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# Domestic violence, obesity and malnutrition in elderly people in a capital in southern Brazil – EpiFloripa Idoso Study

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**Abstract** *The objective of this article was to verify the association between domestic violence and obesity and malnutrition in elderly people in Florianópolis, Santa Catarina, Brazil. Cross-sectional study evaluated in the EpiFloripa Elderly cohort in 2013/2014. The outcomes were body mass index (BMI) and abdominal obesity (increased WC). Violence against elderly people was measured using the HawlekSengstock Elder Abuse Screening Test (H-S/EAST) instrument, and IPV using the Conflict Tatics Scales Form R (CTS-1) instrument. Logistic regression and multinomial logistic regression models were used. It was observed that men had a greater chance of abdominal obesity when in situations of violence and in the potential abuse dimension. Women were more likely to have abdominal obesity in the dimension of violation of personal rights or abuse, when they suffered IPV and when they were perpetrators of IPV. In relation to BMI, elderly women in situations of violence were associated with a greater chance of being overweight and those who suffered IPV. On the other hand, men in vulnerable situations were more likely to be underweight. It is concluded that violence against elderly people and IPV generate an asymmetric impact on nutritional status in relation to sex.*

**Key words** *Violence against elderly people, Intimate partner violence, Anthropometric Indicators, Elderly*

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## Introduction

With the strong population aging growth, it is essential to ensure that elderly people undergo this phase as a positive experience and with quality of life. Recent studies reveal that domestic violence is considered one of the main psychosocial risk factors that influence nutritional status. Therefore, these people should be free from any form of violence and in safe and dignified living conditions, contributing to active and healthy aging[1].

Data on obesity show that in elderly Americans over 60 years of age it increased from 32.0% in 2000 to 37.4% in 2010. This means an increase from 14.6 million (2000) to 20.9 million in 2010[2]. A similar result was identified in Europe, revealing that between 2005 and 2013 the general prevalence of obesity in this population increased from 17.5% to 19.2%[3]. High prevalence has also been observed in Japan, Australia, and Latin American countries[4]. In Brazil, data from the 2019 National Health Survey (PNS) revealed that 64.4% of elderly people (60 years or older) were overweight (BMI≥25 kg/m²), while 24.8% were obese (BMI≥30 kg/m²)[5].

At the other extreme, malnutrition also represents a serious public health problem in this population. The prevalence reported in the literature indicates that between 5% and 30% of elderly people are malnourished and that elderly women are an important risk group[6]. A study carried out in Brazil confirms the relationship between malnutrition and advancing age, indicating that long-lived elderly people have a higher prevalence of nutritional deficit, and that living alone contributes to higher percentages of both underweight (20.4%) and overweight (38.5%)[7].

In parallel, domestic violence has become a relevant social issue of significant magnitude detected worldwide. Global estimates of the prevalence of family violence against elderly people vary between 4% and 10%, showing a 150% incidence increase in the last 10 years[8]. Following this same trend, in Brazil, between 2016 and 2017, the Ministry of Women, Family and Human Rights (MMFDH), identified a 13% increase in relation to the year, requiring a deeper analysis of its consequences, in particular regarding its impact on nutritional status.

Analyses focused on possible determinants of inadequate nutritional status in elderly people have proven insufficient and often show contradictory results. Several studies have analyzed the relationship between domestic violence in childhood and obesity in adulthood[9-11]. To date, only one study has been found that sought to investigate this topic in the elderly[18], which highlights its relevance in Brazil and the world, thus responding to a gap in scientific knowledge.

Little is known about the domestic violence impact on the elderlies' health conditions. Living in a violent home can trigger a series of mental health problems that, in turn, can influence disordered eating behavior. Furthermore, domestic violence in these people can increase the risk of inadequate nutritional status through environmental circumstances, such as the withholding of food by abusive family members, since elderly people lose their financial autonomy[19].

As Brazil is marked by socioeconomic disparities and accelerated population aging, one considers essential to analyze the factors that can influence the occurrence of obesity or malnutrition among the elderly, aiming to subsidize strategies that help promote healthy behaviors and increase this population's healthy lifestyle expectations. Thus, the objective of this study was to verify the association between domestic violence, obesity and malnutrition in elderly people in Florianópolis, Santa Catarina, Brazil.

## Methods

### Study design and location

This is a nested cross-sectional study on elderly people living in the Municipality of Florianópolis, capital of Santa Catarina (EpiFloripa Idoso Study). The baseline was carried out in 2009/2010 and data were collected in 2013/2014. The municipality's population in 2010 was 421 thousand inhabitants, with 11.4% of the total being elderly (60 years of age or over) and 14% of elderlies considered long-lived (80 years of age or over)[3].

### Data sampling and collection

The sample consisted of 1,705 elderlies of both sexes, aged 60 or over, non-institutionalized and residing the urban area of Florianópolis. Sample size was estimated considering the known parameters for sample calculations, and the draw was carried out by conglomerates in two stages, the first being composed of the census tracts and the second consisting of the households to be interviewed. To calculate the sample for intimate partner violence (IPV), 458 elderlies were excluded because they did not have a partner in

the last 12 months, and one excluded 57 interviews for having been completed by informants and 37 due to refusals, totaling 645 elderly people interviewed, with a 53.9% response rate. Further details of the sampling procedure are described in a recently published article on the study methodology[20]. For the calculation of violence against elderly people, 57 interviews completed by informants and 74 due to refusals were excluded, totaling 1,123 elderly people interviewed, with a 93.8% response rate.

In 2013, all participants in the first wave were considered eligible. Addresses were updated via telephone, email or letters before data collection. Deaths that occurred between 2009 and 2012 were verified using state data from the Mortality Information System (SIM). Individuals who were not located after four attempts (at least one at night and another on the weekend), elderlies admitted to a hospital and those who moved to another city were considered losses. Subjects who refused to respond to the questionnaire due to personal choice were considered refusals.

Data collection was carried out using netbooks for application of a standardized questionnaire previously tested in a pilot study. Interviews were carried out face-to-face in the elderlies' homes, data consistency was checked weekly, and quality control was done by applying a reduced questionnaire, via telephone, to approximately 10% of the selected interviewees, through simple random sampling, considering the principle of equiprobability with the lowest risk of selection bias. After reapplication of eight randomly selected questions, the kappa test was used to measure interrater reliability. Results indicated moderate to very good agreement, with values ranging between 0.51 and 0.94 ($p<0.001$).

**Outcome variables**

*Abdominal obesity* (dichotomized) and *body mass index* (BMI) (three categories) were analyzed as outcomes. Abdominal obesity was defined by waist circumference (WC) according to the World Health Organization (WHO)[21] criteria, considering obesity in elderly males as WC values greater than 102 cm and in females greater than 88cm. For BMI, one adopted the points recommended by the Ministry of Health, which include three categories, namely: BMI<22 kg/m² (underweight), 22 to 27 kg/m² (eutrophy), and >27 kg/m² (overweight).

To measure weight, one used a calibrated portable Britânia scale was (150 kg capacity, 100 g graduation). Participants were weighed without shoes, wearing light clothing, and just one measurement was considered. Two height measurements were taken using a stadiometer with a 1 mm resolution measuring rod. The subject remained in the orthostatic position, feet barefoot and together, with heels, buttocks and head in contact with the stadiometer, head in the Frankfurt plane, arms loose at the sides of the body and shoulders relaxed. WC was obtained using an inextensible Sanny anthropometric measuring tape (160 cm long, 1mm resolution) with the individual in an upright position. The measurement was carried out twice, and when there was a difference (≥1 cm), it was made one more time. The measurement was taken in the narrowest part of the trunk below the last rib, identified by the evaluator, with reading taken at the moment of exhalation. For individuals without a visible waist, the midpoint between the iliac crest and the last rib was used as a reference. The evaluator positioned himself in front of the person being evaluated and kept the area to be evaluated free of clothing.

**Exposure variables**

The exposure variable *violence against the elderly* was analyzed through the cross-cultural adaptation of the Hwalek-Sengstock Elder abuse Screening Test (H-S/EAST). This is an instrument developed aimed at identifying signs of presence (direct) and suspicion (indirect) of abuse against the elderly. It consists of 15 items, whose response options are dichotomized (yes and no), and one point is assigned for each affirmative answer, with the exception of items 1, 6, 12 and 14, in which the point is assigned to the negative answer. According to the literature, a score of three or more points may indicate that there is increased risk of some type of violence[22]. The instrument question set can be represented by three violence dimensions: *potential abuse*, *violation of personal rights or direct abuse*, and *characteristics of vulnerability*. One point was assigned to each affirmative answer, with the exception of items 1, 6, 12 and 14, in which the point is assigned to the negative answer.

IPV was also analyzed because it is a type of domestic violence. IPV was measured using the Conflict Tactics Scales Form R (CTS-1) – translated into Portuguese and cross-culturally adapted to the Brazilian context –, which is used to measure violence in couples. The questionnaire analyzes the presence of acts of verbal aggression

in six items of swearing and threats (swearing or insulting; sulking; leaving the place; doing/saying things to irritate; threatening to hit or throw things; destroying/throwing objects) and physical aggression in nine items of physical or explicit force (throwing objects; pushing/grabbing; slapping or slapping; kicking, biting or punching; hitting or trying to hit with objects; beating; strangling/suffocating; threatening with a knife or gun). For each dichotomized (yes and no) question, it was possible to verify the directionality of the violence, as the interviewees were asked if they have committed the act against their partners (violence perpetrated) and if the partner committed it against them (violence suffered).

IPV was considered present when the response was positive for at least one of the items on the scale, in the recall period referring to the last 12 months. The CTS-1 has already been applied in other Brazilian studies and has shown a low refusal rate and good reliability[23,24]. Interviews that had been completed by an informant (someone responsible for the elderly) were excluded from the sample, and for IPV, the exclusion criterion was also not having a partner in relation to marital status.

**Individual Level Adjustment Variables**

Adjustment variables were: age, schooling (no formal education, 1 to 4 years of education, 5 to 8 years of education, 9 to 11 years of education, and ≥12 years of education), marital status (married, single/divorced/separated, widowed), stratified family income in minimum wage (the minimum wage in 2014 was R$ 724). Separation was defined as follows: less than or equal to 1, greater than 1 and less than or equal to 3, greater than 3 and less than or equal to 5, greater than 5 and less than or equal to 10, and greater than 10.

**Data analysis**

Absolute and relative frequencies were calculated, as well as prevalence and 95%CI, for each variable separately and in relation to the outcomes. Bivariate analysis was performed by applying Pearson's $\chi 2$ test. Logistic regression was used in the multivariate analysis for WC, and multinomial logistic regression was used for BMI. Therefore, the crude models were first tested to verify the associations of each violence characteristic with each outcome. Next, the models fitted to individual-level variables (age group, schooling, marital status, and income) were tested. It is noteworthy that no collinearity was observed between the exposure variables (VIF=2.20) and that all models were stratified by sex, considering the significant results of the interaction analyses for this variable ($p<0.05$) . Post-estimation analyses were also carried out for each of the models using two parameters: calculation of predicted values and likelihood ratio test. The first calculation showed positive values for the outcomes in the absence of model effect variation, and the second one confirmed the null hypothesis of the observed coefficients, both justifying that the models fitted adequately to the data. In this study, differences with a p-value of less than 0.05 were considered statistically significant.

The EpiFloripa Idoso study met all ethical precepts, in accordance with Resolution 196 of 1996 of the National Health Council (CNS), in force at the time of the first wave, approved by the Human Research Ethics Committee for (CEPSH) at UFSC, Opinion 352/2008. In 2013/2014, it was approved by the Ethics Committee under CAAE 16731313.0.0000.0121, and the principles of CNS Resolution 466, of December 12, 2012, were respected. All participants consented to participate in the research and signed the informed consent form.

## Results

The final sample was composed of 1,148 elderlies, due to the exclusion of 49 interviews answered by informants; in the case of IPV, 613 responses were considered since participants who did not have a partner were excluded. Significant differences were observed in the variables sex, age and marital status, with a higher proportion of losses due to deaths in people aged 80 years or more (38.6%). Considering health conditions, there was a greater absolute number of losses among overweight/obese elderlies (9% of the sample), but the greatest relative loss occurred in the group of eutrophic elderlies (11% of the sample).

The interviewed elderlies' average age was 73.9 years (standard deviation of 7.2 years), with a higher proportion of women (65%). The majority of the individuals was between 70 and 79 years old and had up to four years of education (36%). The median family income in minimum wages was R$ 3,179.66.

Tables 1 and 2 demonstrate the distribution of socioeconomic characteristics in relation to abdominal obesity and underweight and obesity according to BMI, respectively. Overweight and

abdominal obesity were more prevalent among female individuals, 58.9% and 83.6% respectively. Regarding underweight, the values were very close, 7.9% for men and 7.6% for women.

Among men with no schooling, the prevalence of changes in WC was 36.6%, while for the group who had more than 12 years of education this value more than doubled, reaching 76.2%. The prevalence of underweight among men also demonstrated a significant difference between the groups with the lowest and highest education levels, as approximately one in every five individuals with no education was underweight, compared to just 3.2% of those with more than 12 years of education.

Table 3 presents the results of the logistic regression with WC. The fitted model values showed that elderly men were more likely to have abdominal obesity in situations of violence (OR: 1.75; 95%CI 1.06;2.88), as well as in the potential abuse dimension (OR: 1.55; 95%CI 1.01;2.38). For females, experiencing direct abuse, and suffering and perpetrating IPV were associated with a greater chance of having abdominal obesity (OR: 1.38; 95%CI 1.03;2.31, OR: 1.78; 95%CI 1.01;3.23, OR: 1.89; 95%CI 1.00;3.41). Tables 4 and 5 present the multinomial logistic regression with the outcomes *underweight* and *overweight* according to BMI. In the fitted model, elderly women in situations of violence and victims of IPV had a higher chance of being overweight (OR: 1.23; 95%CI 1.15;1.78, OR: 2.16; 95%CI 1.58;6.74). On the other hand, among males, elderlies in vulnerable situations demonstrated greater chances (OR: 2.27; 95%CI 1.05;5.96) of being underweight.

**Table 1.** Individual and violence characteristics in relation to abdominal obesity in the sample. EpiFloripa Idoso Study 2013/2014, Florianópolis, Santa Catarina, Brazil.

| Variables | n (%) | WC (increased risk*) % (95%CI) | |
|---|---|---|---|
| | | Female | Male |
| Gender | **n=1148** | | |
| Female | 753 (63,8) | 83.6 (80.6;86.2) | - |
| Male | 395 (36,2) | - | 66.5 (60.4;72.1) |
| Age (years) | **n=1148** | **n=629** | **n=257** |
| 60 to 69 | 394 (34,4) | 81.2 (75.2;86.1) | 66.3 (56.3;75.1) |
| 70 to 79 | 492 (42,5) | 87.4 (72.6;91.0) | 69.5 (46.0;77.5) |
| ≥80 | 262 (23,1) | 79.5 (62.2;85.3) | 60.1 (40.0;74.0) |
| Schooling | **n=1148** | **n=629** | **n=57** |
| No education | 84 (7,8) | 82.7 (68.0;91.6) | 36.6 (18.3;59.7) |
| 1 to 4 | 420 (36,0) | 85.1 (80.0;89.2) | 64.3 (53.3;74.0) |
| 5 to 8 | 189 (16,7) | 80.7 (71.5;87.5) | 66.4 (51.6;78.5) |
| 9 to 11 | 171 (15,1) | 82.4 (70.5;90.2) | 61.3 (46.3;74.4) |
| ≥12 | 283 (24,4) | 84.5 (76.0;90.5) | 76.2 (67.0;83.6) |
| Family income | **n=1148** | **n=601** | **n=250** |
| ≤1 | 82 (8,0) | 79.7 (65.1;89.2) | 43.6 (28.3;60.2) |
| >1≤3 | 317 (28,7) | 83.5 (76.5;88.7) | 63.0 (50.6;74.0) |
| >3≤5 | 217 (19,9) | 85.5 (78.0;91.0) | 67.5 (55.0;78.2) |
| >5≤10 | 264 (24,0) | 84.2 (76.0;90.0) | 70.7 (59.1;80.1) |
| >10 | 211 (19,4) | 84.7 (75.4;91.0) | 70.9 (60.0;80.0) |
| Marital status | **n=1148** | **n=629** | **n=257** |
| Married | 646 (55,0) | 85.5 (80.7;89.2) | 67.1 (61.0;72.6) |
| Single | 244 (20,8) | 80.0 (66.0;89.1) | 71.0 (48.5;86.4) |
| Divorced/separated | 258 (22,0) | 72.2 (57.2;83.5) | 77.8 (55.2;91.0) |

*Increased Risk for Women (≥80,0), Increased Risk for Men (≥94,0). 95%CI = 95% confidence interval. Value of the minimum wage in 2014: R$ 724.

Source: Authors.

**Table 2.** Individual and violence characteristics in relation to the BMI of the sample. EpiFloripa Idoso Study 2013/2014, Florianópolis, Santa Catarina, Brazil.

| Variables | n (%) | Underweight % (95%CI) | | Overweight % (95%CI) | |
|---|---|---|---|---|---|
| | | Female | Male | Female | Male |
| Gender | n=1148 | | | | |
| Female | 753 (63.8) | 7.6 (5.8;9.9) | - | 58.9 (55.2;63.3) | - |
| Male | 395 (36.2) | - | 7.9 (4.9;12.4) | - | 45.2 (40.1;50.4) |
| Age (years) | n=1148 | n=259 | n=196 | n=447 | n=180 |
| 60 to 69 | 394 (34.4) | 8.6 (5.1;14.1) | 3.8 (1.8;7.7) | 57.4 (50.2;64.3) | 46.8 (37.4;56.4) |
| 70 to 79 | 492 (42.5) | 3.9 (2.2;6.8) | 10.4 (5.7;18.5) | 66.9 (40.0;73.2) | 47.9 (29.3;50.7) |
| ≥80 | 262 (23.1) | 12.8 (7.2;21.6) | 9.8 (4.5;20.0) | 47.0 (38.4;55.8) | 36.8 (17.5;47.3) |
| Schooling | n=1148 | n=258 | n=196 | n=446 | n=180 |
| No education | 84 (7.8) | 14.1 (6.0;30.1) | 19.9 (9.4;37.4) | 59.5 (44.3;73.0) | 30.2 (15.4;50.6) |
| 1 to 4 | 420 (36.0) | 6.9 (4.1;11.5) | 11.9 (7.0;19.9) | 62.6 (56.0;69.0) | 39.6 (31.0;49.0) |
| 5 to 8 | 189 (16.7) | 7.9 (4.5;13.5) | 11.8 (5.1;25.0) | 61.0 (52.0;69.5) | 50.8 (36.1;65.3) |
| 9 to 11 | 171 (15.1) | 8.4 (3.6;18.3) | 3.4 (0.7;15.1) | 57.3 (44.2;69.4) | 40.2 (26.1;56.1) |
| ≥12 | 283 (24.4) | 5.3 (2.6;10.7) | 3.2 (1.51;6.7) | 52.4 (44.0;61.0) | 52.2 (44.0;61.0) |
| Family income | n=1148 | n=241 | n=189 | n=429 | n=176 |
| ≤1 | 82 (8.0) | 18.7 (9.1;34.6) | 39.8 (23.1;59.3) | 56.9 (41.3;71.3) | 22.3 (12.5;36.7) |
| >1≤3 | 317 (28.7) | 7.8 (4.5;13.2) | 11.2 (5.0;23.2) | 58.9 (51.1;66.4) | 41.3 (30.1;53.4) |
| >3≤5 | 217 (19.9) | 4.2 (2.0;9.2) | 4.6 (2.0;10.4) | 66.8 (58.5;74.2) | 44.2 (29.6;59.8) |
| >5≤10 | 264 (24.0) | 7.2 (4.0;13.0) | 5.2 (2.0;13.1) | 60.9 (53.7;67.7) | 50.6 (38.7;62.5) |
| >10 | 211 (19.4) | 6.1 (2.4;14.5) | 2.8 (0.01;8.8) | 48.9 (38.4;59.7) | 49.1 (39.0;59.2) |
| Marital status | n=1148 | n=259 | n=196 | n=447 | n=180 |
| Married | 646 (55.0) | 4.9 (2.9;8.0) | 6.6 (4.2;10.3) | 60.8 (55.1;66.3) | 45.7 (40.0;51.7) |
| Single | 244 (20.8) | 7.1 (2.4;19.1) | 5.4 (1.0;23.6) | 53.3 (39.1;67.0) | 44.5 (19.0;73.4) |
| Divorced/separated | 258 (22.0) | 4.0 (1.0;13.8) | 17.4 (6.3;39.8) | 48.2 (33.6;63.2) | 41.1 (23.5;61.2) |

95%CI = 95% confidence interval. Value of the minimum wage in 2014: R$ 724.

Source: Authors.

## Discussion

The main results of this work indicate that elderlies in situations of violence were more likely to be overweight, abdominally obese, and underweight. Similarly, researchers sought to investigate if domestic violence in midlife would be associated with an increase or decrease in weight and WC in women. After a ten-year follow-up, the results demonstrated that being a victim of domestic violence had significant association with weight gain (OR: 2.39; 95%CI 1.28;4.47), weight loss (OR: 3.54; 95%CI 1.73;7.22) and gain (OR: 2.44; 95%CI 1.37;4.37) or loss (OR: 2.66; 95%CI 1.23;5.77) of WC centimeters[25].

Since the beginning of the last decade, studies have investigated a possible association between experiencing situations of family violence and the individuals' nutritional status. This literature has focused especially on violence occurring in childhood or adolescence and its repercussions on these same periods or in adult life. Although still scarce, findings point to a positive relationship between violence and overweight/obesity[26,27]. The main assumption of these analyses is that suffering violence triggers a series of mental health problems, which in turn culminate in excessive consumption of high energy density foods and reduced physical activity, lifestyles that can last into adulthood[28].

Studies also suggest that the stress impact on weight may vary according to the individual's nutritional status throughout their life. The authors understand that individuals who are overweight/obese at baseline would increase their body weight even further when submitted to situations that trigger stress. On the other hand, eutrophic or malnourished individuals, if submitted to a stressful situation, would tend to lose weight[29]. In any case, future studies that assess nutritional

**Table 3.** Logistic regression analysis between violence and abdominal obesity, according to sex. EpiFloripa Idoso Study 2013/2014, Florianópolis, Santa Catarina, Brazil.

| Variáveis | Female | | Male | |
|---|---|---|---|---|
| | Crude | Adjusted# | Crude | Adjusted# |
| | OR (95%CI) | OR (95%CI) | OR (95%CI) | OR (95%CI) |
| Risk of viol. (n=1,137) | n=727 | | n=400 | |
| Did not suffer | 1.00 | 1.00 | 1.00 | 1.00 |
| Increased risk* | 1.47 (0.90;2.41) | 1.48 (0.88;2.47) | 1.73 (1.08;2.80)* | 1.75 (1.06;2.88)* |
| **Violence dimensions** | | | | |
| Potential abuse (n=1,138) | n=728 | | n=400 | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.01 (0.68;1.51) | 0.95 (0.62;1.43) | 1.57 (1.04;2.37)* | 1.55 (1.01;2.38)* |
| Direct abuse (n=1,137) | n=727 | | n=400 | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.48 (1.09;2.44)* | 1.38 (1.03;2.31)* | 1.37 (0.87;2.17) | 1.27 (0.80;2.03) |
| Vulnerability (n=1,140) | n=730 | | n=400 | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 0.79 (0.51;1.23) | 0.79 (0.50;1.25) | 1.21 (0.80;1.84) | 1.18 (0.76;1.83) |
| **IPV** | | | | |
| Suffered (n=651) | n=308 | | n=337 | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.81 (1.03;3.33)* | 1.78 (1.01;3.23)* | 1.08 (0.69;1.70) | 1.12 (0.69;1.79) |
| Perpetrated (n=651) | n=308 | | n=337 | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.90 (1.02;3.53)* | 1.89 (1.00;3.41)* | 1.09 (0.69;1.70) | 1.12 (0.70;1.80) |

*Increased Risk for Women (≥80,0), Increased Risk for Men (≥94,0). 95%CI = 95% confidence interval. # Adjustment variables: age, schooling, income and marital status. Value of the minimum wage in 2014: R$ 724.

Source: Authors.

status prior to exposure to violence and the stress that it supposedly triggers are considered necessary to help elucidate this association.

Regarding the violence dimensions, differences between the sexes and the direction of the associations were evident. For men, having characteristics of a potential abuse situation increased the chance of having abdominal obesity by 55%; on the other hand, men who presented characteristics of a greater vulnerability to abuse had a 127% chance of being underweight. For women in situations of violation of personal rights, there was a 33% chance of having abdominal obesity. Thus, one verifies that these findings also corroborate previous studies, where suffering domestic violence was associated with greater chances of abdominal obesity in elderly women in Egypt, and that the chances were marginally higher among women who reported sexual violence, followed by physical violence, and psychological violence[30].

Similar to the results of this study, researchers demonstrated that domestic abuse had a positive relationship with overweight and abdominal fat, but only physical aggression was significantly associated with overweight[25,31].

Victims of abuse are not always overweight, and some pieces of research show that the association tends in the opposite direction, that is, violence is linked to reduced or lower BMI values. In this sense, aiming to analyze the relationship between domestic violence and malnutrition in women, scholars observed that exposure to various types of violence (physical, verbal, sexual) resulted in lower BMI values[16].

Furthermore, regarding the differences between the sexes found in this study and in the literature, it is important to highlight that there are differences in responses between individuals in relation to adversities and the resilience potential that many victims may present. With regard to the violence dimensions, a study identified that

**Table 4.** Multinomial logistic regression analysis between violence and underweight (BMI), according to sex. Estudo EpiFloripa Idoso 2013/2014, Florianópolis, Santa Catarina, Brazil.

| Variables | Underweight | | | |
|---|---|---|---|---|
| | Female | | Male | |
| | Crude OR (IC95%) | Adjusted# OR (IC95%) | Crude OR (IC95%) | Adjusted# OR (IC95%) |
| Total score | | | | |
| Did not suffer | 1.00 | 1.00 | 1.00 | 1.00 |
| Increased risk | 0.69 (0.31;1.49) | 0.57 (0.24;1.36) | 1.22 (0.54;2.75) | 1.47 (0.62;3.48) |
| Potential abuse | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 0.92(0.50;1.69) | 1.05 (0.55;2.00) | 1.17 (0.56;2.46) | 0.97 (0.44;2.16) |
| Violation of personal rights | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.08 (0.52;2.24) | 1.03 (0.47;2.22) | 0.77 (0.35;1.69) | 0.58 (0.25;135) |
| Vulnerability | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.05 (0.55;2.00) | 1.15 (0.58;2.26) | **2.62 (1.17;4.80)*** | **2.27 (1.05;5.96)*** |
| **IPV** | | | | |
| Violence suffered | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.48 (0.55;3.97) | 2.01 (0.70;5.76) | 1.34 (0.55;3.27) | 1.10 (0.43;2.82) |
| Violence perpetrated | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.16 (0.44;3.03) | 1.70 (0.61;4.74) | 1.15 (0.47;2.77) | 0.93 (0.36;2.35) |

95%CI = 95% confidence interval. #Adjustment variables: age, schooling, income and marital status. Value of the minimum wage in 2014: R$ 724.

Source: Authors.

for the dimension *potential abuse*, 41.2% of men and 25.8% of women were helping support someone. It therefore demonstrates the magnitude of this item for men, considering that 56.4% of them belonged to the highest income strata (from 5 to 10 minimum wages).

In the dimension *violation of personal rights or direct abuse*, the item "other people make decisions about your life – such as how you should live or reside", was the most frequent among women. In women, this characteristic may be exacerbated, as it is linked to the caregiver role that they played during their lives, but at this stage it is reversed, having to be cared for instead of providing care, which can cause many family conflicts[24]. The study also demonstrated that 50% of men responded no to the item "has someone to keep you company" in the dimension *vulnerability characteristics*.

Intimate or emotional loneliness refers to the perception of the absence of a significant and trusty person, lack of emotional support, mutual assistance and affirmation of the person's value. A population study with adults, including the elderly, demonstrated that marital status is the best predictor for this type of loneliness. The feeling of loneliness can often be linked to various health conditions, as aspects such as eating meals without company, lack of cooking skills, and inability to go shopping can result in inadequate nutritional intake[6], which, in this study, demonstrated to be associated with underweight in men.

IPV is another health condition associated with underweight and malnutrition. In this sense, researchers investigated the relationship between malnutrition and IPV among Bangladeshi women, but the results pointed in two directions. Both women who experienced physical IPV and physical and sexual IPV were positively associated with being underweight, and being overweight/obese was associated with all forms of IPV[16].

Another result found in Rio de Janeiro was that IPV was negatively associated with BMI between the 25$^{th}$ and 85$^{th}$ percentiles, corresponding to 22.9 and 31.2 kg/m$^2$, demonstrating that IPV

**Table 5.** Multinomial logistic regression analysis between violence and overweight (BMI), according to sex. EpiFloripa Idoso Study 2013/2014, Florianópolis, Santa Catarina, Brazil.

| Variables | Overweight | | | |
|---|---|---|---|---|
| | Female | | Male | |
| | Crude OR (IC95%) | Adjusted# OR (IC95%) | Crude OR (IC95%) | Adjusted# OR (IC95%) |
| Risk of violence | | | | |
| Did not suffer | 1.00 | 1.00 | 1.00 | 1.00 |
| Increased risk* | 1.27 (1.18;1.82)* | 1.23 (1.15;1.78)* | 1.15 (0.73;1.83) | 1.14 (0.71;1.84) |
| **Violence dimensions** | | | | |
| Potential abuse | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.19 (0.66;2.14) | 1.27 (0.68;2.36) | 1.19 (0.57;2.52) | 0.96 (0.42;2.15) |
| Direct abuse | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes to any item | 1.35(0.66;2.67) | 1.22 (0.58;2.57) | 0.91 (0.41;2.02) | 0.67(0.29;1.56) |
| Vulnerabilidade | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.02 (0.55;1.90) | 1.13 (0.59;2.17) | 2.03 (0.96;4.30) | 2.25 (0.98;5.17) |
| **IPV** | | | | |
| Suffered | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 2.43 (1.88;5.61)* | 2.16 (1.58;6.74)* | 1.51 (0.62;3.71) | 1.29 (0.50;3.34) |
| Perpetrated | | | | |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.60 (0.63;4.06) | 1.99 (0.74;5.35) | 1.44 (0.60;3.50) | 1.24 (0.48;3.17) |

*Increased Risk for Women (≥80,0), Increased Risk for Men (≥94,0). 95%CI = 95% confidence interval. # Adjustment variables: age, schooling, income and marital status. Value of the minimum wage in 2014: R$ 724.

Source: Authors.

can reduce BMI in low-income women. Similarly, a study conducted in Florianópolis demonstrated that for elderly women, both committing and suffering IPV resulted in lower quality-of-life scores. Also, the negative impact on the quality of life was greater for women who perpetrate violence against their partners (-3.15; 95%CI: -4.84;-1.45) when compared to those who suffered attacks (-1.62; 95%CI: -3.06;-0.17)[32]. In this study, similar associations were observed, as elderly women who perpetrated IPV demonstrated an 89% chance of abdominal obesity, and a 78% chance when suffering IPV.

These findings contradict the literature, which suggests that the serious consequences of violence are related to female victims[9,11]. One of the hypotheses that could justify this result is that the suffering generated in women who cause violence serves as a catalyst for established or predisposed illness processes, such as compromised physical health, lower self-perception of health, or even the search for compensation for their emotional gaps through food, which would compromise the quality of life of people involved in violence[28].

Among the positive aspects of this work, the novelty in Brazil and the world stands out, which is the objective of investigating the association in elderly people between indicators of nutritional status, using two assessment measures (BMI and WC) and the different aspects of domestic violence. Regarding the methodology used, in addition to the high response rate obtained, it is considered that the use of BMI and WC measurements contributed to the data quality, eliminating the bias inherent in self-reported outcomes.

It is considered that the cross-sectional design adopted, despite not impacting cause and effect relationships, can indicate the magnitude of the associations and point out new hypotheses for future research. The analysis of a representative population-based sample from a capital in southern Brazil, conducted using validated and highly reliable instruments, achieved reliable re-

sults, making it clear that domestic violence has some influence on the prevalence of obesity in both sexes and underweight in elderly men.

Considering that this is the fastest growing age group in Brazil and worldwide, the importance of new long-term population-based studies that investigate violence against elderly people is highlighted, so that the evidence brought can support effective actions to prevent violence, especially that that occur at home.

## Collaborations

CAH Araújo participated in the conception, research, information collection, result analysis and interpretation, and final writing. D Warmling participated in the conception, research, information collection, result analysis and interpretation, and final writing. PG Araújo participated in the conception, research, information collection, result analysis and interpretation, and final writing. EBS Coelho participated in the conception, result analysis and interpretation, final writing, and critical review.

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