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EDITORA

NUTRITIONAL STATUS AND FOOD CONSUMPTION OF ADULTS AND ELDERLY MEMBERS OF THE LANDLESS RURAL WORKERS MOVEMENT (MST) IN A MUNICIPALITY IN WESTERN PARANÁ STATE

ESTADO NUTRICIONAL E CONSUMO ALIMENTAR DE ADULTOS E IDOSOS PERTENCENTES AO MOVIMENTO DOS TRABALHADORES RURAIS SEM-TERRA (MST) DE UM MUNICÍPIO DO OESTE DO ESTADO DO PARANÁ

ESTADO NUTRICIONAL Y CONSUMO DE ALIMENTOS DE ADULTOS Y ANCIANOS MIEMBROS DEL MOVIMIENTO DE TRABAJADORES RURALES SIN TIERRA (MST) EN UN MUNICIPIO DEL OESTE DEL ESTADO DE PARANÁ

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Késia Zanuzo[1], Caroline de Maman Oldra[2], Tania Mara Takamori Damas Pavinato[3], Amanda Rocha Fujita[4], Ellen Carolina Zawoski Gomes[5], Sabrina Grassiolli[6]

ABSTRACT

Introduction: The Landless Rural Workers Movement (MST) is one of the largest social movements in Latin America, focused on the struggle for agrarian reform. The Brazilian rural population, especially in vulnerable contexts, faces the growing challenge of chronic non-communicable diseases, such as obesity, which coexist with nutritional deficiencies.

Objective: To evaluate the nutritional status and characterize the dietary profile of adults and elderly people residing in MST encampments in western Paraná.

Methods: This study was approved by the Research Ethics Committee under CAAE No. 63033021.9.0000.0107. This is a cross-sectional study with a non-probabilistic sample of 150 individuals (adults and elderly), of both sexes, conducted between December 2022 and

[1] Doctorate in Biosciences and Health. Universidade Estadual do Oeste do Paraná (UNIOESTE).
E-mail:kesiazanuzo@gmail.com Orcid: https://orcid.org/0000-0002-6397-2160
Lattes: http://lattes.cnpq.br/7816694886339297
[2] Doctorate in Biosciences and Health. Universidade Estadual do Oeste do Paraná (UNIOESTE).
E-mail: carol.dmaman@gmail.com Orcid: https://orcid.org/0000-0002-3869-3880
Lattes: http://lattes.cnpq.br/9840607511107674
[3] Master in Pharmaceutical Sciences. Universidade Estadual do Oeste do Paraná (UNIOESTE).
E-mail: tania_takamori@hotmail.com Orcid: https://orcid.org/0000-0002-1935-201X
Lattes: http://lattes.cnpq.br/9937630133920883
[4] Doctorate in Nutrition and Sports Sciences and Metabolism. Universidade Estadual de Campinas (UNICAMP). E-mail: nutriamandafujita@gmail.com Orcid: https://orcid.org/0009-0008-2806-4395
Lattes: http://lattes.cnpq.br/9038340172627060
[5] Doctorate in Biosciences and Health. Universidade Estadual do Oeste do Paraná (UNIOESTE).
E-mail: carolinazawoski@gmail.com Orcid: https://orcid.org/0000-0002-0543-6642
Lattes: http://lattes.cnpq.br/8326245423592294
[6] Dr. in Biological Sciences (Area of Concentration in Cell Biology). Universidade Estadual do Oeste do Paraná (UNIOESTE). E-mail: sgrassiolli@gmail.com Orcid: https://orcid.org/0000-0001-5647-7877
Lattes: http://lattes.cnpq.br/1379417550389891

December 2023, in an MST encampment located in a municipality in western Paraná state. Socioeconomic data were collected through a questionnaire. Nutritional status was obtained through anthropometric assessment of weight (kg) and height (m) to obtain the Body Mass Index (BMI – weight [kg]/height [m]²); and waist circumference (WC-cm) and hip circumference (HC-cm) were measured to identify the risk of cardiovascular disease. Laboratory data (fasting blood glucose, triglycerides, and cholesterol), blood pressure (BP), and heart rate (HR) were also collected. Dietary profile was assessed using a Food Frequency Questionnaire composed of 7 food groups, adapted from the Nutrition and Food Consumption Survey of the municipality of Campinas. For the statistical analysis of the quantitative variable "age" among individuals separated according to BMI classification as "Without Excess Weight" versus "With Excess Weight," the Mann-Whitney U test was used. To assess categorical variables between the "Without Excess Weight" versus "With Excess Weight" groups, the chi-square test of independence was performed. Spearman's correlation was applied between anthropometric, biochemical, blood pressure, heart rate, and dietary data variables. All statistical tests were two-tailed and performed using XLSTAT® software version 2014.5.03, considering a significance level of 5%.

Results: The research revealed a high frequency of excess weight (65%) in the studied population, with obesity being the most prevalent condition (38.67%). Individuals with excess weight presented greater visceral adiposity and elevated levels of triglycerides and cholesterol, which increases cardiovascular risk. Correlation analysis showed that increased visceral fat was associated with the consumption of ultra-processed foods (cookies and soft drinks) and higher levels of blood pressure and glucose.

Conclusion: The data demonstrate that the studied population presented a high frequency of overweight and risk factors for cardiovascular diseases, such as dyslipidemia. This health condition is multifactorial and not only a result of dietary habits, but also of exposure to vulnerable socio-environmental conditions. The struggle for land ownership and the transition to settlements are seen as fundamental processes for improving food security and living conditions, being crucial for the health and quality of life of this population.

Keywords: Popular Movements. Rural Workers. Health. Obesity. Nutrition.

RESUMO

Introdução: O Movimento dos Trabalhadores Rurais Sem-Terra (MST) é um dos maiores movimentos sociais da América Latina, focado na luta pela reforma agrária. A população rural brasileira, especialmente em contextos de vulnerabilidade, enfrenta o desafio crescente de doenças crônicas não transmissíveis, como a obesidade, que coexistem com deficiências nutricionais.

Objetivo: Avaliar o estado nutricional e caracterizar o perfil alimentar de adultos e idosos que residem em acampamentos do MST no Oeste do Paraná.

Métodos: O presente estudo foi aprovado pelo Comitê de Ética em pesquisa sob o CAAE nº 63033021.9.0000.0107. Trata-se de um estudo transversal com uma amostra não probabilística de 150 indivíduos (adultos e idosos), de ambos os sexos, realizado entre dezembro de 2022 a dezembro de 2023, em um acampamento do MST localizado em um município do oeste do estado do Paraná. Os dados socioeconômicos foram coletados por meio de questionário. O estado nutricional foi obtido por meio de avaliação antropométrica de peso (Kg) e estatura (m), para obtenção do Índice de Massa Corporal (IMC– peso[Kg]/altura [m]²); e as circunferências da cintura (CC-cm) e do quadril (CQ-cm), foram realizadas para identificação do risco de doenças cardiovasculares. Foram coletados ainda, dados laboratoriais (glicemia de jejum, triglicerídeos e colesterol), pressão arterial (PA) e

frequência cardíaca (FC). O perfil alimentar foi avaliado usando um Questionário de Frequência Alimentar composto por 7 grupos alimentares, adaptado do Inquérito de Nutrição e Consumo Alimentar do município de Campinas. Para a análise estatística da variável quantitativa “idade” entre os indivíduos separados de acordo com a classificação do IMC entre “Sem Excesso de Peso” versus “Com Excesso de Peso” foi utilizado o teste Mann-Whitney-U. Para avaliar as variáveis categóricas entre os grupos “Sem Excesso de Peso” versus “Com Excesso de Peso” foi realizado o teste qui-quadrado de independência. A correlação de Spearman foi aplicada entre as variáveis antropométricas, bioquímicas, pressóricas, FC e dados dietéticos. Todos os testes estatísticos foram bilaterais e realizados com o Software XLSTAT® versão 2014.5.03, considerando o nível de significância de 5%.

Resultados: A pesquisa revelou uma alta frequência de excesso de peso (65%) na população estudada, com a obesidade sendo a condição mais prevalente (38,67%). Indivíduos com excesso de peso apresentaram maior adiposidade visceral e níveis elevados de triglicerídeos e colesterol, o que aumenta o risco cardiovascular. A análise de correlação mostrou que o aumento da gordura visceral estava associado ao consumo de alimentos ultra processados (biscoitos e refrigerantes) e a níveis mais altos de PA e glicemia.

Conclusão: Os dados demonstram que a população estudada apresentou uma alta frequência de excesso de peso e fatores de risco para doenças cardiovasculares, como a dislipidemia. Este quadro de saúde é multifatorial, e não apenas resultado de hábitos alimentares, mas também de uma exposição a condições socioambientais de vulnerabilidade. A luta pela posse da terra e a transição para assentamentos são vistas como processos fundamentais para a melhoria da segurança alimentar e das condições de vida, sendo cruciais para a saúde e a qualidade de vida dessa população.

Palavras-chave: Movimentos Populares. Trabalhadores Rurais. Saúde. Obesidade. Alimentação.

RESUMEN

Introducción: El Movimiento de los Trabajadores Rurales Sin Tierra (MST) es uno de los movimientos sociales más grandes de América Latina, centrado en la lucha por la reforma agraria. La población rural brasileña, especialmente en contextos vulnerables, enfrenta el creciente desafío de las enfermedades crónicas no transmisibles, como la obesidad, que coexisten con deficiencias nutricionales.

Objetivo: Evaluar el estado nutricional y caracterizar el perfil dietético de adultos y adultos mayores residentes en campamentos del MST en el oeste del estado de Paraná.

Métodos: Este estudio fue aprobado por el Comité de Ética en Investigación (CAAE) con el número 63033021.9.0000.0107. Se trata de un estudio transversal con una muestra no probabilística de 150 personas (adultos y adultos mayores) de ambos sexos, realizado entre diciembre de 2022 y diciembre de 2023 en un campamento del MST ubicado en un municipio del oeste del estado de Paraná. Los datos socioeconómicos se recopilaron mediante un cuestionario. El estado nutricional se obtuvo mediante una evaluación antropométrica de peso (kg) y talla (m) para calcular el Índice de Masa Corporal (IMC – peso [kg]/talla [m]²); y se midieron la circunferencia de cintura (CC-cm) y la circunferencia de cadera (CC-cm) para identificar el riesgo de enfermedad cardiovascular. También se recopilaron datos de laboratorio (glucemia en ayunas, triglicéridos y colesterol), presión arterial (PA) y frecuencia cardíaca (FC). El perfil dietético se evaluó mediante un cuestionario de frecuencia de consumo de alimentos compuesto por 7 grupos de alimentos, adaptado de la Encuesta de Nutrición y Consumo de Alimentos del municipio de Campinas. Para el análisis estadístico

de la variable cuantitativa «edad» entre los individuos clasificados según su IMC como «Sin exceso de peso» versus «Con exceso de peso», se utilizó la prueba U de Mann-Whitney. Para evaluar las variables categóricas entre los grupos «Sin exceso de peso» y «Con exceso de peso», se realizó la prueba de independencia de chi-cuadrado. Se aplicó la correlación de Spearman entre las variables antropométricas, bioquímicas, de presión arterial, frecuencia cardíaca y datos dietéticos. Todas las pruebas estadísticas fueron bilaterales y se realizaron con el software XLSTAT® versión 2014.5.03, considerando un nivel de significancia del 5%.

Resultados: La investigación reveló una alta frecuencia de sobrepeso (65%) en la población estudiada, siendo la obesidad la condición más prevalente (38,67%). Las personas con sobrepeso presentaron mayor adiposidad visceral y niveles elevados de triglicéridos y colesterol, lo que incrementa el riesgo cardiovascular. El análisis de correlación mostró que el aumento de la grasa visceral se asoció con el consumo de alimentos ultraprocesados (galletas y refrescos) y niveles más altos de presión arterial y glucosa.

Conclusión: Los datos demuestran que la población estudiada presentó una alta frecuencia de sobrepeso y factores de riesgo para enfermedades cardiovasculares, como la dislipidemia. Esta condición de salud es multifactorial y no solo es resultado de los hábitos alimentarios, sino también de la exposición a condiciones socioambientales vulnerables. La lucha por la propiedad de la tierra y la transición a los asentamientos se consideran procesos fundamentales para mejorar la seguridad alimentaria y las condiciones de vida, siendo cruciales para la salud y la calidad de vida de esta población.

Palabras clave: Movimientos Populares. Trabajadores Rurales. Salud. Obesidad. Nutrición.

1 INTRODUCTION

The Landless Rural Workers Movement (MST) is considered one of the largest social movements in Latin America and the largest in Brazil (Da Cruz Chiabotto; Montagner, 2021). Its central focus is on the articulation and organization of rural workers to achieve Agrarian Reform and, in partnership with society, develop a Popular Project for Brazil (MST, 2025). Although the first actions of this process began in the late 70s, it was in January 1984, in Cascavel, Paraná, during the 1st National Meeting of the Movement, with the participation of 80 representatives from 13 states (Baldi; Orso, 2013) that the MST was officially founded. Currently, the MST is organized in the five regions of the country and present in 24 Brazilian states. According to information from the movement itself, There are approximately 450 thousand Brazilian families who conquered the land through the struggle and organization of rural workers.

Thus, over the years, the MST has developed a new form of struggle to claim ownership of land from the State, through occupations and the creation of encampments. These encampments constitute the locus of pressure on the State for the expropriation of unproductive lands and the promotion of the territorialization of individuals interested in agrarian reform. In the camps, the subjects or "encamped" began to integrate new routines organized in commissions and nuclei, demanding a collective life that is fundamental for the structuring of future settlements (Belo; Pedlowski, 2014).

The encampments are well consolidated as organizational and collective structures of struggle, however, the expropriated latifundia usually have few improvements and infrastructure, such as sanitation, electricity, and access to culture and leisure, which increases the risk to the health of their members (MST, 2025). In this context, there are few scientific studies evaluating the relationships between the health conditions of the rural population and their determinants (Figueiredo *et al*., 1987; Valentine; Burlandy, 2001). In general, studies on the health conditions of this population associate nutritional status with land tenure, work and health processes (including the use of pesticides), reported morbidity and mortality, and relationship with health services (Carneiro *et al*., 2008). In general, the living, food and health conditions of the rural population in Brazil are little known and studied, especially those of adults and the elderly living in rural settlements (Fietz; Salay; Watanabe, 2010).

The MST has a Health Sector, in which in-depth concepts about health are developed, valuing the relationship between man and nature, agroecology, defending the Unified Health System (SUS), where the participation of the subjects is respected and income and wealth are distributed equally (MST, 2000). In this way, the struggle for Agrarian Reform is linked to

the struggle for health and the State must guarantee and defend the health of the entire population, implementing public policies of sovereignty, food security, decent living conditions, as preventive measures against diseases (Rückert; Aranha, 2018).

However, it has already been identified that there is a situation of Food and Nutrition Insecurity (FNI) and a high prevalence of cardiovascular risk factors (WHR) among the settlers (Victorio; De Andrade Gonçalves, 2021). FNI can be seen both in situations of insufficient nutrition, such as hunger and malnutrition, and in situations of diseases resulting from inadequate nutrition, such as overweight and specific deficiencies. The consequences of these situations fall on different sectors, but directly on the health sector (Alves; Jaime, 2014; Trivellato *et al*., 2019).

Excess weight is commonly associated with the exacerbated expansion of adipose mass, which is closely related to the development of Chronic Non-Communicable Diseases (NCDs), especially diabetes and cardiovascular changes, such as hypertension (Shing et al., 2025). In addition, maternal and child malnutrition has been implicated in the increased risk of obesity and NCDs in adulthood, showing that critical phases of the life cycle are determinants of health over time, in line with the Developmental *Origins of Health and Disease* (Hsu; Tain, 2019).

Brazil, like other countries, faces an obesity epidemic strongly associated with eating habits and contemporary lifestyle, marked by high consumption of ultra-processed foods and low physical activity (FIOCRUZ, 2024). In this context, the so-called multiple burden of malnutrition is observed, characterized by the coexistence of malnutrition, overweight, and obesity in the same population, a condition that compromises people's health and quality of life, in addition to generating significant social and economic impacts for families, communities, and governments (IDEC, 2019).

The rural population of the Americas has also been affected by high obesity rates (Okobi *et al*., 2021). In Brazil, rural workers in the South region stand out, who have the worst conditions (Martins-Silva et al., 2019). However, detailed studies on the nutrition of peasants, especially those living in camps, where the precariousness of living conditions increases their vulnerability, are still scarce. By 2023, Paraná accounted 330 rural settlements, in which 18,801 families were settled. Of these, it is estimated that about 7,000 families still Reside in camps, about which there is no systematized information about health. In a recent study, we demonstrated that the campers in the western region of Paraná have a high incidence of obesity associated with metabolic disorders and hypertension, the causes of which remain poorly understood, but which require urgent attention (Damas *et al*., 2025). In this context, the objective of the present study was to evaluate the nutritional status and

characterize the dietary profile of adults and elderly people living in MST camps in the western region of Paraná.

2 METHODS

Study Design and Ethical Aspects: The present study is cross-sectional, with non-probabilistic and consecutive sampling and quantitative data analysis. A total of 150 adult and elderly individuals (20 to 83 years old), of both sexes, encamped by the MST, in a municipality in the west of the state of Paraná, southern Brazil, between December 2022 and December 2023, were evaluated. The present study was approved by the Research Ethics Committee (REC) under CAAE No . 63033021.9.0000.0107. All research participants signed the Informed Consent Form (ICF). Exclusion criteria were children under 18 years of age, pregnant women, and those with incomplete anthropometric or dietary data (Figure 1).

Data collection: For data collection, a questionnaire was applied containing socioeconomic data (gender, age), dietary data (Food Frequency Questionnaire-FFQ) adapted from the Nutrition and Food Consumption Survey of the municipality of Campinas (ISACAMP-NUTRI, 2014), in addition to anthropometric assessment, collection of laboratory tests, blood pressure (BP) and heart rate (HR) values. All data were collected on the same day.

Nutritional status and risk of cardiovascular diseases: The anthropometric measurements collected in the study were: weight (kg), height (m), waist circumference (WC-cm) and hip circumference (HC-cm). Weight and height measurements were performed according to the technique of Gordon, Chumlea and Roche (1998) – weight: standing, barefoot or wearing thin socks, light clothing, unadorned in the pockets, positioned in the center of the scale, motionless and arms extended along the body and height: barefoot, unadorned on the head, positioned on the surface of a smooth wall, without baseboards at five points (heels, calf, buttocks, clavicle and occipital region) and positioning the head according to Frankurt's plan – with a Supermed® digital electronic scale (capacity 180 kg) and Avanutri wall stadiometer® (capacity 2.10 meters). For WC and HC measurements, the Callaway technique (1988) was used – WC: smallest curvature located between the ribs and the iliac crest, the reading was taken on expiration, without compressing the skin and HC: in the area of greatest protuberance, without compressing the skin – with a Fiber-Glass® tape measure (capacity 150 cm).

Nutritional status was assessed according to BMI [weight (Kg)/height $(m)^2$] adopting the World Health Organization (WHO, 2000) cut-off points for adults: Low Weight (<18.5 Kg/m2), Normal Weight (18.5 to 24.99 Kg/m2), Overweight (25.0 to 29.99 Kg/m2) and Obesity

(≥30 Kg/m2). For the elderly, the classification of the Pan American Health Organization (PAHO, 2002) was used: Low weight (<23 kg/m2), normal weight (23 to 27.9 kg/m2), overweight (≥28 to <30 kg/m2) and obesity (≥ 30 kg/m2). For statistical analysis purposes, the cutoff points were distributed into 2 groups: Non-Overweight (BMI: <24.99 Kg/m2) and Overweight (BMI: ≥ 25.0 Kg/m2) (Silva *et al.*, 2017).

The risk for CVD was assessed by the variables Waist-to-Hip Ratio - WHR (WC/WC) and WC. WHR was classified as: low risk (<0.85) and high risk (≥0.85) for women; and low risk (<1) and high risk (>1) for men (WHO, 1997). For WC, the following classification was used: <80 cm (no risk) and >80 cm (risk) for women; and < 94cm (no risk); and ≥ 94 cm (at risk) for men (WHO, 2000).

Laboratory data: The laboratory data collected were: capillary fasting glucose (Device: G-TECH®), capillary triglycerides (TG) and capillary total cholesterol (TC) (Device: Acctrend®Plus). Fasting blood glucose was classified as normal (< 100 mg/dL) and elevated (≥ 100 mg/dL) according to the criteria of the Brazilian Diabetes Society Guideline-2023 (Cobas *et al*., 2023). TG and TC were classified as normal and elevated according to the criteria of the Cardiovascular Prevention Guideline of the Brazilian Society of Cardiology-2019 (Précoma *et al*., 2019): TG < 150 mg/dL (normal) and ≥ 150 mg/dL (elevated) and TC < 190 mg/dL (normal) and ≥ 190 mg/dL (elevated).

Blood pressure and heart rate: BP was measured with the Omron Confort® automatic arm BP monitor and was performed with the interviewee seated, feet flat on the floor, left arm relaxed, resting on a table and at heart level, palm facing upwards, bladder empty, without having practiced moderate or heavy exercises, smoked or ingested alcoholic beverage in the 30 minutes prior to the measure (Barroso, 2021). BP and HR were classified according to the criteria of the Brazilian Guidelines on Arterial Hypertension-2020 (Barroso, 2021): adequate systolic BP (SBP) (<129 mmHg) and high SBP (>129 mmHg); and adequate diastolic BP (DBP) (<84 mmHg) and elevated DBP (>84 mmHg); and HR was classified as normal (<80 bpm) and high (>80 bpm).

Dietary data: Regarding the FFQ, the consumption of 7 food groups was evaluated: 1) raw vegetables; 2) cooked vegetables; 3) *fresh* fruits. 4) artificial juice; 5) biscuits; 6) Packaged snacks and 7) Soda. Participants answered the FFQ in relation to weekly consumption (7 times a week; 6 times a week; 5 times a week; 4 times a week; 3 times a week; 2 times a week; 1 time a week or 0/never). For the characterization and statistical analysis purposes, food consumption was categorized as follows: raw vegetables; cooked vegetables and *fresh fruits*: ≥5X in the week (adequate) or <5X in the week (inadequate); and

for artificial juice; biscuits; packaged snacks and soft drinks: <2X in the week (adequate) or >2X in the week (inadequate) (BRASIL, 2024).

Data analysis: The data were organized in *Microsoft* Office Excel(R), version 2014 and presented through descriptive statistics (absolute and relative frequency) and inferential. The normality of the quantitative independent variables was assessed by the Shapiro-Wilk test and the F test was used to assess homoscedasticity. For the analysis of the quantitative variable "age" among the individuals separated according to the BMI classification between "No Overweight" *versus* "Overweight", the non-parametric Mann-Whitney-U test was used and the result was presented as median (1st Quartile and 3rd Quartile). To evaluate the categorical variables (classification of biochemical tests, BP, HR, cardiovascular risk and FFQ) between the "No Overweight" *versus* "Overweight" groups, the chi-square test of independence was performed and adjusted residual analysis was performed (>1.96). Spearman's correlation (non-parametric data) was applied between anthropometric, biochemical, blood pressure, HR and dietary data variables, and was classified as: very weak (0.00-0.19); weak (0.20-0.39); moderate (0.40-0.59); strong (0.60-0.79) and very strong (0.8-1.00) (Evans, 1996). All statistical tests were bilateral. All statistical analyses were performed with the XLSTAT(R) software, version 2014.5.03. The level of statistical significance adopted for all analyses was 5%.

3 FINDINGS

The final sample of the present study consisted of 150 individuals (Figure 1). The median age of the sample was 49 (36-60.5) years, 50.67% of whom were males and 49.33% were females. Regarding nutritional status, there was a higher frequency of obesity (38.67%), followed by normal weight (29.33%), overweight (28.00%) and underweight (4.00%). Regarding the cardiovascular risk, 40.67% had cardiovascular risk due to WHR and 65.34% due to WC alone (Table 1).

When were evaluated the associations of age, anthropometric and cardiovascular risk characteristics between the groups distributed as "No Overweight" and "Overweight" were observed, a higher frequency of "Overweight" was observed in females (37.33%; p=0.0209; adjusted residual=2.30) and "No Overweight" in males (21.33%; p=0.0209; adjusted residue=2.30). Regarding cardiovascular risk, both by WHR and WC, there was a higher frequency of CVD risk in individuals in the "Overweight" group (33.33%; p=0.0010; adjusted residual=3.29 and 57.34%; p<0.0001; adjusted residual=7.52, respectively) and without cardiovascular risk in the "Non-Overweight" group (26%; p=0.0010; adjusted residue=3.29

and 25.33%; p<0.0001; adjusted residue=7.52, respectively). The variable age did not present a statistically significant difference between the two groups (Table 2).

Table 3 shows the associations between biochemical, blood pressure and HR variables between the groups. The frequency of elevated TG and TC was higher in the "Overweight" group (11.76%; p=0.0073; adjusted residue=2.68 and 29.86%; p=0.0207; adjusted residue=2.31, respectively) and the frequency of individuals classified with adequate TG and TC values was more frequent in the "No Overweight" group (38.82%; p=0.0073; adjusted residue=2.68 and 25.69%; p=0.0207; adjusted residue=2.31, respectively). The other variables (fasting glucose, SBP, DBP, and HR) did not show statistically significant differences between the two groups.

Regarding food consumption assessed by the FFQ (Table 4), no statistically significant difference was observed between the groups. However, it is worth noting that overweight individuals had higher frequencies of inadequate consumption (>2X/week) of soft drinks (14.99%) and artificial juices (30.50%), but also had higher adequate consumption (>5X/week) of *fresh fruits* (23.94%) and raw and cooked vegetables (34.97% and 9.09%, respectively) compared to those without overweight.

When the correlation between anthropometric, visceral fat, blood pressure and biochemical data was evaluated (Figure 2), a positive and weak correlation with SBP was observed in relation to BMI (*r=0.3739; p=0.0464; Figure 2a). WC was positively and moderately correlated with SBP (r=0.4324; p=0.0199; Figure 2b) and fasting glucose (r=0.4598; p=0.0128; Figure 2c). WHR was positively and moderately correlated with SBP (r=0.4113; p=0.0274; Figure 2d). When these same variables were correlated with FFQ, a positive and moderate correlation was observed between WHR and the consumption of cookies and/or crackers (r=0.4484; p=0.0154; Figure 2e) and soft drinks (r=0.4875; p=0.0079; Figure 2f). TG showed a negative and moderate correlation with the consumption of raw vegetables (r=-0.4140; p=0.0264; Figure 2g). Fasting glucose was negatively and moderately correlated with artificial juice (r=-0.4359; p=0.0189; Figure 2h) and with packaged snacks (r=-0.5463; p=0.0025; Figure 2i).*

4 DISCUSSION

The concept of health expressed in our Federal Constitution of 1988 (Law No. 8,080) establishes that health has multiple aspects as determining and conditioning factors, among which we highlight food, housing, basic sanitation, the environment, work, income and education. These aspects are intertwined in the concept of Social Determinants of Health, which establishes that the social conditions in which individuals are born, grow, live, work and

age are responsible for the enormous differences in health situation between countries and between population groups within each nation. Therefore, the struggle and the possession of land become fundamental processes in the guarantee of rights that will reverberate directly in the health of their subjects (Silva; Prada, 2020).

In Brazil, high prevalence of infectious diseases (dengue, tuberculosis, leishmaniasis and leptospirosis, etc.) is still observed, reflecting precarious living conditions and limitations in access to health services (Cunha *et al*., 2025; Santos *et al*., 2024). At the same time, there has been a significant increase in overweight and obesity, as well as NCDs, especially diabetes and CVD (Silva *et al*., 2024). Situations that can be aggravated in rural populations, especially those who live in conditions of greater vulnerability, such as those that occur in the MST camps (Damas *et al*., 2025).

In this study, we sought to evaluate the anthropometric aspects of the population of peasants living in three camps in the western region of Paraná, focusing on the parameters of adiposity and metabolic alterations that increase the risk of diabetes and CVD, as well as to characterize the dietary profile of this population. Thus, our findings show that 65% of the subjects living in the camps evaluated in the present study are overweight (overweight + obese), confirming the global and national scenario of rapid advance of obesity (NCD, 2024; Brazil, 2024; Paraná, 2024).

There is a lack of studies with anthropometric, adiposity and metabolic data exclusively in peasants. Thus, we compared our data especially with rural workers or other groups living in rural areas or rural workers. Thus, despite our small sample, it was possible to note that our results corroborate a large national study that evaluated more than 59 thousand men and women, comparing urban and rural areas (Martins-Silva *et al*., 2019).

Interestingly, this same study showed that in rural areas, especially in the southern region of Brazil, there was a high prevalence of visceral obesity (Martins-Silva *et al*., 2019). Similarly, the data from the present study also show that among the peasants living in the MST camps in the western region of the state of Paraná there is a high frequency of high WC values, indicating visceral obesity, and higher cardiovascular risk. It is well established in large international studies (Jackson *et al*., 2020; Shi *et al*., 2023) and national (Santos *et al*., 2025; French; Ceschini; Ramallo, 2014) that there is a close relationship between excess visceral adiposity and the development of glycemic and lipid alterations, especially because the excessive expansion of visceral BAD generates a chronic pro-inflammatory condition that leads to insulin resistance (Garg *et al*., 2023).

When we separated the non-overweight and overweight peasants, we confirmed the higher rate of visceral obesity and higher cardiovascular risk in the overweight group. These

subjects also had increased blood values of TG and TC compared to those without excess weight.

Our findings confirm data from a study carried out in the state of Espírito Santo with more than 700 farmers of both sexes, in which dyslipidemia was the second most frequent risk factor in rural workers (Luz *et al*., 2020). However, unlike this study, we did not observe differences in blood pressure between the groups. We found no differences in blood glucose changes in the non-overweight and overweight subjects. Similarly, in the aforementioned study, glycemic alterations had a lower contribution as a risk factor for rural workers in Espírito Santo.

Evidence suggests that the prevalence of cardiovascular diseases and their risk factors is higher in the rural population than in the urban population (Luz *et al*., 2020; Liu *et al.,* 2025). According to different studies, modernization processes and consequent changes in lifestyle and diet have also favored the accumulation of BAD in the visceral region and the disruption of glycemic and lipid homeostasis in rural workers, contributing to a higher risk of CVD (Martins-Silva *et al.,* 2019; Mendonça Filho *et al*., 2024).

Over the last few decades, the Brazilian population has gone through a period of nutritional transition, which has led to a higher caloric intake, with an increase in the consumption of fats, sugar, and refined cereals, thus modifying the morbidity and mortality profile of Brazilians (Popkin; Adair; Ng, 2012). However, urbanization and modernization trends have different effects among the populations of each country, which makes it impossible to generalize these effects on health at the national or global level, so it is important to define these aspects within the different subgroups that make up a population.

The increase in the consumption of animal-based, processed and high-calorie-dense foods by rural populations, aggravated by the reduction in physical activity rates, are important factors in the global obesity epidemic and related NCDs (Martins; Silva; Hallal, 2018; Da Silva Oliveira *et al*., 2024). In Brazil, these items are progressively gaining more space: it is possible to observe, based on the data brought by Louzada *et al*. (2023), that between 2002-2003 and 2017-2018, natural or minimally processed foods experienced a decline from 51% to 48.7% in the total caloric participation in the household diet, while ultra-processed foods participated from 14.3% to 19.4% in the same period, with a very significant proportional increase in rural (7.4% to 11.5%) and urban (15.6% to 20.6%) areas, in addition to a higher prevalence in the states of the South and Southeast compared to the North and Northeast.

Our study sought to make a general analysis of the diet of peasants, through the application of FFQ. With this tool, we showed that overweight subjects consumed soft drinks

and artificial juices more frequently, but also had higher consumption of raw and cooked fruits and vegetables compared to those who were not overweight.

When evaluating the correlation between anthropometric, blood pressure, biochemical and food frequency data, we observed that increased weight and visceral fat is associated with increased BP. In addition, visceral adiposity showed a positive correlation with both fasting glucose and the consumption of cookies/crackers and soft drinks. On the other hand, TG concentrations showed a negative association with the consumption of raw vegetables.

Therefore, in an initial analysis, the results suggest that diet — especially higher consumption of caloric foods and low fiber consumption — may be influencing the increase in adiposity, as well as glycemic and lipid control in the present sample of peasants analyzed.

A systematic review showed that the degree of food insecurity is higher among MST campers compared to settlers (Trivellato *et al*., 2019). Similar to our study, the studies analyzed indicate that the rural environment is in a situation of vulnerability and that, in addition to food and nutritional issues, other socioeconomic determinants may be involved. Just as we did not observe differences between the groups, factors other than eating habits may be contributing to this process in our sample.

The lower income of rural populations, when compared to urban populations, may hinder access to healthier food, especially fruits, since these products would only be available to these communities during harvest periods, in addition to the need to travel to make purchases, which may limit continuous access to these products (Lamano-Ferreira; Aquinas; Molina, 2016). In addition, specifically in the MST, the formation of encampments is a tactic employed by thousands of families during land occupations, however, in these initial spaces there is a lot of precariousness and vulnerability, which increases the risk of food insecurity. Definitive land tenure has been attributed to the possible sustenance of the family and the production of food for self-consumption, contributing to nutritional food security, and this condition is worse in the camps (Carneiro *et al*., 2008).

A study of campers and settlers in Paraná showed that there is a significant presence of children born with low birth weight (<2,500g), a factor that contributed to the high rates of malnutrition found (Lang; Almeida; Taddei, 2011). Malnutrition and low birth weight are well-recognized factors linked to the onset of obesity in adulthood, a hypothesis defended by the new DoHaD concept (Lacagnina, 2020).

In addition, pesticides are well-known endocrine disruptors, which can favor obesity and metabolic alterations (Vieira-Filho, 2024). The camps studied in Paraná are surrounded by large agricultural areas where there is indiscriminate use of pesticides. It is important to highlight that the municipality of Cascavel-PR, the region where the three camp territories are

located, is the Regional Health Department with the most municipalities with high rates of pesticide commercialization and health outcomes (Oliboni; Triches; Oliveira, 2023). In addition, on average, 60% of the food samples analyzed in Paraná between 2001-2019 contained some level of pesticide contamination. Even in this study, the municipality of Cascavel had the worst rates of food contamination by pesticides (Gaboardi; Candiotto, 2023).

Other elements, such as the difficulty of access to health services, the low level of education and the low socioeconomic level of rural workers, make this population even more vulnerable to the risk of obesity and metabolic diseases (Cattafesta *et al*., 2025).

In the present study, we did not evaluate the degree of physical activity of the peasants. However, studies have shown that the characteristics of the built environment in rural areas with the absence of squares, hiking trails and gyms can make it difficult for rural workers to perform physical exercise (Bicalho *et al*., 2010).

The present study has some limitations that should be considered in order to extrapolate the data presented here, among which we highlight the restricted sample size, which impacts the statistical analysis of some data, for example, making it impossible to perform regression analyses and calculations of risk chances that would make the analyses more robust. However, in general, our data corroborate studies with larger populations in rural areas. Another factor that can interfere with our analyses is the type of FFQ that did not allow us to explore other information such as calories, food composition and other nutrients that could contribute to explain the adiposity data.

5 CONCLUSION

Our data indicate that campesinos living in camps in western Paraná have a high frequency of overweight, higher visceral adiposity and alterations in TG concentrations, increasing cardiovascular risk. Eating habits cannot be considered the only determinants for this situation, indicating that this population may be exposed to a set of socio-environmental conditions that may be contributing to health problems. Currently, there are about 7,000 families camped on 114,000 hectares of unproductive land in Paraná, who have been fighting for agrarian reform for more than 20 years. Therefore, it is urgent to defend the principle of equity that should guide health policies, recognizing the unique demands and needs of certain population groups, in order to reduce their vulnerabilities and minimize the impacts of the social determination of health. Land ownership, with the transition from the camp to the settlement, is fundamental in this process, since it improves the conditions of access to food, income and quality of life. Thus, it is necessary to advance in the struggle for Popular Agrarian

Reform, which is essential to expand food production and meet the country's internal demand.

REFERENCES

Alves, K. P. de S., & Jaime, P. C. (2014). A Política Nacional de Alimentação e Nutrição e seu diálogo com a Política Nacional de Segurança Alimentar e Nutricional. Ciência & Saúde Coletiva, 19, 4331–4340.

Barroso, W. K. S., et al. (2021). Diretrizes Brasileiras de Hipertensão Arterial – 2020. Arquivos Brasileiros de Cardiologia, 116(3), 516–658.

Baldi, F., & Orso, P. J. (2013). Movimento dos Trabalhadores Rurais Sem Terra–MST–Educaçao em Movimento. Revista HISTEDBR On-Line, 13(50), 275–285.

Belo, D. C., & Pedlowski, M. A. (2014). Acampamentos do MST e sua importância na formação da identidade do sem terra (The MST´s encampments and their importance for the construction of the “Sem Terra” identity). Revista Nera, (24), 71–85.

Bicalho, P. G., et al. (2010). Atividade física e fatores associados em adultos de área rural em Minas Gerais, Brasil. Revista de Saúde Pública, 44, 884–893.

Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Departamento de Análise Epidemiológica e Vigilância de Doenças Não Transmissíveis. (2024). Vigitel Brasil 2006-2023: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica do estado nutricional e consumo alimentar nas capitais dos 26 estados brasileiros e no Distrito Federal entre 2006 e 2023: estado nutricional e consumo alimentar. Ministério da Saúde. https://bvsms.saude.gov.br/bvs/publicacoes/vigitel_2006_2023_estado_nutricional.pdf

Callaway, C. W. (1988). Circumferences. In T. G. Lohman, A. F. Roche, & R. Martorell (Eds.), Anthropometric standarization reference manual. Human Kinetics.

Carneiro, F. F., et al. (2008). Saúde de famílias do Movimento dos Trabalhadores Sem Terra e de bóias-frias, Brasil, 2005. Revista de Saúde Pública, 42, 757–763.

Cattafesta, M., et al. (2022). Prevalence and determinants of obesity and abdominal obesity among rural workers in Southeastern Brazil. PLoS ONE, 17(7), Article e0270233.

Cobas, R., et al. (n.d.). Diagnóstico do diabetes e rastreamento do diabetes tipo 2. https://diretriz.diabetes.org.br/diagnostico-e-rastreamento-do-diabetes-tipo-2/

Cunha, A. D. da, et al. (2025). Dengue in Brazil: an ecological study of burden, hospitalizations, and mortality trends (2019–2024). Infectious Diseases of Poverty, 14(1), 1–13.

Da Cruz Chiabotto, C., & Montagner, R. (2021). Movimento dos Trabalhadores Rurais Sem Terra (MST): narrativas, memórias e histórias na luta pela terra. Revista NERA, 24(57).

Damas, T. M. T., et al. (2025). Alta frequência de obesidade, síndrome metabólica e risco cardiovascular em três acampamentos do Movimento Sem Terra na região Oeste do Paraná. NewScience ARACÊ, 7(8).

Da Silva Oliveira, E. K., et al. (2024). Consumption of ultra-processed foods in the Brazilian Amazon during COVID-19. Nutrients, 16(13), Article 2117.

Evans, J. D. (1996). Straightforward statistics for the behavioral sciences. Thomson Brooks/Cole Publishing Co.

Fietz, V. R., Salay, E., & Watanabe, E. A. M. T. (2010). Condições socioeconômicas, demográficas e estado nutricional de adultos e idosos moradores em assentamento rural em Mato Grosso do Sul, MS. Segurança Alimentar e Nutricional, 17(1), 73–82.

Figueiredo, V. M., et al. (1987). Questão agrária e saúde no Brasil contemporâneo. Revista Brasileira de Saúde Ocupacional, 15(59), 7–17.

Fiocruz Brasília. (2024, June 26). Metade dos adultos brasileiros com obesidade em 20 anos. https://www.fiocruzbrasilia.fiocruz.br/quase-metade-dos-adultos-brasileiros-viverao-com-obesidade-em-20-anos/

Freitas, M. C., Ceschini, F. L., & Ramallo, B. T. (2014). Resistência à insulina associado à obesidade: efeitos anti-inflamatórios do exercício físico. Revista Brasileira de Ciência e Movimento, 22(3), 139–147.

Gaboardi, S. C., & Candiotto, L. Z. P. (2023). Resíduos de agrotóxicos em alimentos no Paraná: um estudo acerca do monitoramento do PARA/PR (2001-2019). Terra Plural, 17, 1–18.

Garg, S. S., et al. (2023). Association between obesity, inflammation and insulin resistance: Insights into signaling pathways and therapeutic interventions. Diabetes Research and Clinical Practice, 200, Article 110691.

Gordon, C. C., Chumlea, W. C., & Roche, A. (1998). Stature, recumbent length, and weight. Human Kinetics.

Hsu, C., & Tain, Y. (2019). The good, the bad, and the ugly of pregnancy nutrients and developmental programming of adult disease. Nutrients, 11(4), Article 894.

Instituto Brasileiro de Defesa do Consumidor – IDEC. (2019). A sindemia global da obesidade, desnutrição e mudanças climáticas: sumário executivo para decisões políticas sobre alimentação. https://alimentandopoliticas.org.br/wp-content/uploads/2019/08/idec-the_lancet-sumario_executivo-baixa.pdf

Inquérito de Nutrição e Consumo Alimentar do Município de Campinas (ISACAMP-Nutri, 2014). Universidade Estadual de Campinas. https://pt.scribd.com/document/559930656/questionario-QFA-UNICAMP

Jackson, S. H., et al. (2020). Longitudinal associations between obesity, inflammation, and the incidence of type 2 diabetes mellitus among US Black and White adults in the CARDIA Study. Journal of Diabetes Research, 2020(1), Article 2767393.

Lacagnina, S. (2020). The developmental origins of health and disease (DOHaD). American Journal of Lifestyle Medicine, 14(1), 47–50.

Lamano-Ferreira, A. P., Aquino, S., & Molina, S. M. (2016). Comparação de dietas rurais e urbanas: Escolha de alimentos pelas mães de crianças pré-escolares na cidade de Piracicaba, São Paulo, Brasil. Revista Espacios, 37(35), 16373501–16373530.

Lang, R. M. F., Almeida, C. C. B., & Taddei, J. A. de A. C. (2011). Segurança alimentar e nutricional de crianças menores de dois anos de famílias de trabalhadores rurais Sem Terra. Ciência & Saúde Coletiva, 16, 3111–3118.

Liu, M., et al. (2025). Cardiovascular health among rural and urban US adults—healthcare, lifestyle, and social factors. JAMA Cardiology, 10(6), 585–594.

Louzada, M. L. da C., et al. (2023). Consumo de alimentos ultraprocessados no Brasil: distribuição e evolução temporal 2008–2018. Revista de Saúde Pública, 57, Article 12.

Luz, T. C. da, et al. (2020). Fatores de risco cardiovascular em uma população rural brasileira. Ciência & Saúde Coletiva, 25, 3921–3932.

Martins, R. C., Silva, I. C. M. da, & Hallal, P. C. (2018). Physical activity in the rural population of Pelotas, Brazil: prevalence and associated factors. Revista de Saúde Pública, 52, Article 9s.

Martins-Silva, T., et al. (2019). Prevalências de obesidade em zonas rurais e urbanas no Brasil: Pesquisa Nacional de Saúde, 2013. Revista Brasileira de Epidemiologia, 22, Article e190049.

Mendonça Filho, V. C. M., et al. (2024). Fatores de risco cardiovascular em populações rurais no Brasil: uma revisão integrativa de literatura. Brazilian Journal of Health Review, 7(9), e74516.

Movimento dos Trabalhadores Rurais Sem Terra, & Setor de Saúde. (2000). Caderno de saúde nº 05: Construindo o conceito de saúde do MST. Movimento dos Trabalhadores Rurais Sem Terra - MST.

Movimento dos Trabalhadores Rurais Sem Terra (MST). (n.d.). Quem somos. https://mst.org.br/quem-somos/

NCD Risk Factor Collaboration. (2024). Worldwide trends in underweight and obesity from 1990 to 2022: A pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. The Lancet, 403(10431), 1027–1050.

Okobi, O. E., et al. (2021). The burden of obesity in the rural adult population of America. Cureus, 13(6), Article e15770.

Oliboni, K. C., Triches, R. M., & Oliveira, A. M. B. de. (2023). Comercialização de agrotóxicos e desfechos de saúde no Estado do Paraná: uma associação não linear. Physis: Revista de Saúde Coletiva, 33, Article e33014.

Organización Panamericana de la Salud. División de Promoción y Protección de la Salud (HPP). (2002). Encuesta multicentrica salud beinestar y envejecimiento (SABE) em América Latina el Caribe: Informe preliminar. In XXXVI Reunión del Comité asesor de investigaciones em salud. OPAS. http://www.opas.org/program/sabe.htm

Paraná. Secretaria da Saúde. (2024). Situação alimentar e nutricional do Paraná 2012-2022. https://www.aen.pr.gov.br/sites/default/arquivos_restritos/files/documento/2024-04/material_nutricao.pdf

Popkin, B. M., Adair, L. S., & Ng, S. W. (2012). Global nutrition transition and the pandemic of obesity in developing countries. Nutrition Reviews, 70(1), 3–21.

Précoma, D. B., et al. (2019). Diretriz de prevenção cardiovascular da Sociedade Brasileira de Cardiologia, 2019. http://publicacoes.cardiol.br/portal/abc/portugues/aop/2019/aop-diretriz-prevencao-cardiovascular-portugues.pdf

Rückert, B., & Aranha, A. V. S. (2018). Lutar por saúde é lutar por reforma agrária: estudo sobre práticas de saúde no Movimento dos Trabalhadores Rurais Sem Terra. Saúde e Sociedade, 27(1), 116–127.

Santos, A. F. dos, et al. (2024). Retrospective epidemiologic and genomic surveillance of arboviruses in 2023 in Brazil reveals high co-circulation of chikungunya and dengue viruses. BMC Medicine, 22, Article 324.

Santos, M. S., et al. (2025). Compreendendo a ligação entre a gordura visceral e o risco cardiovascular. Journal of Clinical Endocrinology & Metabolism, 109(5), 1234–1245. https://pmc.ncbi.nlm.nih.gov/articles/PMC11216327/

Shi, J., et al. (2023). Association of physical activity and dietary inflammatory index with overweight/obesity in US adults: NHANES 2007–2018. Environmental Health and Preventive Medicine, 28, 40.

Shing, V., et al. (2025). Obesity as a chronic disease: A narrative review of evolving definitions, management strategies, and cardiometabolic prioritization. Advances in Therapy, 1–24.

Silva, R. C. B., et al. (2017). Anthropometric measures change and incidence of high blood pressure levels among adults: A population-based prospective study in Southern Brazil. Journal of Hypertension, 35(1), 39–46.

Silva, C. G. da, & Prada, C. A. (2020). Saúde no campo: caminhos percorridos pelo Movimento dos Trabalhadores Rurais Sem Terra (MST). Saúde em Debate, 43, 50–65.

Silva, L. M., et al. (2024). Time trends in hypertension and diabetes prevalence by body mass index categories in Brazilian adults from 2006 to 2023. Diabetes, Obesity and Metabolism, 26(5), 1234–1245.

Trivellato, P. T., et al. (2019). Insegurança alimentar e nutricional em famílias do meio rural brasileiro: revisão sistemática. Ciência & Saúde Coletiva, 24, 865–874.

Vieira-Filho, J. P. B. (2024, January). Controle do glifosato, pesticidas, disruptores hormonais na epidemia de obesidade, diabetes mellitus tipo 2 e comorbidades, síndrome metabólica, entre os xavantes de Sangradouro-Volta Grande e São Marcos. Associação Brasileira de Nutrologia. https://abran.org.br/publicacoes/artigo/controle-do-glifosato-pesticidas-disruptores-hormonais-na-epidemia-de-obesidade-diabetes-mellitus-tipo-2-e-comorbidades-sindrome-metabolica-entre-os-xavante-de-sangradouro-volta-grande-e-sao-marcos

Victorio, V. C. M., & De Andrade Gonçalves, E. C. B. (2021). Aspectos de saúde relacionados à idade, escolaridade e produções agrícolas de agricultores no Assentamento Rural Rio Madeira-RO. Agricultura Familiar: Pesquisa, Formação e Desenvolvimento, 14(2), 183–202.

Veiga, G. V. da, & Burlandy, L. (2001). Indicadores sócio-econômicos, demográficos e estado nutricional de crianças e adolescentes residentes em um assentamento rural do Rio de Janeiro. Cadernos de Saúde Pública, 17, 1465–1472.

World Health Organization. (1997). Obesity: Preventing and managing the global epidemic. Report of a WHO consultation on obesity. World Health Organization.

World Health Organization. (2000). Obesity: Preventing and managing the global epidemic. Report of a WHO consultation (Technical Report Series 894). World Health Organization.

APPENDIX

Figure 1

Flowchart of participant selection in the study

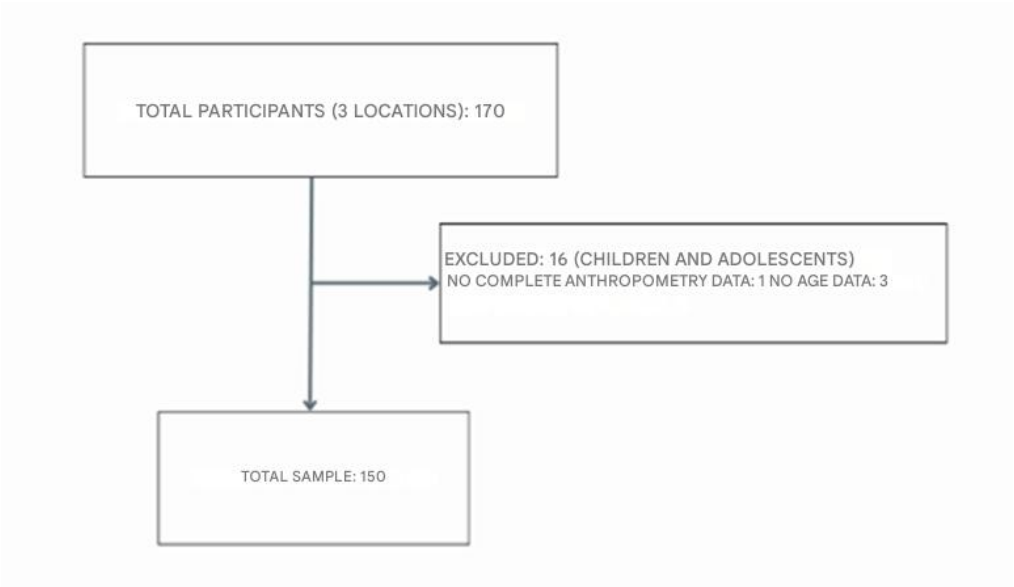

Table 1

Characterization of the sample according to age, gender, anthropometric characteristics, and cardiovascular risk of the participants

Variables	**Total (n=150; 100%)**
Age	49 (36-60,5)
Gender	
Female	74 (49,33%)
Male	76 (50,67%)
BMI	
Low Weight	6 (4,00%)
Eutrophy	44 (29,33%)
Overweight	42 (28,00%)
Obesity	58 (38,67%)
RCQ Rating	
No CVD risk	89 (59,33%)
At CVD risk	61 (40,67%)
CC Rating	
No CVD risk	52 (34,66%)

At CVD risk	98 (65,34%)

Legend: BMI (Body Mass Index); WHR (Waist-Hip Ratio); CC (Waist Circumference); CVD (Cardiovascular Diseases. *Age presented as median (1st Quartile and 3rd Quartile).

Table 2

Association between age, sex, anthropometric characteristics and cardiovascular risk between the non-overweight and overweight groups

Variables	No excess weight (< 24,99 kg/m²) (n=50; 33,33%)	Overweight** (≥25 kg/m²) (n=100; 66,67%)	p-value
Age	55 (30,25-69)	48,5 (38,75-57)	0,3781¨
Gender			**0,0209†**
Female	18 (12,00%)	56 (37,33%)	
	-2,30	2,30#	
Male	32 (21,33%)	44 (29,34%)	
	2,30#	-2,30	
RCQ Rating			**0,0010†**
No CVD risk	39 (26,00%)	50 (33,33%)	
	3,29#	-3,29	
At CVD risk	11 (7,33%)	50 (33,33%)	
	-3,29	3,29#	
CC Rating			**<0,0001†**
No CVD risk	38 (25,33%)	14 (9,33%)	
	7,52#	-7,52	
At CVD risk	12 (8,00%)	86 (57,34%)	
	-7,52	7,52#	

Legend: BMI (Body Mass Index); WHR (Waist-Hip Ratio); CC (Waist Circumference); CVD (Cardiovascular Diseases). †Chi-square test for independence. #resíduos adjusted (p>1,96). ¨Mann-Whitney-U test for non-parametric variables, data presented as median (1st Quartile and 3rd Quartile). **Sum of overweight and obese individuals. *p-value <0,05 for statistical significance (in bold).

Table 3

Association of biochemical variables, blood pressure, and heart rate between groups without excess weight and those with excess weight

Variables	No excess weight (< 24,99 kg/m²)	Overweight** (≥25 kg/m²)	p-value
Fasting blood glucose			0,6030†
(mg/dL) n= 147	41 (27,89%)	76 (51,70%)	
Proper	0,52	-0,52	
	9 (6,12%)	21 (14,29%)	
High	-0,52	0,52	
Triglycerides			**0,0073†**
(mg/dL) n=85			
Adequate	33 (38,82%)	42 (49,41%)	
	2,68#	-2,68	
High	0 (0,00%)	10 (11,76%)	
	-2,68	2,68#	
Total Cholesterol			**0,0207†**
(mg/dL) n=144			
Adequate	37 (25,69%)	51 (35,42%)	
	2,31#	-2,31	
High	13 (9,03%)	43 (29,86%)	
	-2,31	2,31#	
SBP (mmHg) n=149			0,5582†
Proper	27 (18,12%)	50 (33,56%)	
	0,58	-0,58	
High	22 (14,77%)	50 (33,56%)	
	-0,58	0,58	
DBP (mmHg) n=149			0,1239†
Proper	32 (21,48%)	52 (34,90%)	
	1,53	-1,53	
High	17 (11,41%)	48 (32,21%)	
	-1,53	1,53	
Heart Rate			0,8119†
(bpm) n=110			
Proper	24 (21,82%)	51 (46,36%)	
	-0,23	0,23	

High	12 (10,91%)	23 (20,91%)
	0,23	-0,23

Legend: SBP (Systolic Blood Pressure); DBP (Diastolic Blood Pressure). †Chi-square test for independence. #resíduos adjusted (p>1,96). **Sum of overweight and obese individuals. *p-value <0,05 for statistical significance (in bold).

Table 4

Characterization and association of food consumption through FFQ between the groups without overweight and overweight

Variables	No excess weight (< 24,99 kg/m²)	Overweight** (≥25 kg/m²)	p-value
Vegetables (raw) (n= 143)			0,4231†
< 5 X/week	19 (13,29%)	47 (32,87%)	
	-0,80	0,80	
>5 X/week	27 (18,88%)	50 (34,97%)	
	0,80	-0,80	
Vegetables (cooked) (n= 143)			0,9529†
< 5 X/week	40 (27,97%)	84 (58,74%)	
	0,05	-0,05	
>5 X/week	6 (4,20%)	13 (9,09%)	
	-0,05	0,05	
Fresh fruits (n=142)			0,1680†
<5 X/week	35 (24,65%)	62 (43,66%)	
	1,37	-1,37	
>5 X/week	11 (7,75%)	34 (23,94%)	
	-1,37	1,37	
Biscuit/biscuit (n=141)			0,3433†
≤ 2 X/week	38 (26,95%)	84 (59,57%)	
	-0,94	0,94	
>2 X/week	8 (5,67%)	11 (7,80%)	
	0,94	-0,94	
Packet snack (n=143)			0,8345†
≤ 2 X/week	44 (30,77%)	92 (64,34%)	
	0,20	-0,20	
>2 X/week	2 (1,40%)	5 (3,50%)	
	-0,20	0,20	
Soft drink (n=143)			0,7749†
≤ 2 X/week	37 (25,87%)	76 (53,15%)	
	0,28	-0,28	
>2 X/week	9 (6,29%)	21 (14,69%)	
	-0,28	0,28	
Artificial Juice (n= 141)			0,1974†
≤ 2 X/week	30 (21,28%)	53 (37,59%)	
	1,28	-1,28	
>2 X/week	15 (10,64%)	43 (30,50%)	
	-1,28	1,28	

Legend: FFQ (Food Frequency Questionnaire). †Chi-square test for independence. #resíduos adjusted (p>1,96). **Sum of overweight and obese individuals. *p-value <0,05 for statistical significance.

Figure 2

Spearman correlation between anthropometric, biochemical, blood pressure, and dietary data of study participants that showed a statistically significant difference (p<0.05). Legend: BMI (Body Mass Index); WC (Waist Circumference); WHR (Waist-to-Hip Ratio); TG (Triglycerides); SBP (Systolic Blood Pressure). Images generated by XLSTAT® software version 2014.5.03