9)	1.00		1.00	
Health sciences	348 (32.1)	0.52 (0.17 – 1.57)		0.76 (0.22 – 2.65)	
Study period			0.13		0.14
Night	274 (25.3)	1.00		1.00	
Day	810 (74.7)	0.50 (0.21 – 1.22)		0.52 (0.21 – 1.24)	
University time in years			0.73		0.54
Up to 2 years	554 (51.2)	1.00		1.00	
3 or more years	528 (48.8)	0.16 (0.47 – 2.84)		0.91 (0.67 – 1.23)	

Note. PR: Prevalence Ratios. 95%CI: 95% confidence interval.

DISCUSSION

In this study, among the aggregations, the combination of absence and presence of all risk factors showed higher than expected prevalence. For these combinations with high OP values, there was an association with greater occurrence effects of the absence of the four risk factors for students in the field of Health Sciences and with less association effect for university students studying during the day.

As for the risk factors, it was possible to observe higher than expected values for the combinations referring to the presence of all studied behavioral factors (OP/EP = 1.91; 95%CI: 1.16 – 2.66) and for the absence of them (OP/EP = 1.25; 95%CI: 1.02 - 1.48), but, in the present study there was no association between sociodemographic and university-affiliation characteristics for the presence of all risk behaviors, which can be justified due to the OP for this combination, with a smaller sample for this classification, and thus may have contributed with less power to estimate the association.

In another study carried out with university students in southern Brazil at the Federal University of Santa Maria, prevalence rates were higher than expected for the combinations of four behavioral risk factors such as physical inactivity, alcohol consumption, smoking and irregular consumption of fruits and vegetables (OP/EP: 1.76; 95%CI: 1.24 – 2.50)[22], these results are similar to the present study with values above expected among the four factors studied, which reinforces the concern about the combination of these behavioral risk factors in college students.

Among the risk factors studied, it is noteworthy that smoking is responsible mainly for deaths caused by the direct use of tobacco and among non-smokers exposed to cigarettes[2]. This situation is responsible for the main causes of NCDs, such as chronic respiratory and cardiovascular diseases, as well as various types of cancer. Thus, the concern about the habit of smoking among young people is justified, however, study showed lower prevalence of smoking among Brazilian university students, with results of 7.5% among those from the southern region[17]. It was observed a reduction in the prevalence of smokers in Brazil, with a decrease in smokers in the period 2006 to 2017, with a variation from 19.3% to 13 .2% among men and 12.4% to 7.5% among women[23]. This can be especially due to campaigns to combat cigarette consumption.

As for alcohol consumption, it is considered a psychoactive drug that can act on the central nervous system (CNS) causing behavioral changes and even symptoms of dependence[24]. It is worrying as it is the most consumed drug among young people, especially in the university environment[25]. In the academic environment, there are large offers of parties aimed at this audience, without age control, sometimes with free drinks, which favors alcohol consumption.

Practice of physical activities at insufficient levels can increase the mortality rates[26], while the regular consumption of fruits and vegetables can contribute to reducing the risk of morbidity and mortality of cardiovascular diseases[27]. The inclusion of a healthy diet and regular physical activity practices in university institutions can contribute to the control of obesity, in addition to other health problems.

The relation among these behaviors may be due to a negative habit influencing the presence of another[9], for example, smoking may be associated with alcohol consumption[28]. The greater the number of risk factors that exist simultaneously, the greater the negative effects related to health problems[29]. The influence of the university environment throughout the school years may be related to the

adoption of negative behaviors, such as smoking, due to the high stress levels, or even the influence of friends[8].

In this study, it was shown that university students in the Health Sciences area were associated with greater co-occurrence effects for the absence of all risk behaviors. Studies that analyzed negative health behaviors in isolation showed higher prevalence for students from other areas not related to the Health Sciences[16]. In a study with university students from Saudi Arabia, it was shown that among those belonging to the health area, there were healthier behaviors than those belonging to other study areas[30]. The results of this study corroborate the research by Crepaldi et al.[15], which demonstrated a higher co-occurrence of behavioral risk factors in university students from a public institution in the Southeast region, especially from the study areas not related to health. This finding may be related to the contents that are studied during graduation, especially about lifestyle, which thus act as a protective factor that leads to health benefits.

It was found in the present study that daytime college students were less likely to have no co-occurrence of risk behaviors. This information corroborates this study and other research on the co-occurrence of behavioral risk factors in university students in Recife, Brazil, which showed a greater propensity for inappropriate behavior in full-time students[18]. However, in another study that investigated freshman university students, who may have a distinct profile of less exposure to the university environment, divergent results were observed, as it showed an association of the co-occurrence of health risk in night shift students[19]. This characteristic is justified in daytime students, as they are those who spend more time at universities and, consequently, have greater involvement in different activities and different social groups.

As a limitation of the present study, the type of sample for convenience can be highlighted, however, students from all courses of the institution participated, with the sample per course being proportionally calculated, thus minimizing the selection bias. Another limitation may be related to the use of a questionnaire, which can overestimate physical activity or consumption of fruits and vegetables, and underestimate the consumption of alcohol and cigarettes, since the population is university students who are potentially aware of the risks of these factors to health. As strengths, the sample stands out, which involved the participation of all courses of the institution and thus expanded the scope of information. It is also strength the data collection period done in a few months, to avoid bias with climate change or festive periods, as well such as training teams to apply the research instrument.

It is concluded that there was a higher prevalence above the expected for the combinations of behavioral risk factors among college students, referring to the presence and absence of the four behavioral risk factors. University students from the Health Sciences areas of study were associated with a higher occurrence for the absence of risk factors, and daytime students were less prone to this combination.

It is extremely important to know the patterns of combination between these risk behaviors and which groups they may be exposed to. The information from this research may help to encourage structural improvements and the creation of health programs in the academic environment, through interventions focused on multiple behaviors, with the objective of raising awareness for the adoption of healthy habits among university students.

Compliance with ethical standards

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee – Federal University of Triângulo Mineiro and the protocol (no. 2.402.734) was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: TFS; Performed experiments: GSF, TFS; Analyzed data: GSF, TFS; Contributed reagents/materials/analysis tools: GSF, DCF, TFS; Wrote the paper: GSF, AJS; Review & Editing: ACRA, SAF.

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