ORIGINAL ARTICLE

Association between excess weight and self-reported depressive symptoms among women of childbearing age in Peru

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The present study is part of the research work to obtain the academic degree of Bachelor of Medicine. *Asociación del exceso de peso (sobrepeso y obesidad) con síntomas depresivos autorreportados en mujeres en edad fértil de la población peruana, según datos de la ENDES 2022*. (Association of excess weight [overweight and obesity] with self-reported depressive symptoms in women of childbearing age in the Peruvian population, according to data from the 2022 ENDES) [Undergraduate thesis]. Lima: School of Human Medicine, Universidad de Piura; 2023.

ABSTRACT

Objective: To evaluate the relationship between excess weight and the occurrence of depressive symptoms (DS) among women of childbearing age (WCA; 15-49 years) and to identify associated risk factors**. Materials and methods:** This is a cross-sectional analytical study based on secondary databases from the 2022 Encuesta Demográfica y de Salud Familiar (ENDES – Demographic and Family Health Survey). The occurrence or absence of DS was evaluated using the Patient Health Questionnaire (PHQ-9). Frequencies, percentages and 95 % confidence intervals were estimated. Additionally, a bivariate analysis was conducted using Pearson's chi-square test, and crude and adjusted odds ratios were calculated using a binary logistic regression model. **Results:** The study population included 13,492 records, with a prevalence of depressive symptoms of 8.7 %. Moreover, we found overweight and obesity in 38.7 % and 29 % of this population, respectively. The results revealed no significant association between excess weight and depressive symptoms. The adjusted odds ratios did not demonstrate a consistent relationship: overweight vs. normal weight (*OR* = 0.98, 95 % CI = 0.77–1.26) and obesity vs. normal weight (*OR* = 1.11, 95 % CI = 0.86–1.44). Despite not finding a significant association between these two main variables, other factors—such as lack of education, living in urban areas, not having a significant other, having diabetes mellitus (DM) and being a victim of emotional and physical violence—notably increased the likelihood of experiencing DS. **Conclusions:** No direct association was found between excess weight and the occurrence of DS among WCA. However, the study evidenced the importance of variables such as lack of education, not having a partner (married or not), living in urban areas, having a history of DM and hypertension (HTN), and being a victim of physical and emotional violence, which behaved as significant risk factors. This highlights the necessity of considering multiple aspects beyond body weight when addressing mental health in this population.

Keywords: Depression; Obesity; Overweight; Women; Patient Health Questionnaire; Secondary Data Analysis (Source: MeSH NLM).

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INTRODUCTION

In Peru, depression is a major cause of morbidity and, as of 2019, was the second leading cause of disability-adjusted life years (DALYs) among individuals aged 15 to 44 years. In the same year, it was estimated that depression accounted for 112,538 DALYs in the female population of any age, with a rate of 6.9 per 1,000 women, with disability being the predominant component [1]. In 2022, out of the 247,171 reported cases of depression, women accounted for 75 % [2]. According to the Encuesta Demográfica y de Salud Familiar (ENDES – Demographic and Family Health Survey) data from 2014 to 2019, the prevalence of depressive symptoms (DS) is higher among women, particularly those residing in rural areas and with low socioeconomic and educational levels [3].

Another disease of interest is obesity, whose prevalence, according to the World Health Organization (WHO), has increased worldwide, tripling from 1975 to 2016. For this reason,

some authors refer to it as a pandemic [4]. In Peru, according to the 2022 ENDES, the prevalence of overweight and obesity among individuals over 15 years of age are 37.5 % and 25.6 %, respectively; obesity in women exceeds that in men by 8.6 percentage points [3].

Obesity is also associated with comorbidities such as diabetes mellitus (DM), hypertension (HTN), cardiovascular diseases and even psychiatric disorders [5-7]. A bidirectional relationship with depression has been proposed, which has been confirmed by longitudinal studies [8-10]. Suggested mechanisms for this association include dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, activation of the central nervous system (CNS) and a chronic inflammatory state [11,12]. Moreover, clinical evidence has reported a reduced response to antidepressant treatment in individuals with obesity [5].

The relationship between depressive symptoms (DS) and overweight in women of childbearing age (WCA; 15–49 years) in the Peruvian population is not well defined. Previous studies have included both men and women [13,14], or other populations such as immigrants [15], without finding significant associations between the two variables. However, it is consistently reported that women have more probability of experiencing DS compared to men, raising the question of whether the association between both variables behaves differently in this specific population.

In view of the high proportion of women affected by excess weight and DS symptoms in the country, we conducted this study where we evaluated the association between excess weight and the presence of DS in WCA, based on data from the 2022 ENDES. In addition, risk factors associated with depression were identified.

MATERIALS AND METHODS

Study design and population

A cross-sectional study was conducted using secondary data from the 2022 ENDES administered by the Instituto Nacional de Estadística e Informática (INEI – National Institute of Statistics and Informatics). This survey collects nationwide information using a complex, two-stage, probabilistic, stratified, and independent sampling design. According to the INEI, in 2022 a total of 35,787 WCA were surveyed across 36,760 evaluated households [16].

We included in our analysis the records from WCA who completed the Patient Health Questionnaire (PHQ-9), anthropometry module and violence module. We excluded the records from WCA with underweight (body mass index [BMI] < 18.5) and those lacking information for the aforementioned modules and questionnaires.

Variables and measurements

The dependent variable was the presence of DS, assessed by the PHQ-9 questionnaire. This requires the respondent to report whether, during the last 14 days, she experienced the following symptoms: little interest, trouble sleeping or sleeping too much, feeling tired, poor appetite or overeating, difficulty concentrating, difficulty moving, hurting herself in some way, seeking to die and feeling bad [17,18].

A numerical value was assigned to each characteristic: "not at all" = 0, "several days" (1–6 days) = 1, "more than half the days" (7–11 days) = 2 and "nearly every day" (12–14 days) = 3; the values obtained in the nine questions were summed to obtain a score between 0 and 27 points. With this score, we categorized the severity of the DS into none (0–4 points), mild (5–9) and moderate-severe (10–27).

This questionnaire has been validated at the national level [17]. To define the presence or absence of DS, a cutoff point of 10 was used, which gives it a sensitivity and specificity of 85 % to diagnose depression according to a meta-analysis [19].

The independent variable corresponded to excess weight in WCA, determined according to BMI: normal (BMI > 18.5 and ≤ 24.9), overweight (BMI ≥ 25 and ≤ 29.9) and obesity (BMI ≥ 30). BMI as previously calculated using weight (variable QS900) and height (variable QS901) data for WCA, which were collected by trained personnel following standards from the Instituto Nacional de Salud (INS – National Institute of Health) and the Ministerio de Salud (Minsa – Ministry of Health), using a calibrated electronic scale and stadiometer and recording these data on paper [16].

Additionally, other covariates were collected and grouped as follows:
i) Characteristics of the woman: age group, educational level, marital status, work status, area of residence, poverty level, mother tongue and number of children;
ii) Characteristics of the partner: age group, educational level and alcohol consumption; and
iii) Lifestyle and health characteristics: alcohol consumption, history or risk of hypertension (HTN), prior diagnosis of DM or hyperglycemia, and being a victim of emotional, sexual or physical violence.

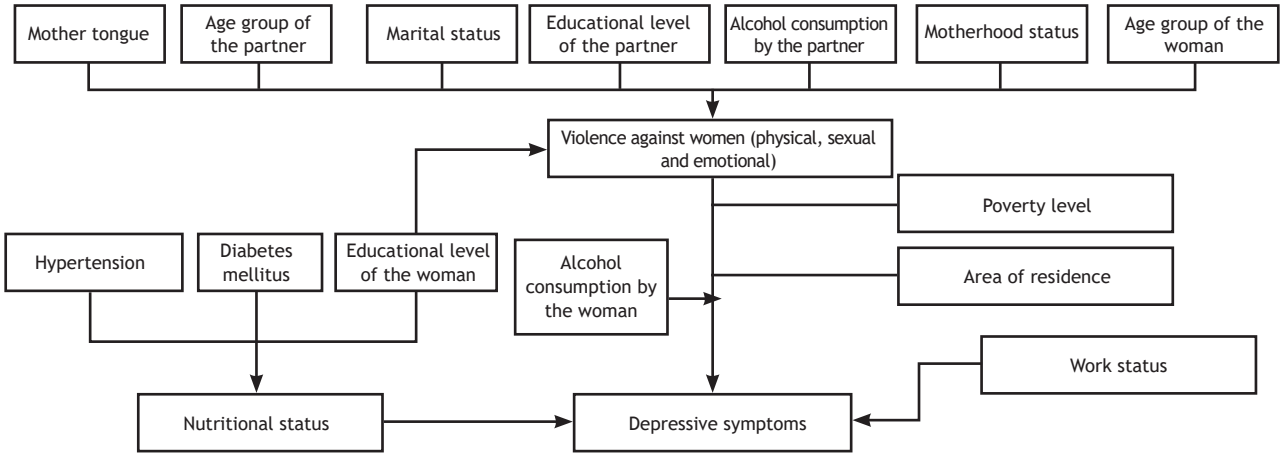

Figure 1. Directed acyclic graph the selected covariates to assess the association between BMI and DS in WCA

Statistical analysis

Data analysis was performed using the statistical software Stata, version 15, taking into account the complex sampling design of the ENDES. The svy command was applied, which considers clusters, strata and the weighting factor. The databases were merged as shown in Figure 2.

At the descriptive level, frequencies, percentages (both unweighted and weighted) and 95 % confidence intervals (95 % CI) were estimated for all variables. In addition, it was determined whether the coefficient of variation exceeded 15 % in the estimates. In the bivariate analysis, the difference in the weighted percentages of depression were identified according to the independent variable and covariates using the Pearson's chi-square test with Rao-Scott correction.

To determine the factors associated with DS, a multivariate analysis was conducted using a binary logistic regression model in which those variables with a significance level of ≤ 0.20 in the bivariate analysis were adjusted, while retaining the independent variable as an adjustment of epidemiological interest. Multicollinearity among covariates was assessed using the variance inflation factor. A significance level of < 0.05 was considered in all analyses.

Ethical considerations

The data used for the analysis are available to the general public on the INEI's official website (https://proyectos.inei.gob.pe/microdatos/). This entity anonymizes participant data; therefore, the privacy of the respondents is not violated. The research protocol for this study was approved by the Institutional Review Board of the Universidad de Piura under file No. PREMED07202216 and is listed in the registry of Proyectos de Investigación en Salud (Prisa – Health Research Projects of the INS of the Minsa, under code EI00000003136 (https://www.ins.gob.pe/prisa/ver_investigacion.aspx)

RESULTS

Study population

The study included 13,492 records from WCA out of a total of 35,787, after excluding those who did not meet the inclusion criteria or had missing data (Figure 2).

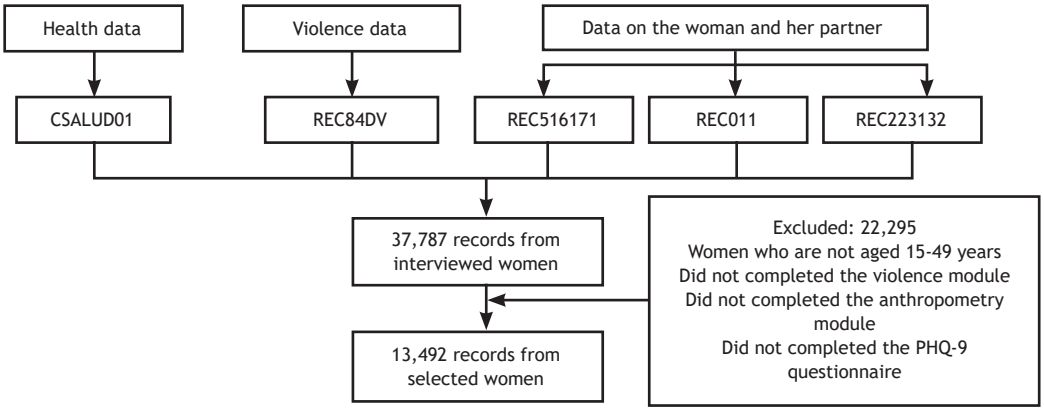

Figure 2. Sample selection flowchart
Source: 2022 Demographic and family health survey.

Sample characteristics

Of the total sample, 5,997 were 15-29 years old (44.8 %), 6,705 had a secondary education level (50 %), 8,821 were partnered (60.4 %), 9,020 resided in urban areas (82.5 %) and 3,804 were classified as "poor" according to the wealth index (23 %).

The prevalence of overweight and obesity was 38.7 % and 29 %, respectively. DS were present in 8.7 % of the sample; among them, 19.4 % had mild symptoms. These and the other characteristics are presented in Table 1.

Table 1. Distribution of the characteristics of the women included in the study sample

Variable	ns (%s)	%p (95 % CI)
Characteristics of the woman		
Age group		
15-29	5,997 (44.5)	44.8 (43.4-46.1)
30-39	5,035 (37.3)	30.2 (29.1-31.4)
40-49	2,460 (18.2)	25.0 (23.7-26.4)
Educational level		
No education	186 (1.4)	1.1 (0.9-1.3)
Primary	2,288 (16.9)	13.1 (12.3-13.9)
Secondary	6,705 (49.7)	50.0 (48.6-51.4)
Higher	4,313 (32.0)	35.8 (34.5-37.3)
Marital status		
Unpartnered	4,671 (34.6)	39.6 (38.2-41.0)
Partnered	8,821 (65.4)	60.4 (59.0-61.8)
Work status		
Not working	5,357 (39.7)	39.9 (38.6-41.2)
Working	8,135 (60.3)	60.1 (58.8-61.4)
Area of residence		
Urban	9,020 (66.8)	82.5 (81.8-83.3)
Rural	4,472 (33.2)	17.5 (16.7-18.2)
Poverty level		
Very poor	4,084 (30.3)	17.7 (16.9-18.5)
Poor	3,804 (28.2)	23.0 (21.8-24.3)
Neither poor nor rich	2,672 (19.8)	22.1 (21.0-23.3)
Rich	1,786 (13.2)	20.3 (19.1-21.5)
Very rich	1,146 (8.5)	16.9 (15.7-18.2)
Mother tongue		
Spanish	10,395 (77.0)	85.8 (84.9-86.6)
Indigenous language	3,077 (22.8)	14.1 (13.3-14.9)
Foreign language	20 (0.2)	0.1 (0.10-0.3)*
Motherhood status		
Without children	2,035 (15.1)	20.1 (19.0-21.3)
With children	11,457 (84.9)	79. 9 (78.8-81.0)
Characteristics of the partner		
Age group		
No partner - Does not know/No response	4,671 (34.6)	39.6 (38.2-41.0)
Minor (< 18)	13 (0.1)	0.2 (0.1-0.4)*
Young (18-29)	2,202 (16.3)	14.8 (13.8-15.8)

Association between job satisfaction and intention to migrate among Peruvian physicians and nurses

Variable	ns (%s)	%p (95 % CI)
Adult (30-59)	6,529 (48.4)	44.7 (43.4-46.1)
Older adult (≥ 60)	77 (0.6)	0.7 (0.5-1.1)*
Educational level		
No education	69 (0.5)	0.3 (0.2-0.5)*
Primary	1,681 (12.5)	9.4 (8.8-10.0)
Secondary	5,911 (43.8)	40.6 (39.3-42.1)
Higher	3,446 (25.5)	27.0 (25.7-28.3)
No partner - Does not know/No response	2,385 (17.7)	22.7 (21.5-23.9)
Alcohol consumption		
No partner - Does not know/No response	3,356 (24.9)	32.0 (30.7-33.3)
Does not consume	2,010 (14.9)	16.1 (15.1-17.3)
Consumes	8,126 (60.2)	51.9 (50.5-53.3)
Characteristics of lifestyle and health		
Nutritional status		
Normal weight (18.5-24.9)	4,214 (31.2)	32.3 (31.0-33.7)
Overweight (25.0-29.9)	5,416 (40.2)	38.7 (37.4-40.1)
Obesity (≥ 30.0)	3,862 (28.6)	29.0 (27.7-30.2)
Alcohol consumption		
Does not consume	4,769 (35.4)	36.3 (34.9-37.6)
Consumes	3,862 (28.6)	32.9 (31.6-34.3)
Does not know/No response	4,861 (36.0)	30.8 (29.6-32.0)
History or risk of HTN		
No	12,541 (93.0)	91.7 (90.8-92.5)
Yes	951 (7.1)	8.3 (7.5-9.2)
Diagnosis of DM or hyperglycemia		
No	13,260 (98.3)	98.3 (97.9-98.6)
Yes	225 (1.7)	1.7 (1.4-2.1)
Does not know/No response	7 (0.0)	0.0 (0.0-0.1)*
Victim of emotional violence		
No partner	3,356 (24.9)	31.9 (30.7-33.3)
Partner does not no perpetrate violence	7,595 (56.3)	51.5 (50.1-52.8)
Partner perpetrates violence	2,541 (18.8)	16.6 (15.6-17.6)
Victim of sexual violence		
No partner	3,356 (24.9)	32.0 (30.7-33.3)
Partner does not perpetrate violence	9,522 (70.6)	64.0 (62.7-65.4)
Partner perpetrates violence	614 (4.5)	4.0 (3.5-4.6)
Victim of physical violence		
No partner	3,356 (24.9)	32.0 (30.7-33.3)
Partner does not perpetrate violence	7,223 (53.5)	49.0 (47.6-50.4)
Partner perpetrates violence	2,913 (21.6)	19.0 (18.1-20.1)
Depressive symptoms		
Presence of depression		
Present	12,487 (92.5)	91.3 (90.5-92.1)

Variable	ns (%s)	%p (95 % CI)
Not present	1,005 (7.5)	8.7 (7.9- 9.5)
Severity of depression		
None	9,951 (73.7)	71.9 (70.6-73.2)
Mild	2,536 (18.8)	19.4 (18.3-20.6)
Moderate - severe	1,005 (7.5)	8.7 (7.9-9.5)
Total	13,492 (100)	----------

ns: unweighted frequency. %s: unweighted percentage. %p: weighted percentage. 95 % CI: 95 % confidence interval. HTN: hypertension. *Coefficient of variation greater than 15 %.

The presence of DS was significantly more frequent among the 15-29-year age group, those with a secondary education level, unpartnered WCA, residents in urban areas, in women not having children, those with a history of HTN and DM and those who were victims of any type of violence. It was also more frequent among those whose partners consumed alcohol and who had only a primary education level (Table 2).

Table 2. Analysis of the presence of depression according to the characteristics of the women included in the study sample

Variable	Depression %p (95 % CI)	*p* value†	*cOR* (95 % CI)	*p* value
Characteristics of the woman				
Age group (years)				
15-29	9.7 (8.5-11.2)	0.028***	Reference	
30-39	7.3 (6.3-8 .4)		0.73 (0.58-0.91)	0.006***
40-49	8.6 (7.1-10.4)		0.88 (0.68-1.12)	0.292
Educational level				
No education	9.5 (5.1-17.1)*	< 0.001***	1.59 (0.79-3.18)	0.19
Primary	8.2 (6.4-10.4)		1.35 (0.98-1.86)	0.067***
Secondary	10.6 (9.4-12.0)		1.79 (1.42-2 .26)	< 0.001***
Higher	6.2 (5.2-7.4)		Reference	
Marital status				
Unpartnered	12.3 (10.8-1 4.0)	< 0.001***	2.07 (1.69-2.55)	< 0.001***
Partnered	6.3 (5.6-7.2)		Reference	
Work status				
Not working	9.0 (7.9-1.3)	0.16	1.07 (0.87-1.31)	0.516
Working	8.5 (7.5-9.6)		Reference	
Area of residence				
Urban	9.2 (8.3-10.2)	< 0.001***	1.47 (1.20-1.80)	< 0.001***
Rural	6.4 (5.5-7.5)			Reference
Poverty level				
Very poor	7.5 (6.3-8.9)	0.221	1.02 (0.71-1.48)	0.908
Poor	8.9 (7.4-10.7)		1.24 (0.85-1.80)	0.263
Neither poor nor rich	9.7 (8-11.6)		1.36 (0.93-1.98)	0.114
Rich	9.6 (7.8-11.8)		1.35 (0.91-2)	0.137
Very rich	7.3 (5.5-9.8)			Reference
Mother tongue				
Spanish	8.6 (7.8-9.6)	0.708		Reference

Variable	Depression %p (95 % CI)	*p* value†	*cOR* (95 % CI)	*p* value
Indigenous language	9.1 (7.5-11.1)		1.06 (0.83-1.36)	0.630
Foreign language	5.1 (0.9-24.3)*		0.57 (0.10-3.39)	0.540
Having children				
No	12.4 (10.3-14.9)	< 0.001***	1.69 (1.34-2.13)	< 0.001***
Yes	7.8 (7.0-8.6)			Reference
Characteristics of the partner				
Age group				
No partner - Does not know /No response	12.3 (10.8-14.0)		2.5 (1.78-3.5)	< 0.001***
Minor (< 18)	**		**	
Young (18-29)	5.3 (4.0-7.1)			Reference
Adult (30-59)	6.6 (5.7-7.6)		1.26 (0.89-1.79)	0.200
Older adult (≥ 60)	12.2 (3.3-36.6) *		2.48 (0.58-10.64)	0.222
Educational level				
No education	2.5 (0.7-9.2) *	< 0.001***	0.39 (0.10-1.57)	0.186
Primary	8.9 (7-11.3)		1.48 (1.05-2.09)	0.025***
Secondary	8.4 (7.3-9.6)		1.38 (1.05-1.82)	0.023***
Higher	6.2 (5.0-7.7)			Reference
No partner - Does not know/No response	12.3 (10.3-14.6)		2.11 (1.58-2.83)	< 0.001***
Alcohol consumption				
No partner - Does not know/No response	11.2 (9.6-13.1)	< 0.001***	2.03 (1.47-2.80)	< 0.001***
Partner does not consume	5.9 (4.5-7.7)			Reference
Partner consumes	8.0 (7.1-9.0)		1.39 (1.01-1.92)	0.043***
Characteristics of lifestyle and health				
Nutritional status				
Normal weight (18.5-24.9)	9.1 (7.7-10.6)	0.368		Reference
Overweight (25.0-29.9)	8.0 (6.9-9.3)		0.87 (0.69-1.11)	0.264
Obesity (≥ 30.0)	9.2 (7.9-10.8)		1.02 (0.80-1.30)	0.876
Alcohol consumption				
Does not consume	9.8 (8.5-11.4)	0.010***		Reference
Consumes	9.0 (7.7-10.4)		0.9 (0.72-1.14)	0.387
Does not know / No response	7.1 (6.0-8.3)		0.7 (0.56-0.87)	0.002***
History or risk of HTN				
No	8.5 (7.7-9.3)	0.041***		Reference
Yes	11.4 (8.6-14.9)		1.39 (1.01-1.90)	0.042***
Diagnosis of DM or hyperglycemia				
No	8.5 (7.7-9 .3)	< 0.001***		Reference
Yes	20.9 (13-31.7)*		2.84 (1.60-5.02)	< 0.001***
Does not know / No response	**		**	
Victim of emotional violence				
No partner	11.2 (9.6-13.1)	< 0.001***	2.23 (1.79-2.79)	< 0.001***
Partner does not perpetrate violence	5.4 (4.6-6.2)			Reference
Partner perpetrates violence	14.2 (12.1-16.6)		2.91 (2.28-3.72)	< 0.001***

Variable	Depression %p (95 % CI)	*p* value†	*cOR* (95 % CI)	*p* value
Victim of sexual violence				
No partner	11.2 (9.6-13.1)	< 0.001***	1.72 (1.40-2.12)	< 0.001***
Partner does not perpetrate violence	6.8 (6.1-7.7)			Reference
Partner perpetrates violence	18.2 (13.8-23.7)		3.04 (2.2-4.34)	< 0.001***
Victim of physical violence				
No partner	11.2 (9.6-13.1)	< 0.001***	2.52 (1.99-3.19)	< 0.001***
Partner does not perpetrate	4.8 (4.1-5.6)			Reference
Partner perpetrates violence	14.5 (12.5-16.8)		3.39 (2.65-4.34)	< 0.001***
Total	8.7 (7.9-9.5)		-------	-------

%p: weighted percentage. 95 % CI: 95 % confidence interval. *cOR*: crude odds ratio.

† Chi square test for trend. *Coefficient of variation greater than 15 %. **Not calculable. ***$p < 0.05$.

Table 3. Analysis of factors related to the women, their partner, and lifestyle and health associated with the presence of DS

Variable	*aOR* (95 % IC)	*p* value
Characteristics of lifestyle and health		
Nutritional status		
Normal weight (18.5-24.9)	Reference	
Overweight (25.0-29.9)	0.98 (0.77-1.26)	0.902
Obesity (≥ 30.0)	1.11 (0.86-1.44)	0.412
Alcohol consumption		
Does not consume	Reference	
Consumes	0.91 (0.72-1.14)	0.401
Does not know / No response	0.72 (0.57-0.92)	0.008**
History or risk of HTN		
No	Reference	
Yes	1.37 (1.00-1.89)	0.054**
Diagnosis of DM or hyperglycemia		
No	Reference	
Yes	2.63 (1.56-4.46)	< 0.001**
Does not know / No response	*	
Victim of emotional violence		
No partner	*	
Partner does not perpetrate violence	Reference	
Partner perpetrates violence	1.50 (1.06-2.12)	0.022**
Victim of sexual violence		
No partner	*	
Partner does not perpetrate violence	Reference	
Partner perpetrates violence	1.18 (0.77-1.8)	0.450
Victim of physical violence		
No partner	*	
Partner does not perpetrate violence	Reference	

Variable	aOR (95 % IC)	*p* value
Partner perpetrates violence	2.24 (1.60-3.12)	< 0.001**
Characteristics of the woman		
Age group		
15-29	Reference	
30-39	0.83 (0.63-1.09)	0.176
40-49	0.80 (0.59-1.09)	0.159
Educational level		
No education	2.21 (1.01-4.86)	0.048**
Primary	1.55 (1.01-2.36)	0.043**
Secondary	1.70 (1.30-2.22)	<0.001**
Higher	Reference	
Marital status		
Unpartnered	1.73 (1.12-2.66)	0.013**
Partnered	Reference	
Area of residence		
Urban	1.45 (1.06-1.99)	0.021**
Rural	Reference	
Poverty level		
Very poor	1.10 (0.67-1.81)	0.698
Poor	1.04 (0.68-1.57)	0.872
Neither por nor rich	1.13 (0.76-1.68)	0.535
Rich	1.29 (0.87-1.92)	0.211
Very rich	Reference	
Having children		
No	1.32 (0.86-2.03)	0.401
Yes	Reference	
Characteristics of the partner		
Age group		
No partner - Does not know / No response	*	
Minor (< 18)	*	
Young (18-29)	Reference	
Adult (30-59)	1.34 (0.91-1.97)	0.134
Older adult (≥ 60)	2.43 (0.55-10.65)	0.239
Educational level		
No education	0.35 (0.09-1.42)	0.141
Primary	1.17 (0.77-1.79)	0.453
Secondary	1.04 (0.77-1.40)	0.816
Higher	Reference	
No partner - Does not know / No response	1.00 (0.57-1.74)	0.992

Variable	aOR (95 % IC)	*p* value
Alcohol consumption		
No partner – Does not know / No response	1.87 (1.18-2.96)	0.007**
Partner does not consume	Reference	
Partner consumes	1.13 (0.81-1.57)	0.464

aOR: adjusted odds ratio for age group, educational level, marital status, area of residence, poverty level, having children, partner's age group, partner's educational level, alcohol consumption by the partner, nutritional status of respondents, alcohol consumption by the respondent, history of HTN and diabetes, and physical, emotional, and sexual violence. *Not calculable. **$p < 0.05$.

A descriptive graph representing the proportion of severity of DS among individuals with normal weight, overweight and obesity shows a similar distribution across the three categories. A slight difference is noted in obesity group compared to the overweight group, increasing the proportion of individuals with moderate-severe symptoms with respect to mild symptoms (Figure 3).

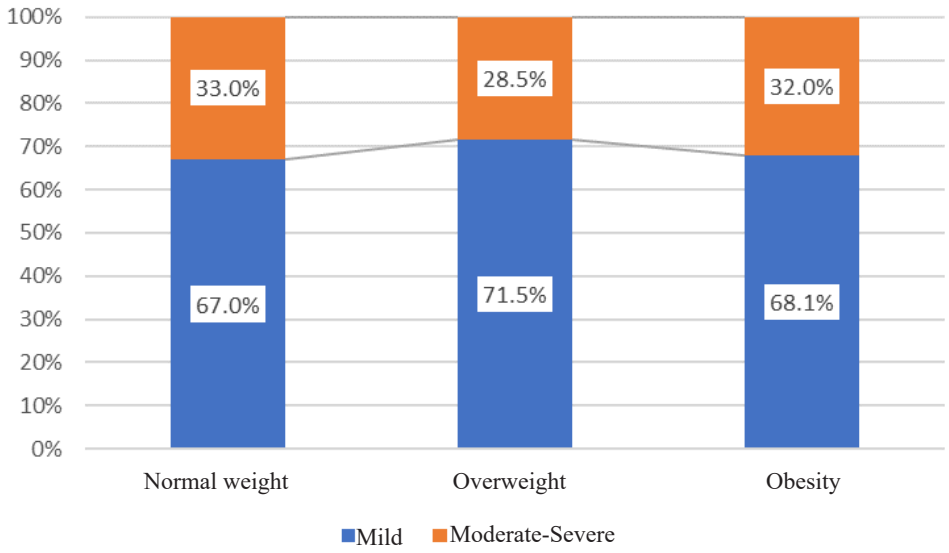

Figure 3. Distribution of the severity of DS by nutritional status

DISCUSSION

We did not find an association between excess weight (overweight and obesity) and the presence of DS. Additionally, we observed that WCA with no education or with only school-level education have a higher probability of experiencing DS, as do those who live in urban areas, those unpartnered and those who have been victims of emotional and physical violence.

The relationship between nutritional status and DS has been previously evaluated in other studies: Zavala et al. found that, for both men and women, the probability of experiencing DS increases significantly in patients with obesity, whereas those with overweight show a lower probability of this condition. For women, specifically, the probabilities remain consistent after adjusting for age, history of diabetes, educational level attained and marital status [13]. These results differ from the findings of the present study, in which the categories of nutritional status did not alter the probability of experiencing DS. One possible explanation is that the studies used different instruments to assess DS.

The analysis of the 2019, 2020 and 2021 ENDES, which included men and women, found that, after adjusting for certain variables of interest, obesity did not increase the risk of depression compared with those without obesity [14]. These results are consistent with the findings of this study.

On the other hand, a study based on the 2019 ENDES reported a prevalence of DS of 5.9 % in its population [19], a figure that differs from that found in the present study, where the prevalence was 8.7 % and focused exclusively on the WCA group. However, the prevalence observed aligns with findings reported by other studies conducted in Latin America [19,20].

The general health status of an individual directly impacts the occurrence of DS, and it appears that DM contributes to their

onset. It has been shown that 27 % of women with DM develop at least one depressive episode [5]. In this study, it was found that having a diagnosis of DM or presenting with hyperglycemia at the time of evaluation significantly increased the probability of having DS. However, this assessment does not take into account the treatment status for this condition or other patient characteristics. Likewise, the results of this study show that having HTN significantly increased the probability of experiencing DS in women. The pathophysiological explanation involves factors such as a proinflammatory environment, hyperactivation of the HPA axis, heart rate variability and platelet activation [5,6].

Acts of violence have been shown to significantly increase the risk of depression. For example, a cohort study in Mexico found that individuals exposed to any type of violence had 2.29 times more probability of suffering depression compared to those not exposed to violence. Those exposed only to physical violence were 4.3 times more likely to suffer depression; and those who suffered emotional or sexual violence had 3.1 times more probability [19]. These results are consistent with our findings, as violence increases the probability of suffering DS. However, this association was only observed for emotional and physical violence. This discrepancy could be attributed to the small proportion of women who reported having suffered sexual violence, which may be due to a reluctance among WCA to share such sensitive information.

The higher risk of DS among "unpartnered" WCA is consistent with previous research, such as that conducted in China in 2015. It included men and women with a mean age of 60 years, with predominance of women. They reported that divorced, separated, widowed and never-married individuals had a 39 % higher probability of experiencing DS compared to married individuals [21].

WCA residing in urban areas also had an increased risk of DS, which is consistent with that reported by a study conducted in Bangladesh. In that study, female adolescents residing in urban areas were 56 % more likely to have DS compared to those in rural areas [22].

In the crude analysis, women aged 15–29 years were found to have more probability of experiencing DS, but this association was lost after adjusting for the other confounders. This conflicts with the findings of another study, where individuals older than 30 years had a higher probability of having DS compared to those younger than 30. It is important to mention that they included men and women in their analysis [23].

Another nonsignificant relationship was the poverty index. The previously cited study found that individuals with obesity in the "rich" category had 65 % more probability of experiencing DS compared to those in the "poorest" category [14]. Unlike this study, that one focused on the obese subpopulation.

Alcohol consumption by the partner behaved as a risk factor in the crude model, but lost significance after adjustment. This suggests a possible confounding effect exerted by violence, as previous studies have reported that alcohol consumption by the partner is associated with a higher risk of violence [24].

Only in the crude analysis, not having children was a risk factor compared to being a mother. This is supported by findings from other studies, such as a longitudinal study conducted in Finland, which reported that childlessness was a significant predictor of experiencing DS at the age of 52. This result was revealed after adjusting for confounding variables, such as participants' mental health at age 16 years, socioeconomic status at that age, etc. It is likely that the inability of the present study to collect and adjust for such variables affected its ability to find a significant association [25].

The study has limitations, notably the instrument used to measure the DS. It does not allow an accurate diagnosis of depression and is susceptible to social desirability bias, since the surveyed women may underreport symptoms to avoid feeling judged.

Furthermore, since the data were collected at a single point in time, it is not possible to draw definitive conclusions about the causal relationship between excess weight and DS.

During data collection, individuals were not excluded based on their psychiatric history. Therefore, some diagnoses such as complicated grief, post-traumatic stress disorder or undetected personality disorders may influence the assessment of depression. In addition, there are other factors associated with depression that are not collected by the ENDES and, therefore, were not included in our analysis (such as body image self-perception, self-esteem, etc.) [26]. Finally, it should be noted that the primary purpose of the ENDES was not specifically to assess DS in the Peruvian population, but rather to provide updated information on the demographic dynamics and health status of that population. This may affect the statistical power of the study.

As a strength, a sample size representative of the Peruvian population was used. In addition, anthropometric measurements were taken by trained personnel using objective methods—i.e., such measurements were not based on self-report [16]. As already mentioned, an instrument (PHQ-9) with optimal psychometric properties was used to detect the severity of DS in the Peruvian population. In addition, the incorporation of the violence variable is innovative compared to previous studies, since violence is a prevalent problem in Peru: 55.7 % of women aged 15–49 years have suffered some type of violence, whether psychological, physical or sexual. This directly impacts other variables, exerting a confounding effect that hinders the correct visualization of the effect of one variable on another. The lack of adjustment of the variable in the analysis may lead to erroneous estimates and false associations. Finally, this study addressed two conditions with a high impact on public health in the country: depression and excess weight.

In conclusion, the present study did not find a significant association between the presence of DS and excess weight. However, there was a slight trend indicating that as BMI increases, the risk of developing DS also increases. Other factors such as educational level, marital status, area of residence, a prior diagnosis of DM and HTN and being a victim of physical and emotional violence were significantly associated with the presence of DS. Research in other countries has found an association between the two main variables, but studies in Peru suggest a different pattern in our country. Therefore, we suggest conducting prospective studies with a design that can clarify this aspect for the benefit of those involved and for the advancement of science.

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