

NUTRITIONAL STATUS, DIETARY INTAKE, AND CLINICAL-FUNCTIONAL VULNERABILITY AMONG OLDER ADULTS RECEIVING CARE AT A FAMILY HEALTH STRATEGY IN SANTA MARIA/RS

PERFIL NUTRICIONAL, CONSUMO ALIMENTAR E VULNERABILIDADE CLÍNICO-FUNCIONAL DE PESSOAS IDOSAS ACOMPANHADAS EM UMA ESTRATÉGIA SAÚDE DA FAMÍLIA EM SANTA MARIA/RS

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ABSTRACT

Introduction: Population aging, together with epidemiological and nutritional transitions, has increased the need for nutritional and functional assessment of older adults in Primary Health Care (PHC). **Objective:** To assess the nutritional status, dietary intake, and clinical-functional vulnerability of older adults attending a Family Health Strategy (FHS) unit in Santa Maria, Rio Grande do Sul, Brazil. **Methods:** This cross-sectional, descriptive, analytical study with a quantitative approach was conducted between August and October 2025 with 30 older adults (aged ≥ 60 years) of both sexes, selected by convenience sampling. The food consumption markers of the Brazilian Food and Nutrition Surveillance System (SISVAN) were applied, together with anthropometric assessment, including weight, height, body mass index (BMI), and calf circumference (CC), and the Clinical-Functional Vulnerability Index-20 (CFVI-20). Data were analyzed in SPSS using descriptive statistics and tests of association, adopting a significance level of 5% ($p \leq 0.05$). **Results:** Women predominated (83,3%; $n = 25$), and the mean age was 70.1 ± 6.5 years. A high frequency of overweight was observed (63,3%; $n = 19$), while 36,7% ($n = 11$) had reduced CC. Regarding clinical-functional vulnerability, 83,3% of participants had some degree of vulnerability, with 40,0% ($n = 12$) classified as moderate risk and 43,3% ($n = 13$) as high risk. Overweight predominated among those classified as moderate risk (83,4%) and high risk (61,5%). A statistically significant association was observed between regular consumption of vegetables and adequate CC ($p = 0.029$), with 73,9% of participants who reported this consumption having adequate CC. **Conclusion:** The study population showed a high frequency of overweight, along with clinical-functional vulnerability and reduced CC. Regular vegetable consumption was associated with adequate CC. These findings highlight the applicability of anthropometric measures and clinical-functional screening instruments in PHC to identify nutritional and functional changes in older adults.

Keywords: Diet; Nutritional Status; Frailty; Aged; Public Health.

RESUMO

Introdução: O envelhecimento populacional e as transições epidemiológica e nutricional ampliam a necessidade de estratégias de avaliação nutricional e funcional das pessoas idosas na Atenção Primária à Saúde

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(APS). **Objetivo:** Avaliar o perfil nutricional, o consumo alimentar e a vulnerabilidade clínico-funcional de pessoas idosas acompanhadas em uma Estratégia Saúde da Família (ESF) de Santa Maria/RS. **Métodos:** Estudo transversal, descritivo e analítico, de abordagem quantitativa, realizado entre agosto e outubro de 2025, com 30 pessoas idosas (≥ 60 anos), de ambos os sexos, selecionadas por conveniência. Foram aplicados os marcadores de consumo alimentar do Sistema de Vigilância Alimentar e Nutricional (SISVAN), além de avaliação antropométrica, incluindo peso, altura, índice de massa corporal (IMC) e circunferência da panturrilha (CP), e do Índice de Vulnerabilidade Clínico-Funcional-20 (IVCF-20). Os dados foram analisados no software SPSS por meio de estatística descritiva e testes de associação, adotando-se nível de significância de 5% ($p \leq 0,05$). **Resultados:** Houve predomínio do sexo feminino (83,3%; $n=25$) e média de idade de $70,1 \pm 6,5$ anos. Observou-se elevada frequência de excesso de peso (63,3%; $n=19$), enquanto 36,7% ($n=11$) apresentaram CP reduzida. Quanto à vulnerabilidade clínico-funcional, 83,3% dos participantes apresentaram algum grau de vulnerabilidade, sendo 40,0% ($n=12$) classificados como de moderado risco e 43,3% ($n=13$) como de alto risco. O excesso de peso predominou entre aqueles classificados como de moderado (83,4%) e alto risco (61,5%). Observou-se associação estatisticamente significativa entre o consumo regular de verduras e legumes e a adequação da CP ($p=0,029$), com 73,9% dos participantes que relataram esse consumo apresentando CP adequada. **Conclusão:** A população estudada apresentou elevada frequência de excesso de peso, concomitantemente à presença de vulnerabilidade clínico-funcional e de CP reduzida. O consumo regular de verduras e legumes esteve associado à adequação da CP. Os achados destacam a aplicabilidade de medidas antropométricas e instrumentos de triagem clínico-funcional na APS para a identificação de alterações nutricionais e funcionais em pessoas idosas.

Palavras-chave: Alimentação; Estado Nutricional; Fragilidade; Pessoa Idosa; Saúde Pública.

INTRODUCTION

Population aging in Brazil is occurring alongside major demographic and epidemiological changes, including increased life expectancy and a growing proportion of older adults. This process is accompanied by a rising burden of noncommunicable diseases (NCDs), such as hypertension and dyslipidemia, which are highly prevalent in this population (Brazil, 2013; Maia *et al.*, 2020; Pereira; Sampaio, 2019; Reis *et al.*, 2016). The nutritional transition, characterized by shifts in dietary and physical activity patterns, has contributed to higher rates of overweight, obesity, and metabolic disorders (Gomes *et al.*, 2020; Goulart, 2011). Aging may bring changes in muscle mass and function, including sarcopenia and, when it coexists with excess adiposity, sarcopenic obesity (Cruz-Jentoft *et al.*, 2019; Donini *et al.*, 2022).

Aging can affect several dimensions of health and functional capacity beyond nutritional conditions and NCDs. Clinical-functional vulnerability encompasses cognition, mood, mobility, and comorbidities, among other domains. The Clinical-Functional Vulnerability Index-20 (CFVI-20) is a multidimensional instrument used to screen older adults and to identify different levels of clinical-functional vulnerability in Primary Health Care (PHC) (Maia *et al.*, 2020).

Nutritional surveillance enables the monitoring of nutritional status and dietary intake at the population level. In Brazil, the Food and Nutrition Surveillance System (SISVAN) guides the

monitoring of anthropometric measurements and food consumption markers across the life course (Brazil, 2011, 2015). Analyzing these aspects together with clinical-functional vulnerability provides a fuller picture of health conditions in PHC. Although recent studies have investigated nutritional aspects, sarcopenia, and clinical-functional vulnerability among older adults in this setting, few have addressed these dimensions jointly (Rocha *et al.*, 2025; Valentim *et al.*, 2025). Such an integrated approach may improve understanding of the health conditions and care needs associated with aging within the Family Health Strategy (FHS).

This study aimed to assess the nutritional status, dietary intake, and clinical-functional vulnerability of older adults attending an FHS unit in Santa Maria, Rio Grande do Sul, Brazil.

METHODS

STUDY DESIGN AND SETTING

This quantitative, cross-sectional study, with descriptive and analytical components, was conducted at an FHS unit linked to the Municipal Health Department of Santa Maria, Rio Grande do Sul, Brazil. The study was approved by the Permanent Health Education Center of the Municipal Health Department and by the Research Ethics Committee of Universidade Franciscana (approval No. 7.734.487), and it complied with Resolution No. 466/2012 of the Brazilian National Health Council.

PARTICIPANTS

Individuals of both sexes aged ≥ 60 years who received care at the FHS unit were eligible. Those with mobility limitations that prevented anthropometric measurements or with cognitive impairment documented in medical records were excluded. Participants were selected by convenience sampling and included all eligible individuals who could be assessed during the data collection period.

VARIABLES AND DATA COLLECTION

Data were collected between August and October 2025 by the FHS nutrition team during clinic visits and home visits, using standardized instruments. Demographic (age and sex), anthropometric, dietary, and functional data were obtained with the following instruments:

- SISVAN food consumption markers: an instrument used to identify healthy and unhealthy eating behaviors based on the consumption of foods and beverages;
- Anthropometric measurements: weight, height, and calf circumference (CC) were measured. Weight and height were used to calculate body mass index (BMI), and CC was interpreted using the cutoff points proposed by Barbosa-Silva *et al.* (2016);
- CFVI-20: a multidimensional instrument comprising 20 items across eight domains: age, self-rated health, activities of daily living, cognition, mood, mobility, communication, and comorbidities.

BMI was classified according to Lipschitz (1994) as underweight ($<22 \text{ kg/m}^2$), normal weight ($22 \text{ to } 27 \text{ kg/m}^2$), or overweight ($>27 \text{ kg/m}^2$). CC values $\leq 34 \text{ cm}$ for men and $\leq 33 \text{ cm}$ for women were considered reduced, indicating lean mass depletion (Barbosa-Silva *et al.*, 2016). CFVI-20 scores were classified as low risk or robust (0 to 6 points), moderate risk (7 to 14 points), or high risk (≥ 15 points).

Data were recorded in a spreadsheet and later entered into the Municipal Health Department's information system, which supplies data to SISVAN.

STATISTICAL ANALYSIS

Descriptive analysis used absolute and relative frequencies for categorical variables and means and standard deviations for quantitative variables. Associations between categorical variables were tested with Pearson's chi-square test or Fisher's exact test, as appropriate. Statistical significance was set at $p < 0.05$. Analyses were performed in IBM SPSS Statistics, version 25.0 (IBM Corp., Armonk, NY, USA).

RESULTS

The sample comprised 30 older adults attending an FHS unit in Santa Maria, Rio Grande do Sul, with a predominance of women and a mean age of 70.1 ± 6.5 years (Table 1). The nutritional profile revealed a prevalence of overweight, and some participants had reduced CC, indicating possible lean mass depletion.

Table 1 - Demographic and clinical characteristics.

Variável	Total (n=30)
Sex, n (%)	
Female	25 (83,3)
Male	5 (16,7)
Age, years (mean $\pm$ SD)	70,1 $\pm$ 6,5
Weight, kg (mean $\pm$ SD)	73,7 $\pm$ 16,2
Height, m (mean $\pm$ SD)	1,59 $\pm$ 0,07
BMI, n (%)	
Underweight	3 (10)
Normal weight	8 (26,7)
Overweight	19 (63,3)
CC, n (%)	
Adequate	19 (63,3)
Reduced	11 (36,7)
CFVI-20, n (%)	
Low risk	5 (16,7)
Moderate risk	12 (40)
High risk	13 (43,3)

Note: SD: standard deviation; BMI: body mass index; CC: calf circumference;
CFVI-20: Clinical-Functional Vulnerability Index-20.

Source: Authors (2025).

Analysis of eating habits showed that lunch was the most frequent meal among the older adults, followed by the afternoon snack and breakfast, whereas intermediate meals, such as snacks, showed lower adherence (Table 2). Consumption of fresh fruits and vegetables was substantial, whereas consumption of sweetened beverages and sweets was less frequent.

Table 2 - Types of meals and food consumption.

Item	Yes (n(%))	No (n(%))
Meals with distractions	5 (16,7)	25 (83,3)
Breakfast	23 (76,7)	7 (23,3)
Morning snack	10 (33,3)	20 (66,7)
Lunch	30 (100)	-
Afternoon snack	24 (80)	6 (20)
Dinner	21 (70)	9 (30)
Supper	8 (26,7)	22 (73,3)
Beans	17 (56,7)	13 (43,3)
Fresh fruits	25 (83,3)	5 (16,7)
Vegetables	23 (76,7)	7 (23,3)
Processed meats	7 (23,3)	23 (76,7)
Sweetened beverages	13 (43,3)	17 (56,7)
Salty snacks and cookies	12 (40)	18 (60)
Sweets and candies	13 (43,3)	17 (56,7)

Source: Authors (2025).

We also examined the association between food consumption markers and CC adequacy, the main anthropometric indicator assessed (Table 3).

Table 3 - Association between calf circumference and food consumption.

Food consumption	Adequate CC, n (%)	Reduced CC, n (%)	p-value
Beans			
Yes	11 (64,7)	6 (35,3)	0,858
No	8 (61,5)	5 (38,5)	
Fresh fruits			
Yes	16 (64)	9 (36)	0,865
No	3 (60)	2 (40)	
Vegetables			
Yes	17 (73,9)	6 (26,1)	0,029**
No	2 (28,6)	5 (71,4)	
Processed meats			
Yes	4 (57,1)	3 (42,9)	0,698
No	15 (65,2)	8 (34,8)	
Sweetened beverages			
Yes	7 (53,8)	6 (46,2)	0,346
No	12 (70,6)	5 (29,4)	
Salty snacks and cookies			
Yes	9 (75)	3 (25)	0,279
No	10 (55,6)	8 (44,4)	
Sweets and candies			
Yes	8 (61,5)	5 (38,5)	0,858
No	11 (64,7)	6 (35,3)	

Note: CC: calf circumference. ** Statistically significant ($p < 0.05$).

Source: Authors (2025).

A statistically significant association was observed between vegetable consumption and CC adequacy. Among participants who reported this consumption, most had adequate CC, which was not the case among those who did not consume these foods, suggesting that regular consumption of unprocessed foods may contribute to better muscle condition.

Regarding the overall dietary pattern, the number of daily meals eaten by the sample was also analyzed (Table 4).

Table 4 - Number of daily meals.

Meals per day	n(%)
2	3 (10)
3	9 (30)
4	7 (23,3)
5	10 (33,4)
6	1 (3,3)

Source: Authors (2025).

The mean number of daily meals was 3.9 ± 1.1 , with five and three meals per day being the most frequent patterns in the sample. The relationship between food consumption and nutritional status, classified according to BMI, was then assessed (Table 5).

Table 5 - Body mass index according to food consumption.

Food consumption	Underweight, n (%)	Normal weight, n (%)	Overweight, n (%)
Beans			
Yes	2 (11,8)	4 (23,5)	11 (64,7)
No	1 (7,7)	4 (30,8)	8 (61,5)
Fresh fruits			
Yes	2 (8)	7 (28)	16 (64)
No	1 (20)	1 (20)	3 (60)
Vegetables			
Yes	0 (0)	7 (30,4)	16 (69,6)
No	3 (42,9)	1 (14,2)	3 (42,9)
Processed meats			
Yes	1 (14,3)	1 (14,3)	5 (71,4)
No	2 (8,7)	7 (30,4)	14 (60,9)
Sweetened beverages			
Yes	2 (15,4)	5 (38,5)	6 (46,1)
No	1 (5,9)	3 (17,6)	13 (76,5)
Salty snacks and cookies			
Yes	1 (8,3)	4 (33,3)	7 (58,4)
No	2 (11,1)	4 (22,2)	12 (66,7)
Sweets and candies			
Yes	2 (15,4)	4 (30,8)	7 (53,8)
No	1 (5,9)	4 (23,5)	12 (70,6)

Note: BMI: body mass index.

Source: Authors (2025).

Overweight predominated in most food consumption groups, especially among older adults who regularly consumed vegetables. Among those who did not consume these foods, greater heterogeneity in nutritional status was observed, with underweight and overweight in similar proportions.

The relationship between nutritional status and the CFVI-20 was also analyzed (Table 6).

Table 6 - Body mass index according to clinical-functional vulnerability.

Variable		BMI classification, n (%)		
		Underweight	Normal weight	Overweight
CFVI-20	Low risk	0 (0)	4 (80)	1 (20)
	Moderate risk	1 (8,3)	1 (8,3)	10 (83,4)
	High risk	2 (15,4)	3 (23,1)	8 (61,5)

Note: CFVI-20: Clinical-Functional Vulnerability Index-20.

Source: Authors (2025).

Overweight predominated in both the moderate-risk and high-risk groups according to the CFVI-20, whereas underweight was present exclusively among the most vulnerable older adults, suggesting an association between nutritional inadequacy and greater functional frailty.

Finally, the relationship between sex and clinical-functional vulnerability was analyzed (Table 7).

Table 7 - Sex according to clinical-functional vulnerability.

Variable		Sex, n (%)	
		Female	Male
CFVI-20	Low risk	5 (100)	0 (0)
	Moderate risk	9 (75)	3 (25)
	High risk	11 (84,6)	2 (15,4)

Note: CFVI-20: Clinical-Functional Vulnerability Index-20.

Source: Authors (2025).

Women predominated in all CFVI-20 categories, being the only sex represented among older adults classified as low risk and maintaining a clear majority in the moderate-risk and high-risk groups, in line with the predominance of women in the total sample.

DISCUSSION

This study assessed the nutritional status, dietary intake, and clinical-functional vulnerability of older adults attending an FHS unit in Santa Maria, Rio Grande do Sul. The findings underscore the value of multidimensional assessment in PHC, as nutritional and functional aspects are closely linked and both affect quality of life and functional capacity.

Clinical-functional vulnerability was high in this sample. A total of 83,3% of participants were classified as moderate or high risk by the CFVI-20, well above the 17% to 20% reported in PHC samples by Santos (2019) and Maia *et al.* (2020). This figure also exceeds international estimates of frailty among community-dwelling older adults, which range from 12% to 24% in population-based studies (Walsh *et al.*, 2023). Several factors may explain the discrepancy: the small sample ($n = 30$), recruitment from a single health unit, the specific profile of the territory served, and differences in instruments and cutoff points across studies.

CFVI-20 results were related to clinical and nutritional variables: older adults with worse scores also tended to have overweight and unfavorable dietary markers. This is consistent with the literature on the impact of diet and nutritional status on functional vulnerability. Using SISVAN data, Pereira and Sampaio (2019) reported a high prevalence of overweight among Brazilian older adults, especially women, and a declining trend in underweight, similar to our findings. The same authors observed a progressive national increase in ultra-processed food consumption despite the

predominance of unprocessed foods. We did not measure this trend directly, but it highlights the need for continued monitoring of dietary patterns in this population.

CC was highly relevant for assessing muscle mass and functional status in this sample. The European consensus on sarcopenia (Cruz-Jentoft *et al.*, 2019) recommends CC as a proxy for low muscle mass when more accurate methods are unavailable, with cutoffs similar to those used here. This applicability has also been confirmed in Asian populations. In a sample of more than 6,000 older Thai adults, Champaiboon *et al.* (2023) found a strong correlation between CC and appendicular muscle mass measured by bioimpedance, with cutoffs very close to the 33 cm for women and 34 cm for men used in our study. These findings support the use of CC as a marker of muscle status in PHC, especially given its association with vegetable consumption in this study.

Overweight was a recurrent finding. It may reflect age-related metabolic changes, the frequent consumption of energy-dense foods, or both. When excess weight coexists with muscle loss, the result is sarcopenic obesity, which, according to a recent review (Prado *et al.*, 2024), arises from a complex interaction of hormonal changes, chronic low-grade inflammation, oxidative stress, and lifestyle factors. It substantially increases the risk of disability, falls, hospitalization, and mortality. The possible coexistence of overweight and reduced muscle mass in this sample poses a challenge for clinical practice. Strategies should prioritize preserving lean mass and limiting fat gain, rather than focusing on weight loss alone.

The dietary intake of the older adults in this study partly resembled the healthy pattern described by Gomes *et al.* (2020), characterized by higher intake of fruits, vegetables, whole grains, and milk, as opposed to the Western pattern of sweets, fried foods, and ultra-processed foods. Those authors linked adherence to each pattern to sex, smoking, and education, variables we did not collect and therefore could not compare directly. Even so, educational actions in PHC remain essential to promote healthier food choices and reduce nutritional vulnerability among older adults.

Our findings also align with Maia *et al.* (2020), who identified associations between frailty and low education, multimorbidity, polypharmacy, and impaired activities of daily living, none of which we assessed. The high functional vulnerability and dietary inadequacy observed here suggest, as in that study, a multifactorial vulnerability that calls for integrated care. Jointly assessing nutritional status, dietary intake, CC, and functional vulnerability gives a broader view of the health of older adults and supports interventions to prevent frailty and promote autonomy.

Overall, these results indicate that healthy eating habits, physical activity, and continuous follow-up by the multiprofessional PHC team are key strategies to reduce clinical-functional vulnerability and preserve functional capacity in older adults. The CFVI-20, together with anthropometric assessment (including CC) and dietary assessment, should be incorporated into routine health services for screening and monitoring, allowing early identification of risks and appropriate clinical decisions.

LIMITATIONS

This study has limitations that should be considered when interpreting the results. Its cross-sectional design precludes causal inference about the relationships among dietary markers, nutritional status, and clinical-functional vulnerability. The sample comprised 30 older adults from a single FHS unit, which limits generalizability. The SISVAN food consumption markers also rely on self-report, which introduces recall bias.

CONCLUSION

These results showed a high frequency of overweight and clinical-functional vulnerability among older adults attending an FHS unit in Santa Maria, Rio Grande do Sul. Dietary patterns were predominantly based on unprocessed or minimally processed foods, and vegetable consumption was significantly associated with adequate CC. These findings support the use of simple, low-cost tools such as the CFVI-20 and CC for early screening of nutritional and functional risks in PHC, and can inform multiprofessional interventions for active and healthy aging. Longitudinal studies with larger samples are needed to confirm these associations and to clarify the relationship among diet, nutritional status, and functional vulnerability in older adults.

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