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ORIGINAL ARTICLE

Behavioral lifestyles and motivations for adopting a vegetarian style among under-graduate students from the State of São Paulo, Brazil

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Vegetarians,
Young Adult,
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Abstract

Objective: Young adults have gained recognition as a period marked by changes in dietary and other lifestyle behaviors. The aim was to characterized young adults as meat and non-meat consumers and examine non-meat consumers associations between lifestyle behaviors, reasons, and motivations for adhering to vegetarian styles. **Methods:** cross-sectional analysis with 692 college students from 18 to 25 years old. Participants reported socio-demographic and lifestyle characteristics. Non-meat consumers questionnaire was related to aspects of adhering a vegetarian style, and they were classified as difficulties, positive and negative aspects of adhering it. Questions related to overall health were asked. Descriptive analysis and logistic regressions were used for analyses. **Results:** The majority of the study participants were female (79.2%) with mean age of 21.2±0.07 years. Almost 18% of the participants were non-meat consumers, from those, 78.9% reported themselves as ovo-lacto-vegetarian. Meat consumers had a higher probability for practicing less physical activity (PA) (OR 1.51; 95%CI 1.01, 2.27) and being less underweight (OR 0.22; 95%CI 0.10, 0.49) or normal weight (OR 0.48; 95%CI 0.28, 0.84) as compared to non-meat consumers. Ovo-lacto-vegetarian was more likely to reduce industrialized items (OR 3.69; 95%CI 1.18, 11.56) and less willing to do things (OR 0.10; 95%CI 0.01, 0.52) than vegan adults. **Conclusion:** Most participants were meat-consumers and had higher chances of not practicing PA and being more overweight. Vegans might be consuming more industrialized foods and were more willing to do things. Future studies should be considered to increase data generalizability in Brazil and other countries.

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INTRODUCTION

Vegetarianism is associated to a broad spectrum of eating behaviors involving the adoption of a plant-based diets, elimination of red/processed meats, and reduction or elimination of other animal products (such as eggs, milk and dairy products, poultry, and fish/seafoods). There is a variety of vegetarian diet types, which can be identified as: lacto-ovo-vegetarianism, lacto-vegetarian, ovo-vegetarian, vegan, and raw vegans[1]. Other types of alternative diets have been increasingly prevalent among younger adults, such as pesco-vegetarian and flexitarian styles, which red meats, poultries, and fish/seafoods are occasionally eaten[2,3]. The estimated prevalence of people following these diets ranges between 1% and 10% in Western countries. Estimates in the number of vegetarians (all types) have been observed in different high-income countries[4,5]. In Brazil, few studies on the prevalence of vegetarianism have been reported. Overall, data from the Brazilian Vegetarian Society has shown that up to 14% of the Brazilians are classified as vegetarians and 55% of them are buying and consuming more vegetarian/plant-based diets[6]. A large online cross-sectional study with over 3,000 (≥18 years old, 65% female) Brazilian individuals from the Mid-West observed that the most prevalent style was lacto-ovo-vegetarian (48.2%) followed by vegan (33.6%) and this was associated with eating behaviors[7]. Thus, future studies in this field should be taken to clarify associated aspects of vegetarian styles in other Brazilian populations, and increased generalizability to provide adequate strategies to promote health.

Plant-based diets are often interchangeable with vegetarian diets. However, the term plant-based is wider as it focuses on the consumption of foods primarily from plants (fruit and vegetables, nuts, oils, whole grains, and beans), avoiding or excluding animal sources such as dairies and meats[8]. Individuals that follow plant-based diets might choose to substitute animal products for vegetable options, without permanent restriction. Moreover, there is evidence to support that the Mediterranean Diet is mainly a plant-based diet[9,10]. Overall, there are common reasons to support plant-based diets and vegetarian styles, which includes health concerns, environment, animal welfare, meat rejection and religious beliefs[11]. Those reasons vary according to age, sex, family, and social beliefs. Young female population tend to choose vegetarian diets for environment and animal welfare, while adults usually choose those diets for health concerns. Young adults are more likely to adopt vegetarian styles and plant-based diets when compared to other population groups[3,12].

Young adults are defined as 18-30 years of age[13,14] and marked by important transitions, such as leaving high school and starting college, leaving home and increasing autonomy in decision-making, however, adults' responsibilities such as financial independence, residential and employment stability are still in flux[13]. From this perspective, young adults have gained recognition as a period marked by changes in dietary and other lifestyle behaviors[14] Also, it's a life period when they are exposed to unrealistic body image ideals, which can lead to a lower self-esteem and contribute to the adoption of vegetarian lifestyles, in order to maintain an ideal weight status and promote health. Therefore, the aim of this study was to characterized college students as meat and non-meat consumers and examine non-meat consumers associations between lifestyle behaviors, reasons, and motivations for adhering vegetarian styles.

MATERIAL AND METHODS

Study design

This cross-sectional study used data from a sample of college students, which was designed to understand associations between vegetarian styles, lifestyle behaviors, and weight status. College students were eligible if they were young adults between 18-25 years, from humanities, math, and biological courses from private and public universities, and resided in the State of São Paulo, Brazil. All students that reported being vegetarian or vegan, participated in the study, and those who do not adhere to vegetarian/vegan style (consume meat) were included for data comparison. Students who were doing exams to enter in college, or recently graduated from college were not included in the study. College students were recruited through social media, local college, and word-by-mouth. Students agreed to participate and provided informed consent prior to data collection. Questionnaire was sent online for the students through google forms. After the data collection was completed, no compensation was provided for the students. Recruitment and data collection occurred from August to November of 2020. A total of 692 participated in the study, no dropouts occurred.

MEASUREMENTS

Socio-demographic and lifestyle variables

Participants were asked to report their age, sex, religious status, family income and type of course (i.e., biological, math, or humanities). Family income was reported in range of minimum wages, ranges was transformed in income values, and an average value was provided to facilitate interpretation and given that most of the students were in a high-income position[15,16]. One minimum wage equivalize to 1,045 Brazilian Reais in the year of data collection (2020). Other lifestyle variables asked were smoking habit (i.e., smoking, never smoke), frequency for alcohol consumption (i.e., weekly and never), and, frequency for practicing leisure physical activity (i.e., <3x/week vs. ≥3x/week)[17]. Questions regarding mental health were asked, being those: depression, anxiety and/or eating disorders. This was dichotomized as yes or not reported a mental health issue.

Meat consumers and vegetarian styles

Participants were asked if they consumed any type of meat (red meat, poultry and fish). If participants reported they did not consume meat, it was asked if they followed one of the vegetarian styles: lacto-ovo-vegetarian, lacto-vegetarian, ovo-vegetarian, vegan, and raw vegan. For analysis purpose and, given the low frequency for the lacto-ovo-vegetarian, lacto-vegetarian and ovo-vegetarian, vegetarian styles were divided into two categories: lacto-ovo-vegetarian and vegan.

MEAT CONSUMERS AND VEGETARIANS

Two types of questionnaires based on the study of Rosenfeld and Burrow[18] were developed and pre-tested in a similar population of (n=6) to understand the vegetarian patterns among college students. Questionnaires were developed for meat consumers and for vegetarians.

Meat consumers

Participants were asked the frequency, type, and, amount of meat consumed. In addition, participants should have reported if they were trying to reduce meat, and if yes, where did they obtained information to reduce it (e.g., internet search engines, scientific articles, attending classes/seminars, health professionals, and, family/friends). The purpose of those questions was to cover flexitarians or semi-vegetarian, i.e., limiting meat intake without abstaining from meat completely[19].

Also, participants were asked if they were following: (i) medical/ or dietetic care, (ii) dietetic plan recommendations, (iii) biochemical exams regularly being monitored, (iv) have a nutritional deficiency; and, (v) if it is supplemented.

Vegetarians

Participants that were not meat consumers, were initially asked about their vegetarian style. Then, it was asked if they had never eaten meat in their whole life or if they were undergone through transitions before their current vegetarian style. Other questions related to students that adopt a vegetarian style were: (i) reasons for adopting it, (ii) where information was obtained, (iii) how long have been adopting this style; (iv) if there were exceptions for meat consumption (and if there is – what type of meat is consumed).

Questions related to social context were asked. Participants were asked if their family adopted the same diet; how many people at home followed the same diet; family relationship in adopting the same diet (i.e., mother, father, and, siblings) and if their friends/peers adopt some restrictive diet. Also, participants should report if they felt more comfortable living or socializing with people who adopted the same diet; and what are the difficulties to maintain this dietary pattern.

Finally, the same questions asked for the meat consumers should be answered in relation to their health, such as: (i) adoption of specific medical/ dietetic care; (ii) following dietetic plan recommendations, (iii) being monitored regularly by biochemical exams; (iv) have a nutritional deficiency, (v) if it is supplemented, and, (vi) if saw some pros or cons after adopting a vegetarian style.

DATA ANALYSIS

Descriptive statistics were used to describe college students' characteristics. Mean (±standard error) was calculated for continuous variables, and, frequency (%) for categorical variables. Data were normally distributed according to skewness curves[20]. Logistic regression analyses were used to determine associations between students' vegetarian styles and aspects of adopting it. Data were analyzed using SAS on Demand for Academics software (SAS Institute Inc. Cary, NC, USA).

RESULTS

Socio-demographic and lifestyle characteristics of the study participants

Table 1 reported socio-demographic and lifestyle characteristics according to course area, meat consumers, and vegetarian styles. The majority of the participants from biological and math/humanities were female, 82.57% and 75.24%, respectively. Among the biological individuals, 75.07% were normal weight, followed by 6.17% being underweight. In regards to religious status, 44.35% of the biological students and 54.23% of the math/humanities students did not have a religion/atheist. Only 7.77% of biological and 10.03% of the math/humanities students were smoking. Physical activity was regularly practice by 54.69% of the biological students, while 43.26% from math/humanities did not practice. Figure 1 showed the proportion of college students' motivations for adopting a vegetarian lifestyle. Overall, environmental issues were the most prevalent reason for both groups of students (biological and math/humanities) and vegetarian styles.

Lifestyle behaviors and meat consumers

As shown in Table 2, there were significant differences in physical activity and weight status between meat consumers and non-meat consumers. Meat consumers were doing less PA (OR 1.51; 95%CI 1.01, 2.27) as compared to non-meat consumers. Meat consumers showed lower probability for being underweight (OR 0.22; 95%CI 0.10, 0.49) and normal weight (OR 0.48; 95%CI 0.28, 0.84).

Lifestyle behaviors and vegetarian styles

Table 2 also showed the probability for adopting a vegan (in relation to ovo-lacto-vegetarian) style and lifestyle behavior, but no associations were found between variables.

Aspects of adopting vegetarian styles

College students who were adopting a lacto-ovo-vegetarian style reported reducing industrialized items (OR

Table 1. Socio-demographic and lifestyle characteristics according to course area, meat eaters/non-meat eaters and vegetarian styles among under-graduate students living in the greater São Paulo area. São Paulo, 2020.

	Total Sample (n=692)	Biological (n=373)	Math/ Humanities (n=319)	Meat eaters (n=569)	Non-meat eaters (n=123)	Ovo-lacto-vegetarian (n=97)	Vegan (n=26)
				Mean± SD			
Age, years	21,15±1,94	**21,40±1,86**	**20,86±1,77 *****	21,11±1,81	21,33±1,95	21,22±1,93	21,73±2,01
Family Income[1]	14732,75± 10214,02	15100,17± 3,98	14301,40± 3,85	14988,40± 10096,46	13550,12± 10704,36	**14557,84± 11001,51**	**9790,58± 8704,08 ***
Nº people living in the house	2,55± 1,33	2,51± 10273,86	2,59± 10142,75	2,59± 1,34	2,37± 1,29	2,44± 1,27	2,07± 1,32
BMI, kg/m²	23,14±3,92	23,03±3,98	23,26±3,85	**23,40±4,00**	**21,92±3,22*****	22,04±3,39	21,44±2,48
				n (%)			
Sex		* *p*-value		*p*-value*			
Female	548 (79,19)	308 (82,57)	240 (75,24)	439 (77,15)	109 (88,62)	86 (88,66)	11 (11,34)
Male	141 (20,38)	63 (16,89)	78 (24,45)	127 (22,32)	14 (11,38)	23 (88,46)	3 (11,53)
Area of study							
Biological	373 (53,90)	---	----	297 (52,20)	76 (61,79)	58 (59,79)	18 (69,23)
Math/humanities	319 (46,10)	----	----	272 (47,80)	47 (38,71)	39 (40,21)	8 (30,77)
Weight Status		* *p*-value		*p*-value**			
Underweight	48 (6,94)	23 (6,17)	25 (7,84)	32 (5,62)	16 (13,01)	13 (13,40)	3 (11,54)
Normal weight	483 (69,80)	280 (75,07)	203 (63,64)	392 (68,89)	91 (73,98)	71 (73,20)	20 (76,92)
Overweight/ Obesity	161 (23,27)	70 (18,77)	91 (28,53)	145 (25,48)	16 (13,01)	13 (13,40)	3 (11,54)
Mental Health Problems							
Yes	250 (36,13)	130 (34,85)	120 (37,62)	205 (36,03)	45 (36,59)	35 (36,08)	10 (38,46)
No	442 (63,87)	243 (65,15)	199 (62,38)	364 (63,97)	78 (63,41)	62 (63,92)	16 (61,54)
Religious Status		* *p*-value		*p*-value***			
Don't have a religion/Atheist	338 (48,91)	165 (44,35)	173 (54,23)	252 (44,37)	86 (69,92)	66 (68,04)	20 (76,92)
Cristian[2]	261 (37,77)	154 (41,40)	107 (33,54)	239 (42,08)	22 (17,89)	19 (19,59)	3 (11,54)
Other	92 (13,31)	53 (14,25)	39 (12,23)	77 13,56)	15 (12,20)	12 (12,37)	3 (11,54)
Alcoholic beverage							
Frequently	61 (88,82)	248 (70,66)	220 (71,90)	383 (70,53)	85 (74,56)	70 (77,78)	15 (62,50)
Never	631 (91,18)	103 (29,34)	86 (28,10)	160 (29,47)	29 (25,44)	20 (22,22)	9 (37,50)
Smoke Status		* *p*-value					
Yes	468 (71,23)	29 (7,77)	32 (10,03)	53 (9,31)	8 (6,50)	6 (6,19)	2 (7,69)
No	189 (28,77)	344 (92,23)	287 (89,97)	516 (90,69)	115 (93,56)	91 (93,81)	24 (92,31)
Physical Activity		** *p*-value		*p*-value *			
< 3x/week	350 (50,58)	169 (45,31)	181 (56,74)	298 (52,37)	52 (42,28)	43 (44,33)	9 (34,62)
≥ 3x/week	342 (49,42)	204 (54,69)	138 (43,26)	271 (47,63)	71 (57,72)	54 (55,67)	17 (65,38)

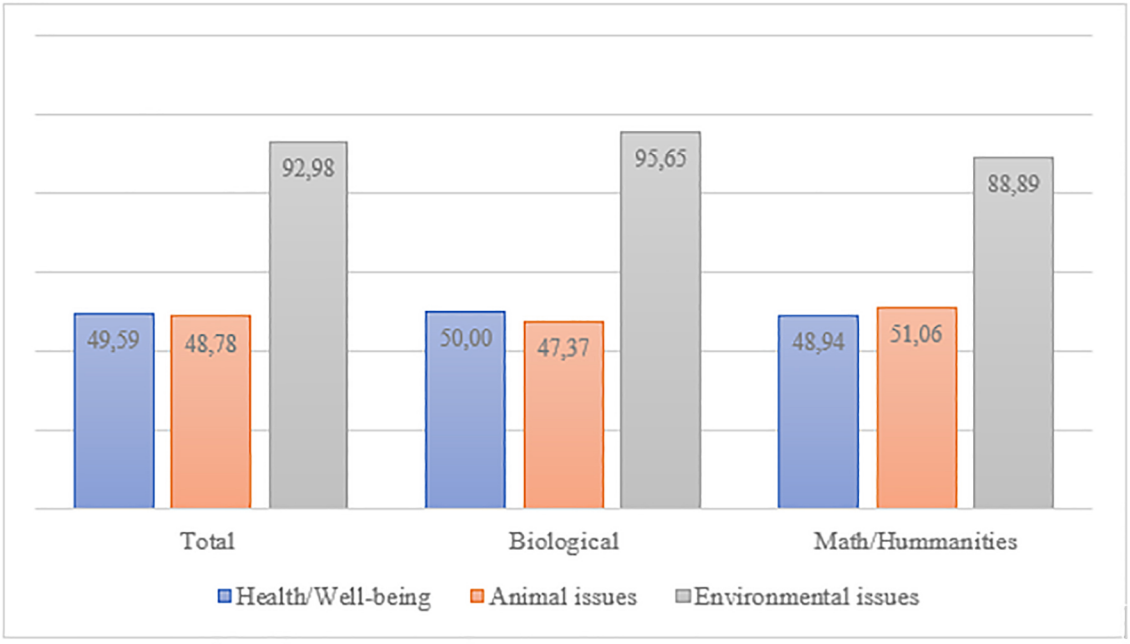
Note: SD: Standard Deviation.

[1]Family Income = expressed in Brazilian Reais.

[2]Cristian = Catholic and other Christian religions.

P-values: *<0.05, ** <0.01, ***<0.001.

(a)



(b)

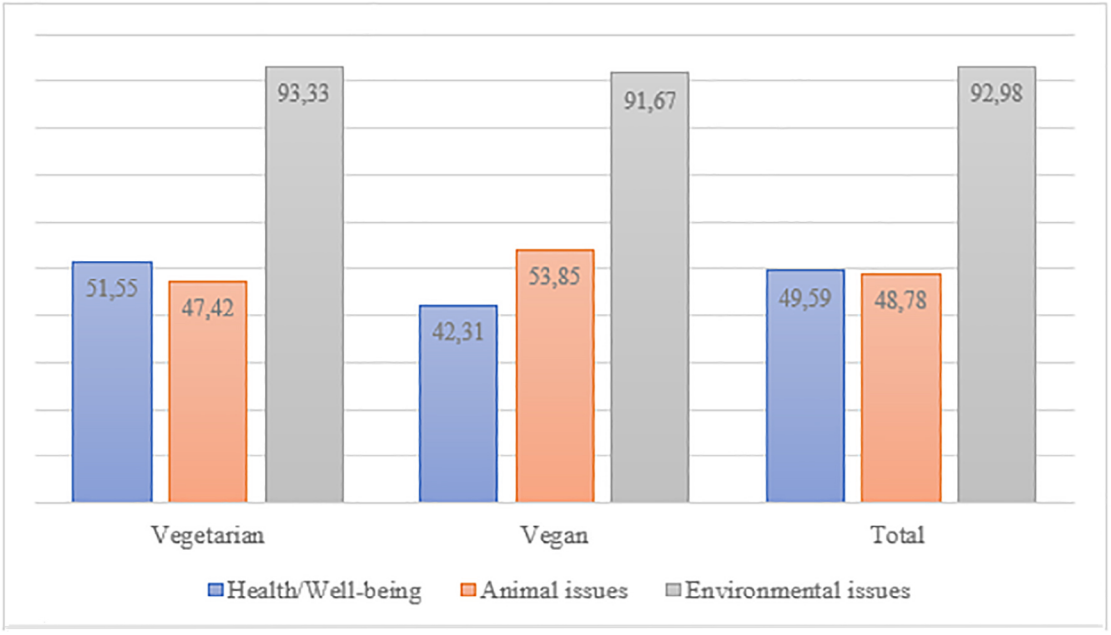


Figure 1. Reasons for adhering to vegetarian lifestyle by: A. course area and; B. vegetarian styles. São Paulo, 2020.

Table 2. Associations between meat consumers, vegetarian styles and lifestyle behaviors among under-graduate students living in the greater São Paulo area. São Paulo, 2020.

	Meat Consumers (vs. non-meat consumers)	**Lacto-ovo-Vegetarian Style (vs. vegan)**
	Adjusted model[1]	Adjusted model[2]
	OR (95%CI)	
Alcoholic Beverage†		
Never	1.18 (0.64, 2.17)	1.69 (0.35, 8.13)
Weekly	1.00	1.00
Physical Activity†		
<3x/week	**1.51 (1.01, 2.27) ***	1.50 (0.61, 3.71)
≥3x/week	1.00	1.00
Smoke		
Yes	1.48 (0.68, 3.19)	0.79 (0.15, 4.12)
No	1.00	1.00
Mental health issues†		
Yes	0.98 (0.65, 1.47)	0.90 (0.37, 2.20)
No	1.00	1.00
Area of study		
Biological	0.68 (0.45, 1.01)	0.67 (0.26, 1.67)
Humanities/Math	1.00	1.00
Weight Status		
Underweight	**0.22 (0.10, 049) ****	1.00 (0.17, 5.90)
Normal weight	**0.48 (0.28, 0.84) ****	0.82 (0.21, 3.16)
Overweight/Obesity	1.00	1.00

CI: confidence interval; OR: Odds Ratio;
Reference = 1.00
[1]Adjusted for sex, religious status, and weight status[†]
[2]Adjusted for family income
P-value: *<0.05; **<0.01; ***<0.001.

3.69; 95%CI 1.18, 11.56) as compared to vegan styles, while they reported more willingness to do things (OR 0.10; 95%CI 0.01, 0.52). Other difficulties, benefits and negative aspects were reported in Table 3, but no significant associations were found between vegan styles and outcomes.

Separate analysis with college students adhering to vegetarian styles showed no significant associations between course areas and aspects for adhering vegetarian styles (data are presented upon request).

DISCUSSION

This study described and compared lifestyle behaviors of meat and non-meat consumers in a population composed of college students from the most populous Brazilian state. Sub-group analysis with non-meat consumers were further conducted to compare aspects of vegetarianism between lacto-ovo-vegetarian and vegan styles. As expected, participants from biological areas had higher chances to not eat meat as compared to humanities/math areas. Meat consumer was less active. Lacto-ovo-vegetarian was reducing industrialized foods, but more willing to do things. Meat consumers were less on an underweight and normal-weight range as compared to non-meat consumers. These results suggested the need to find ways to improve strategies to promote better lifestyle behaviors among vegan students.

The prevalence of overweight among non-meat consumers was slightly lower as well in other studies[7,21]. For example, a national-wide cross-sectional study[7] with 3,319 vegetarians older than 18 years (65% female) found a prevalence of 20.7% of overweight. Another local study with 50 individuals from the countryside of the state of São Paulo found a prevalence of 20% of overweight[21]. Almost 50% of vegan participants were overweight in the sample of young adults and adults[21], while the current study showed lower proportions of overweight vegetarian partici'pants. Obesity was found in 2% of the ovo-lacto-vegetarian and none of the vegan participants were obese. Differently from our study, participants were older than ours. Thus, age might be an important determinant on weight status and lifestyle behaviors. Young adults are on

Table 3. Associations between being ovo-lacto-vegetarian (vs. vegan style) and aspects for adhering it among under graduate students living in the greater São Paulo area. São Paulo, 2020.

	Adjusted model†
OR (95%CI)	
Difficulties in adopting a vegetarian style	
Cost of diet	
Yes	0.88 (0.22, 3.47)
No	1.00
Home lack of vegetarian options	
Yes	1.51 (0.59, 3.82)
No	1.00
Food preparation	
Yes	3.52 (0.77, 16.06)
No	1.00
Restaurants lack on vegetarian options	
Yes	2.24 (0.83, 6.08)
No	1.00
Family do not adhere vegetarian style	
Yes	1.54 (0.53, 4.49)
No	1.00
Don't have any difficulties	
Yes	0.49 (0.21, 1.18)
No	1.00
Benefits of adopting a vegetarian style	
Reduce industrialized items	
Yes	**3.69 (1.18, 11.56) ***
No	1.00
More willing to do things	
Yes	**0.10 (0.01, 0.52) ****
No	1.00
Comfortable with family and friends	
Yes	0.64 (0.27, 1.54)
No	
Negative aspects of adopting a vegetarian style	
Gain weight	
Yes	0.43 (0.12, 1.59)
No	1.00
Lost weight	
Yes	0.87 (0.31, 2.44)
No	1.00

CI: Confidence Interval; OR: Odds Ratio.
Reference: 1.00
†Model adjusted for family income.
p-values: *<0.05, **<0.01, ***<0.001.

transitional life stage and are generally considered to be a low-risk period in life, in which people generally enjoy good health[14].

Food-related situations are one of the most motivations found by the college students to adopt a vegetarian style. Rosenfeld & Burrow[18] discussed that the motivations that prompt people to follow a vegetarian lifestyle includes values for which food is merely an outlet for expression. Health and well-being concerns are linked to ideologies in which people engage outside of food contexts. For example, some of the college students reported being on transition phase to adopt a vegetarian style. Therefore, to build on these ideological principles, transitions is not an ultimate goal in itself, but a means of achieving a larger goal. People looking for positive aspects of the aforementioned causes can engage in other behaviors aligning with these principles[18].

Differences on vegetarian styles and aspects of adhering it have been found. Lacto-ovo-vegetarian students were reporting less industrialized food items than vegan participants. The NutriNet-Santé cohort study with a 21,212 (73.1% female, ≥18 years old) showed that a higher proportion of vegans were consuming more (ultra) processed foods than meat consumers[4]. On the other hand, a systematic and meta-analysis review[22] have shown some beneficial health effects of following a vegetarian diet due to their higher nutritional quality. Importantly to highlight that these health benefits were associated with reduction cardiovascular diseases and certain type of cancers. This review focus on a limit number of cohort studies (n=7) that have complied the accuracy of the assessment of vegetarian status. Vegetarian diets can differ in many ways from non-vegetarian diets, and vegetarian diets themselves vary between different vegetarian groups[22] as in the case of young adults vegetarianism. The NutriNet-Santé cohort study found that the major sources among vegetarians (especially young adult vegans) were plant-based drinks and texture soy protein items, most of them identified by the authors as processed (or industrialized) foods.

Lacto-ovo-vegetarians are less restricted in terms of plant-based diet options and might have misreported their intake on industrialized food items. Self-reported data sometimes are not on an agreement at particular population groups. This may be because vegetarians have their own definitions of vegetarianism, a term that can be interpreted loosely[11,23]. Moreover, the concept of food processing is complex. While processed foods have been linked to additional fat, sugar, and/or sodium, as well the presence of food additives, it can ensure microbiological safety and preservation, and sometimes add vitamins and minerals important to prevent nutritional deficiencies[24]. Classifying foods according to industrialized items did not consider all these variables[25]. Hence, better to identify plant-based diets as core and non-core foods, which took into account the nutritional quality of diets.

Strengths of the study included the large sample size, random sample of young adults, and, pretested measurements to assess lifestyles, reasons, and motivations among meat- and non-meat consumers. However, this study is not without limitations. First, we were unable to examine each vegetarian style separately in measurement invariance testing due to small sample in each group. Hence why, we opt to combine similar vegetarian styles into one group. Future studies should seek to test measurement invariance and compare differences in reasons, motivations, and, lifestyles across the broader spectrum of vegetarian styles, as well occasionally meat eaters (or flexitarians) that can be adopted for healthy lifestyles. Secondly, the current study cannot tell if associations found is specific to college students or can be generalized to those following new vegetarian styles. Finally, data is cross-sectional and, since the questionnaire were sent online, weight, BMI and other data might not be totally trustworthy. Future studies should explore time-lagged associations between the trajectory of vegetarian styles and lifestyles, reasons, and motivations to better understanding the relations between aspects of vegetarian styles in young.

CONCLUSION

The present study adds to the literature data on differences between meat and non-meat Brazilian young adults' consumers in relation to their weight status, lifestyle behaviors, and other aspects for adhering it. Most of the participants were meat-consumers, and had higher chances for not practicing PA and being more overweight. Vegans might be consuming more industrialized foods and were less willing to do things.

It will be essential to account for diet intake in further studies to investigate associations between vegetarian styles and health. Individual reasons and motivations should be taken into consideration as they have a great influence on young adults' adoption to vegetarian styles. Qualitative studies will be necessary to identify these reasons and motivations because of the increase prevalence of vegetarians in the Brazilian population, and consequences of adopting these styles.

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