Impact of Nutrition and Sociodemographic Factors on Students from Public Universities

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Abstract

The study evaluates how diet and sociodemographic factors affect the body composition of university students. Body composition is critical for health and well-being, especially among university students. Factors such as nutrition and sociodemographic elements significantly influence it. The study employed a cross-sectional design with a sample of 171 students. Bioimpedance techniques were used to assess body composition, and detailed questionnaires collected dietary and sociodemographic information. Advanced statistical analyses were conducted to identify significant correlations and trends.A total of 15.79% of the students had a very high fat intake, and only 1.75% met the standards for a nutrient-rich diet. Among males, a nutrient-rich diet was positively correlated with a higher percentage of muscle mass and a smaller hip circumference. Residence location significantly affected arm circumference in females, being higher among those living in urban areas.The study highlights the high prevalence of diets high in fat and low in nutrients among students, emphasizing the need to promote balanced eating habits. Gender differences suggest that nutritional interventions should be tailored accordingly. Additionally, residence location influences body composition, indicating variations in dietary traditions and access to healthy foods. These findings can guide policies and intervention programs at universities to improve the health and well-being of university students in Ecuador.

Keywords: *Body composition, Sociodemographic factors; Nutrition, University students.*

Introduction

Body composition is a key indicator of overall health and well-being, particularly in young populations such as university students. Body composition refers to the proportion of fat, muscle, and bone in the human body (Hemke et al., 2020). It can be influenced by multiple factors, with nutrition and various sociodemographic elements being particularly significant (Zeinali et al., 2015; Neville et al., 2012). The relationship between diet and body composition is especially relevant, as inadequate nutrition can lead to severe health issues such as obesity, cardiovascular diseases, and various nutritional deficiencies (Petřeková et al., 2024; Cobo-Cuenca et al., 2019).

Nutrition plays a crucial role in physical development and the maintenance of overall health (Swapna N & Dr. Hanumanthayya Pujari, 2023). However, the eating habits of university students are often inadequate (Petřeková et al., 2024). Several studies have demonstrated that this population tends to consume diets high in fats and low in essential nutrients, potentially resulting in unbalanced body composition and long-term health problems (Cooke et al., 2020). These inadequate dietary patterns can be attributed to various factors, such as the lack of time to prepare healthy meals (Maqsood et al., 2023), the availability of unhealthy food on university campuses, and academic stress (Choi, 2020), which often lead to poorer food choices (Cobo-Cuenca et al., 2019).

In addition to nutrition, sociodemographic factors also play a significant role in body composition. Residence location, for instance, can influence dietary patterns and levels of physical activity. Students living in urban areas may have greater access to processed foods and fewer opportunities for physical activity

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compared to those residing in rural areas, where fresh food availability and opportunities for outdoor activities may be higher (Petřeková et al., 2024). Similarly, ethnicity and socioeconomic status can affect food choices and, consequently, body composition (Nieczuja-Dwojacka et al., 2023).

Socioeconomic status, in particular, can determine access to quality food. Students from less advantaged backgrounds may have limited access to healthy foods due to economic constraints, often resulting in the consumption of inexpensive, low-nutrient foods (Livingstone et al., 2023). These differences in access and food choices can have a significant impact on the health and well-being of university students (Facina et al., 2023).

Despite the importance of these factors, there is a notable lack of studies that comprehensively address how the combination of diet and sociodemographic factors affects the body composition of university students in Ecuador. Most studies have focused on populations from other countries, leaving a gap in knowledge about the specific situation of Ecuadorian students. This is particularly relevant in a country with considerable geographic and cultural diversity, where eating habits and sociodemographic factors can vary widely.

This study focuses on students from the Escuela Superior Politécnica de Chimborazo, one of the leading higher education institutions in Ecuador. It aims to comprehensively evaluate the influence of nutrition and sociodemographic factors on the body composition of these students. Using a cross-sectional design and advanced assessment methods, such as bioimpedance to measure body composition and detailed questionnaires to collect dietary and sociodemographic data, this study provides a detailed and specific perspective on this particular population.

The main objective of this article is to analyze the relationship between eating habits, sociodemographic factors, and body composition in university students from the Escuela Superior Politécnica de Chimborazo. The results are expected to contribute to the formulation of policies and intervention programs that promote healthier eating habits and improve the health and well-being of university students in Ecuador.

Materials and Methods

To comprehensively address the research question, this study employed a cross-sectional design, allowing for the evaluation of the influence of diet and sociodemographic factors on body structure and composition at a specific point in time. Following the precedents set by previous studies, such as Almeida et al. (2020), precise anthropometric data were collected using bioimpedance techniques, which provide a non-invasive and reliable assessment of body composition. Additionally, comprehensive questionnaires were used to gather detailed and diverse dietary information, as well as key sociodemographic data that could influence dietary patterns and body structure. This methodological approach was complemented by advanced statistical analyses to identify significant correlations and trends, enabling a deeper understanding of how dietary choices and sociodemographic contexts influence the body composition of university students. The methodology also draws on the work of Hendricks et al. (2010) and Mullaney et al. (2016), who applied similar approaches in studies of specific populations, adapting data collection and analysis tools to answer their respective research questions.

For this study, the selected sample consisted of 171 students from the Escuela Superior Politécnica de Chimborazo during the last quarter of 2023. A non-probabilistic sampling approach was used to represent a diversity of opinions.

Data Collection

Demographic Data

During the interviews, demographic data were collected, including age, sex, ethnicity, marital status, place of birth, habitual place of residence, and parents' place of origin.

Body Composition and Structure

Anthropometric assessments included the following measurements:

- Body weight

- Skinfolds (four measurements: triceps, subscapular, biceps, suprailiac)

- Body circumferences (three measurements: relaxed arm, waist, hip)

- Bone diameters (three measurements: transverse thorax, anteroposterior thorax, biacromial diameter)

Additionally, bioelectrical impedance was used to measure total body fat percentage and total muscle mass percentage. All measurements followed standardized techniques according to the International Society for the Advancement of Kinanthropometry (ISAK) protocol (Ros et al., 2019).

Dietary Characteristics

To assess dietary intake, both a quantitative method (24-hour recall) and a qualitative method (frequency of consumption of specific foods) were applied. Using this information, the adequacy percentages of energy, macronutrients, and micronutrients (iron, calcium, vitamin C) were calculated, and food intake patterns were determined.

Dietary assessment was performed using the Block screening questionnaire (Thompson et al., 2006), which measures the intake of fat, fruits, vegetables, and fiber (see Appendix 1). According to this questionnaire, specific scores were assigned for fat intake (fat points) and for the intake of fruits, vegetables, and fiber (fruit, vegetable, and fiber points).

Statistical Analysis Plan

The statistical analysis plan included representing the sample on a two-dimensional plane (fat intake score vs. fruit, vegetable, and fiber consumption score), categorized by participants' sex. A comparative study was conducted by classifying students based on their sex and various variables, including the sum of three bone diameters, arm, waist, and hip circumferences, as well as the sum of four skinfolds, body fat percentage, muscle mass, and weight.

Participants were grouped based on their dietary type, place of residence, place of birth, and parents' origins. Descriptive analyses were conducted, and one-way ANOVA tests were applied to compare means and examine differences between groups.

Results

Statistical Characteristics of the Sample

The sample consisted of 40.35% men and 59.65% women, with an average age of 21.85 years, ranging from 18 to 37 years. The median and mode were 21 and 20 years, respectively, with a standard deviation of 2.61 years.

Regarding diet, 15.79% of the students had a very high fat intake, followed by 16.96% with a high-fat diet. Additionally, 10.53% maintained a medium-fat diet, while 19.88% followed a low-fat diet. On the other hand, 36.84% of the participants reported following a diet nearly free of fats.

In terms of fruit, vegetable, and fiber intake, only 1.75% of respondents met the standards of a nutrient-rich diet. In contrast, over 29.82% of the students had a diet requiring additional intake of vegetables and grains. Furthermore, more than 68.43% of respondents maintained a diet low in nutrients.

Results of the Statistical Analysis

The evaluation of diet in relation to fat intake revealed a significant correlation with the sum of the four bone diameters in men. Individuals with a very high fat intake exhibited a significantly greater sum of the four bone diameters compared to those with a medium-fat intake. Additionally, subjects with a very high fat intake showed a significantly larger hip circumference than others. However, fat intake did not show a significant impact on women.

The evaluation of diet based on fruit, vegetable, and fiber intake in men revealed a significant correlation with total muscle mass percentage and hip circumference. Individuals consuming a nutrient-rich diet had a significantly higher muscle mass percentage compared to those with a poor diet and those needing to supplement their diet with vegetables and grains. Moreover, subjects with a nutrient-rich diet exhibited a significantly smaller hip circumference than others. Fruit, vegetable, and fiber intake did not impact the body structure and composition in women.

The students' place of birth did not show a significant impact on body measurements for either men or women. Conversely, the place of residence for female students had a significant impact on arm circumference. Women residing in urban areas had a significantly larger arm circumference compared to those living in rural areas. The residence of the father and mother did not have a significant impact on the body measurements of either men or women.

The results of the statistical analysis are presented in Tables 1, 2, and 3.

Table 1. One-Way ANOVA Results Between Diet and Body Composition and Structure (Pr(>F) < 0.05)

	df	SS	F	Pr(>F)	df	SS	F	Pr(>F)
Ingesta de grasa								
		MUJERES				HOMBRES		
Suma de cuatro diámetros óseos	4	107	0.467	0.76	**4**	**1111**	**2.923**	**0.0277 ***
Suma de cuatro pliegues cutáneos	4	34108	0.084	0.987	4	1162	0.773	0.547
Brazo	4	22.8	0.575	0.61	4	40.7	0.752	0.561
Cintura	4	190	0.748	0.561	4	661	1.995	0.112
Cadera	4	152	0.74	0.567	4	323.5	1.783	0.143
% de grasa total	4	37	0.16	0.958	4	303	1.515	0.208
% de masa muscular	4	15.9	0.615	0.653	4	38.8	0.587	0.673
Peso corporal	4	163	0.45	0.772	4	720	1.394	0.246
Ingesta de frutas, vegetales y fibras								
		MUJERES				HOMBRES		

	df	SS	F	Pr(>F)	df	SS	F	Pr(>F)
Suma de cuatro diámetros óseos	2	64	0.565	0.57	2	136	0.635	0.553
Suma de cuatro pliegues cutáneos	2	429	0.628	0.536	2	457	0.61	0.547
Brazo	2	11.7	0.594	0.554	2	42.8	1.631	0.203
Cintura	2	9	0,07	0.932	2	119	0.662	0.519
Cadera	2	77	0.754	0.473	**2**	**233.4**	**4,029**	**0.0214 ****
% de grasa total	2	66	0.585	0.559	2	16	0.151	0.86
% de masa muscular	2	5.9	0.458	0.634	**2**	**207.4**	**7.69**	**0.0009 *****
Peso	2	42	0.234	0.792	2	725	2.897	0.0623

Table 2. One-Way ANOVA Results Between Participants' Sociodemographic Factors and Body Composition and Structure (Pr(>F) < 0.05)

	df	SS	F	Pr(>F)	df	SS	F	Pr(>F)
Place of Birth								
		WOMEN				MEN		
Sum of Four Bone Diameters	1	0	0.004	0.947	1	5	0.043	0.836
Sum of Four Skinfolds	1	358	1.056	0.307	1	141	0.377	0.541
Arm Circumference	1	0	0	1	1	0.3	0.025	0.875
Waist Circumference	1	0	0.007	0.932	1	6	0.065	0.799
Hip Circumference	1	20	0.4	0.528	1	2	0.041	0.841
Total Body Fat Percentage	1	110	1.998	0.161	1	1	0.57	0.917
Muscle Mass Percentage	1	0.7	0.117	0.733	1	1	0.063	0.802
Weight	1	58	0.652	0.421	1	0	0.002	0.964
Place of Residence								
		WOMEN				MEN		
Sum of Four Bone Diameters	1	22	0.392	0.533	1	7	0.069	0.793
Sum of Four Skinfolds	1	69	0.201	0.655	1	1	0.002	0.964
Arm Circumference	**1**	**28.4**	**4166**	**0.00408 ****	1	0,9	0.064	0.801

Waist Circumference	1	41	0.653	0.421	1	138	1.559	0.216
Hip Circumference	1	2	0.033	0.856	1	0	0.001	0.976
Total Body Fat Percentage	1	31	0.547	0.461	1	30	0.575	0.451
Muscle Mass Percentage	1	0.9	0.135	0.714	1	0.2	0.012	0.913
Weight	1	56	0.629	0.43	1	26	0.193	0.662

Table 3. One-Way ANOVA Results Between the Sociodemographic Factors of Participants' Parents and Body Composition and Structure (Pr(>F) < 0.05)

	df	SS	F	Pr(>F)	df	SS	F	Pr(>F)
Father's Place of Origin								
		WOMEN				MEN		
Sum of Four Bone Diameters	1	0	0.003	0.956	1	0	0.001	0.977
Sum of Four Skinfolds	1	0	0	1	1	163	0.435	0.512
Arm Circumference	1	1.3	0.134	0.715	1	1.5	0.107	0.744
Waist Circumference	1	37	0.587	0.445	1	11	0.124	0.726
Hip Circumference	1	1	0.002	0.962	1	21	0.433	0.513
Total Body Fat Percentage	1	71	1.278	0.261	1	1	0.02	0.887
Muscle Mass Percentage	1	1.4	0.212	0.646	1	16.1	0.996	0.322
Weight	1	8	0.094	0.759	1	34	0.254	0.616
Mother's Place of Origin								
		WOMEN				MEN		
Sum of Four Bone Diameters	2	143	0.606	0.548	2	246	0.673	0.513
Sum of Four Skinfolds	2	392	0.513	0.6	2	1692	1.774	0.177
Arm Circumference	2	2.8	0.104	0.901	2	15.8	0.618	0.542
Waist Circumference	2	72	0.474	0.624	2	99	0.53	0.591
Hip Circumference	2	61	0.471	0.626	2	209	2.14	0.126
Total Body Fat Percentage	2	38	0.359	0.699	2	239	1.999	0.143
Muscle Mass Percentage	2	6.9	0.41	0.665	2	51.8	1.005	0.371
Weight	2	6	0.026	0.974	2	346	1.098	0.34

Discussion

The present study aimed to identify the influence of diet and sociodemographic factors on the structure and body composition of university students in public higher education institutions.

Dietary Patterns of Students

The study observed a notable prevalence of high-fat intake among students. Specifically, 15.79% of students reported a very high fat intake, followed by 16.96% with a high-fat diet. Meanwhile, 10.53% had a medium-fat diet, and 19.88% followed a low-fat diet. Additionally, a significant 36.84% of participants reported adhering to an almost fat-free diet. These data highlight the diverse eating habits among university students, revealing the prevalence of both high-fat and low-fat dietary patterns within this population (Saintila et al., 2024; Neville et al., 2012; Lopukhova et al., 2023). Furthermore, the results underscore the significant prevalence of unbalanced fat consumption among students, with many consuming high levels of fats. This could have implications for their health and well-being, emphasizing the importance of promoting balanced eating habits in educational settings to reduce potential health risks associated with excessive fat consumption in university populations.

Fruit, Vegetable, and Fiber Intake

Regarding fruit, vegetable, and fiber intake, only 1.75% of respondents met the standards of a nutrient-rich diet. In stark contrast, 29.82% of students required additional intake of vegetables and grains to complement their diets. Furthermore, over 68.43% of respondents followed diets with reduced nutrient content. This dietary situation aligns with findings from a study conducted among students on a campus of the University of Valladolid, Spain (Pérez-Gallardo et al., 2015).

Dietary intake of fruits, vegetables, and fiber showed no significant differences among female university students. However, in males, there was a notable impact on hip circumference and total muscle mass percentage. Men with a nutrient-rich diet demonstrated significantly higher muscle mass compared to others and had a significantly smaller hip circumference. This finding contrasts with the study by Tam et al. (2017), which found that women with diets high in vegetables, fruits, and fiber experienced a negative impact on their body mass index. Additionally, the study by Aparicio Martínez et al. (2021), conducted on medical students at a public university in Mexico, revealed a positive relationship between muscle mass and total energy consumption.

Sociodemographic Factors

Our findings indicate that the students' place of birth did not have a significant impact on body composition and structure in either men or women. However, place of residence was significantly associated with arm circumference in women. Female students residing in urban areas had a significantly larger arm circumference compared to those in rural areas. This influence may be related to variations in dietary traditions and the availability of healthy foods across different regions. In contrast, a study conducted on 376 children in Jablona found no significant differences in body proportions between children from urban and rural areas (Nieczuja-Dwojacka et al., 2023), suggesting that such influences may be more pronounced in older populations, such as university students.

The role of residence appears to be particularly important in certain measurements, such as arm circumference in women. Women living in urban areas tend to have significantly larger arm circumferences compared to those in rural areas, possibly influenced by dietary traditions and the availability of healthy foods in different regions (Duda, 2022). This contrast underscores the complexity of interactions between environment, nutrition, and body composition.

Dietary Disorders Among University Students

The study highlights dietary disorders among university students, who often maintain high-fat and low-nutrient diets. According to Fabián et al. (2013), academic stress can disrupt dietary patterns, leading students to make less healthy food choices. These choices may adversely affect both physical health and academic performance.

Parental Residence

The results of this study indicate that parental place of residence has no significant impact on the body structure of either men or women. However, previous studies have shown that the geographic origin of family and maternal relatives does not significantly influence body proportions or anatomical structure in children and adolescents, as evidenced by the work of Mesa et al. (1996).

This set of findings highlights the complexity of factors influencing nutrition and health among university students, which remains a central theme in this study.

Conclusion

This study reveals the significant influence of diet and sociodemographic factors on the body composition and structure of university students at the Escuela Superior Politécnica de Chimborazo. The data indicate a high prevalence of fat intake, with 15.79% of students consuming very high amounts of fat and 16.96% following a high-fat diet. In contrast, only 1.75% of students met the standards for a diet rich in fruits, vegetables, and fiber. These figures highlight unbalanced dietary patterns among students, which could have negative long-term implications for their health and well-being.

Gender differences are also notable. Among men, a nutrient-rich diet is positively correlated with a higher percentage of muscle mass and a smaller hip circumference. However, for women, these dietary patterns do not show a significant impact on body composition. This finding suggests that nutritional interventions may need to adopt a gender-specific approach.

Residence location also emerges as an influential factor, particularly in the arm circumference of women, with those living in urban areas presenting significantly larger measurements compared to their rural counterparts. This could reflect differences in dietary traditions and the availability of healthy foods across regions. Nevertheless, place of birth does not show a significant impact on body structure, nor does the parents' place of residence.

These results underscore the complexity of factors affecting the nutrition and health of university students. The high prevalence of diets rich in fats and low in nutrients suggests the need for educational interventions that promote balanced eating habits. Improving the diet of university students could not only benefit their physical health but also enhance their academic performance and overall well-being. Therefore, it is crucial for educational and health policies in universities to include nutrition programs that address these challenges.

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