RESEARCH ARTICLE

Factors Associated with Depression Symptoms in the Peruvian Population
Analysis of a National Health Survey

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Introduction: Worldwide, approximately 280 million people suffer from depression, which results from complex interactions.

Aims: Determining the prevalence of depressive symptoms and their associated factors in the Peruvian Population.

Methods: Analytical cross-sectional study. The odds ratios together with their 95% confidence intervals were calculated. For evaluating the strength of association between the variables of interest, a generalized linear model of the Poisson family was performed with robust variance.

Results: The factors associated with exhibiting symptoms of depression were: the female sex; the age group older than 70 years; the year 2021; being married, cohabiting and being separated; residents in the region of Lima, the rest of the coast, mountains and jungle; possessing a level of higher education; living in a rural area; physical disability; drinking alcoholic beverages; having type 2 diabetes mellitus; having hypertension; medium and high fruit consumption.

Conclusions: All the variables evaluated, except for the wealth index, tobacco consumption, health insurance, and body mass index, were associated with depressive symptoms.

Keywords: depressive disorder, adult, risk factors, diabetes mellitus, hypertension

Introduction

Depression is a common disease globally, since at the time of composing this article, approximately 280 million people are estimated to suffer from it (Evans-Lacko et al., 2018). The World Health Organization (WHO) predicts that this disease will be the main cause of worldwide morbidity by 2030 (World Health Assembly 65, 2012). In Latin America, the prevalence of depression stands at approximately 4.9% (Kohn et al., 2005), while in Peru, in 2021, MINSA (National Ministry of Health) reported the care of 313,455 depression cases, evidencing an increase of 12% compared to those treated during 2019 (MINSA, 2022).

Peru presents unique characteristics in prevalence and intervention regarding depression that distinguish it globally. Peru has a history of political violence, particularly during the internal armed conflict in the 1980s and 1990s. The effects of this historical trauma may contribute to a unique form of depression, with individuals experiencing symptoms related to collective trauma and loss (Ruiz Effio, 2020). For instance, recent studies have shown that at least one in ten military personnel in Peru are at risk of suicide, underscoring the need for specific interventions in this group (Valladares-Garrido et al., 2022). Implementing mental health screening technologies in the primary care setting has revealed a high prevalence of unidentified psychological symptoms, indicating the need for more effective and accessible interventions (Diez-Canseco et al., 2018).

Depression results from complex interactions between social, psychological and biological factors (World Health Organization, 2023), characterized by a depressed mood, loss of interest in previously enjoyed activities plus the inability to carry out activities of daily living for at least two weeks (Pan American Health Organization, n.d.; Martina et al., 2017). During the COVID-19 pandemic, the loss of personal freedoms and control, uncertainty about the immediate future, increased workload, personal concerns, and those of family members or close people were added to the factors previously explained (Huremović, 2019). These additions contributed to an increase in the prevalence of depression up to seven times worldwide (Bueno-Notivol et al., 2021), mainly affecting those who were quarantined alone or whose family or close friends were isolated in some way (Lei et al., 2020). Therefore, the COVID-19 pandemic exacerbated depressive symptoms in several sociodemographic groups, resulting in the necessity of an interventional approach adapted to the specific needs of each population, especially one such as the Peruvian population, which is characterized by socioeconomic challenges including poverty and the presence of vulnerable groups (Zegarra-López et al., 2022).

Approximately 92% of people without treatment continue to experience depressive symptoms (Mekonen et al., 2022) and 75% of affected people in developing countries do not receive any treatment (World Health Organization, 2023); due to this statistics, in a population such as the Peruvian, where an overall prevalence of depressive symptoms stood five times higher during the COVID-19 pandemic than previously reported nationally in 2018 (Antiporta et al., 2021), studying the associated factors, including sociodemographic variables such as sex, age, and economic status (Martina et al., 2017; Molés Julio et al., 2019) is essential to develop more effective and culturally appropriate intervention strategies (Eappen et al., 2018).

It is relevant to analyze the elements related to depressive symptoms in a society such as the Peruvian since these findings could have applicability in other Latin American societies characterized by low income. Furthermore, this would facilitate the identification of the most prominent factors, with the possibility of reducing expenditures aimed at combating depression in highly developed nations.

The present study, therefore, had the objective of determining the prevalence of depressive symptoms and their associated factors in the Peruvian population.

The exploratory research questions were: What is the prevalence of depressive symptoms in the Peruvian population, and what are the factors associated with the manifestation of these symptoms?

Methods

Design and Study Population

In total, 35,419 people were interviewed in 2019; 34,242 in 2020, and 35,847 in 2021. This investigation comprises an integrative summary of a survey encompassing three distinct cross-sectional analytical studies within a unified framework. A secondary analysis of the Demographic and Family Health Survey (ENDES by its acronym in Spanish: Encuesta Demográfica y de Salud Familiar) 2019, 2020, and 2021 was carried out. These are surveys implemented at the national level that consist of a probabilistic, two-stage, stratified, and independent sampling at the departmental level and by urban and rural areas in charge of the National Institute of Statistics and Informatics (INEI by its acronym in Spanish). Every year, this survey is carried out with a large sample of Peruvian residents, always exceeding 30,000 people, so the sample selected in each edition reflects the entire population (ENDES, 2019; INEI, 2019; INEI-Perú, 2021).

In the ENDES survey, there are three questionnaires: 1) household questionnaire, 2) individual woman questionnaire and 3) health questionnaire, the latter collects information on non-communicable diseases including information on mental health.

Variables and measures

The study's dependent variable was the presence of clinically relevant depressive symptoms. According to WHO, depressive disorder encompasses a prolonged period of low mood or a diminished capacity to experience pleasure or interest in activities (World Health Organization, 2023). In the context of this study, we use the term "depressive symptoms" to refer to a range of emotional, cognitive, and physical indicators commonly associated with the clinical state of depression. The presence of these symptoms does not necessarily indicate a clinical diagnosis of depression, but does suggest the need for a more detailed evaluation. We think it is pertinent to note that we use this term ("depressive symptoms") because the ENDES does not directly evaluate depression. Its main focus involves collect-

ing information on various aspects of the population, such as demographics, housing, education, employment and health. For measuring these symptoms, we employed the PHQ-9 questionnaire (Patient Health Questionnaire-9), which is a validated and widely used tool in mental health research with internal consistency (Cronbach's alpha = .90) (Huarcaya-Victoria et al., 2020). This questionnaire is an instrument used for depression screening that has been validated in Peru. The PHQ-9 was validated to reliably compare according to sociodemographic characteristics in the Peruvian population. The PHQ-9 instrument consists of nine questions that assess the presence of depressive symptoms; the responses measure the severity of these symptoms within a range of 0 (never) to 3 (almost every day) with a total score of 0 to 27 points. The score is classified into five categories: minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). For this study, two categories were used to classify the dependent variable depending on the presence or absence of clinically relevant depressive symptoms, with the cut point ≥ 4.

The study's independent variables (measured in the same way) were: sex (female vs. male), categorized age (15–35, 36–59, 60–69, and 70 and over), year (2019, 2020, and 2021), marital status (single, married, cohabiting, widowed, divorced, and separated), region of residence (metropolitan Lima, rest of the coast, highlands, and jungle), education (no level, primary, secondary, and higher), wealth index (poorest, medium, rich, and more rich) area of residence (urban vs. rural), physical disability (no vs. yes), smokes daily, drinks alcohol – those who drink alcoholic beverages once or twice per year were categorized in the same way as those who drink alcoholic beverages daily (no vs. yes), health insurance (no vs. yes), Body Mass Index (BMI, underweight – less than 18.49 kg/m^2, normal weight – 18.5–24.9 kg/m^2, overweight – 25–29.9 kg/m^2, and obesity – 30 kg/m^2 or more), type 2 diabetes mellitus (T2DM, no vs. yes), high blood pressure – 140/90 mmHg or more (no vs. yes), and consumption of fruits five times per day or less (divided into tertiles: low, medium, and high).

Statistical Analysis

Data were analyzed using the statistical program STATA v.17 (Stata Corporation, College Station, Texas, USA). For the statistical tests, a statistically significant value of less than .050 ($p < .050$) was considered.

Sociodemographic characteristics were described using absolute frequencies, and the chi-square test was used for the bivariate analysis regarding variations among the variables of interest. Odds ratios along with their 95% confidence intervals (95% CI) were calculated. To evaluate the strength of association between the variables of interest, a generalized linear model of the Poisson family was used with robust variance. The association measure used was the crude prevalence ratio as well as the ratio adjusted for the variables: sex, categorized age, year, region of living, education, wealth index, residence area, physical disability, drinking alcoholic beverages, health insurance, type 2 diabetes mellitus, high blood pressure, and fruit and vegetable consumption.

Results

In total, 105,512 people were surveyed during the previously mentioned three years; the overall prevalence of people with depressive symptoms was 23.2%. Of the total, 51.6%, 51.5%, and 51.7% were found to be females during the survey carried out in the years 2019, 2020, and 2021 respectively. Regarding age, we observed that the majority stood in the range of 15 to 35 years of age, with the respondents from the year 2021 being those who presented the highest percentage with 42.9%. In all the years of surveys included in the present study, a marked difference was found between the number of residents of urban areas and the number of residents of rural areas (Table 1).

Regarding harmful habits, daily smoking and alcohol consumption, each year, the majority of those surveyed stated that they did not have them. In contrast, differences were found in terms of fruit and vegetable consumption depending on the year of the survey. For example, in 2019, 20.5% of people reported having a low consumption of fruits and vegetables, in 2020 this number came to 59.8% and in 2021 the number was 27.7% (Table 1).

After controlling for confounding factors, the factors associated with presenting symptoms of depression were found to be: male (PRa: 0.58; 95% CI 0.56–0.61); the age group older than 70 years (PRa: 1.23; 95% CI 1.12–1.35); surveyed in 2021 (PRa:1.08; 95% CI 1.03–1.13) resident of the rest of the coast (PRa: 0.84; 95% CI 0.80–0.89), highlands (PRa: 1.30; 95% CI 1.23–1.38) and jungle (PRa: 0.89; 95% CI 0.84–0.95); possessing a higher education level (PRa: 0.62; 95% CI 0.46–0.84); living in a rural area (PRa: 0.92; 95% CI 0.87–0.97); if you have a physical disability (PRa: 1.59; IC 95% 1.43–1.77); if you drink alcoholic beverages (PRa: 1.10; 95% CI 1.02–1.19); present T2DM (PRa: 1.35; 95% CI 1.24–1.48); have hypertension (PRa: 1.36; 95% CI 1.28–1.46); and medium (PRa: 0.86; 95% CI 0.82–0.91) and high (PRa: 0.94; 95% CI 0.89–0.99) consumption of fruits (Table 2).

Table 1. Descriptive Analysis of the Characteristics of the Study Population in 2019, 2020, and 2021

Characteristics		Survey year		
		2019	2020	2021
		n (% weighted)	n (% weighted)	n (% weighted)
Sex	Female	18,268 (51.6)	17,645 (51.5)	18,548 (51.7)
	Male	17,151 (48.4)	16,597 (48.5)	17,299 (48.3)
Age groups	15 to 35 years old	14,975 (42.3)	14,484 (42.3)	15,359 (42.9)
	36 to 59 years old	14,332 (40.5)	13,841 (40.4)	14,359 (40.1)
	60 to 69 years old	3,227 (9.1)	3,132 (9.2)	3,269 (9.1)
	70 years old or more	2,884 (8.1)	2,785 (8.1)	2,858 (8.0)
Marital status	Single	7,825 (22.1)	8,431 (24.6)	7,798 (21.8)
	Married	9,712 (27.4)	8,961 (26.2)	8,486 (23.7)
	Cohabitant	12,232 (34.5)	11,291 (33.0)	12,916 (36.0)
	Widowed	1,835 (5.2)	1,820 (5.3)	2,212 (6.2)
	Divorced	342 (1.0)	291 (0.9)	300 (0.8)
	Separated	3,473 (9.8)	3,446 (10.1)	4,133 (11.5)
Region of living	Metropolitan Lima	13,479 (38.1)	13,017 (38.0)	12,655 (35.3)
	Rest of coast	8,998 (25.4)	8,631 (25.2)	9,626 (26.8)
	Highlands	8,678 (24.5)	8,420 (24.6)	8,851 (24.7)
	Jungle	4,264 (12.0)	4,173 (12.2)	4,714 (13.2)
Education	No level	66 (0.2)	58 (0.2)	60 (0.2)
	Primary	6,939 (20.3)	6,185 (18.6)	6,574 (19.0)
	Secondary	15,367 (45.0)	15,808 (47.6)	16,690 (48.1)
	Superior	11,816 (34.6)	11,169 (33.6)	11,356 (32.8)
Wealth index	Poorest	6,560 (18.5)	6,255 (18.3)	6,792 (19.0)
	Poor	7,516 (21.2)	7,014 (20.5)	7,310 (20.4)
	Medium	7,311 (20.6)	7,274 (21.2)	7,451 (20.8)
	Rich	7,049 (19.9)	6,923 (20.2)	7,180 (20.0)
	Richer	6,982 (19.7)	6,774 (19.8)	7,113 (19.8)
Residence area	Urban	28,603 (80.8)	27,637 (80.7)	28,941 (80.7)
	Rural	6,816 (19.2)	6,605 (19.3)	6,906 (19.3)
Physical disability	Yes	684 (1.9)	1,175 (3.4)	947 (2.6)
Daily smoking	Yes	565 (1.6)	426 (1.2)	432 (1.2)
Drinking alcoholic beverages	Yes	4,613 (13.0)	3,406 (10.0)	3,209 (9.0)
Health Insurance	Yes	25,950 (73.3)	25,814 (75.4)	27,861 (77.7)
Body Mass Index	Underweight	441 (1.3)	1,639 (6.4)	1,326 (3.7)
	Normal weight	12,310 (34.8)	7,867 (30.7)	11,170 (31.2)
	Overweight	14,189 (40.1)	9,744 (38.0)	13,766 (38.4)
	Obese	8,469 (23.9)	6,384 (24.9)	9,577 (26.7)
Type 2 Diabetes mellitus	Yes	1,356 (3.8)	1,518 (4.4)	1,752 (4.9)
High blood pressure	Yes	3,566 (10.1)	3,450 (10.1)	3,498 (9.8)
Fruit and vegetable consumption	Low	7,263 (20.5)	20,469 (59.8)	9,913 (27.7)
	Medium	20,532 (58.0)	10,145 (29.6)	18,655 (52.0)
	High	7,624 (21.5)	3,628 (10.6)	7,279 (20.3)

Source: self made

Table 2. Crude and Adjusted Multivariate Regression Analysis of the Factors Associated with Depression in People Surveyed in 2019, 2020, and 2021

| Characteristics* | | Symptoms of depression | | Crude model | Adjusted model |
| | | No | Yes | PRc (CI 95%) | PRa (CI 95%) |
		n (%)	n (%)		
Sex	Female	42,890 (84.0)	8,159 (16.0)	Ref.	Ref.
	Male	39,428 (72.4)	15,035 (27.6)	1.73 [1.7–1.8]	0.58 [0.6–0.6]
Age groups	15 to 35 years old	36,233 (80.8)	8,586 (19.2)	Ref.	Ref.
	36 to 59 years old	33,444 (78.6)	9,909 (21.4)	1.16 [1.1–1.2]	1.02 [1.0–1.1]
	60 to 69 years old	7,042 (73.1)	2,587 (26.9)	1.40 [1.3–1.5]	1.07 [1.0–1 .1]
	70 years old or more	5,598 (65.6)	2,930 (34.4)	1.79 [1.7–1.9]	1.23 [1.1–1.3]
Year	2019	27,988 (79.0)	7,432 (21.0)	Ref.	Ref.
	2020	26,559 (77.6)	7,684 (22.4)	1.07 [1.0–1.1]	1.05 [1.0–1.1]
	2021	27,770 (77.5)	8,078 (22.5)	1.07 [1.0 –1.1]	1.08 [1.0–1.1]
Marital status	Single	19,078 (79.3)	4,977 (20.7)	Ref.	–
	Married	21,324 (78.5)	5,837 (21.5)	1.04 [1.1–1.1]	–
	Cohabitant	29,631 (81.3)	6,809 (18.7)	0.90 [0.7-0.9]	–
	Widowed	3,717 (63.4)	2,151 (36.7)	1.77 [1.6–1.9]	–
	Divorced	710 (75.9)	225 (24.1)	1.16 [0.9–1.5]	–
	Separated	7,857 (71.1)	3,196 (28.9)	1.40 [1.3–1.5]	–
Region of living	Metropolitan Lima	30,897 (78.9)	8,255 (21.1)	Ref.	Ref.
	Rest of coast	22,181 (81.4)	5,074 (18.6)	0.88 [0.8–0.9]	0.84 [0.8–0.9]
	Highlands	18,629 (71.8)	7,321 (28.2)	1.34 [1.3–1.4]	1.30 [1.2–1.4]
	Jungle	10,609 (80.6)	2,543 (19.3)	0.92 [0.9–1.0]	0.89 [0.8–0.9]
Education	No level	111 (62.9)	68 (37.1)	Ref.	Ref.
	Primary	14,076 (71.5)	5,623 (28.5)	0.77 [0.6–1.0]	0.88 [0.6–1.2]
	Secondary	37,608 (82.9)	10,257 (21.4)	0.58 [0.5–0.7]	0.77 [0.6–1.0]
	Superior	28,475 (82.9)	5,868 (17.1)	0.46 [0.3–0.6]	0.62 [0.5–0.8]
Wealth index	Poorest	14,718 (75.1)	4,890 (24.9)	Ref.	Ref.
	Poor	16,918 (77.5)	4,923 (22.5)	0.90 [0.9–0.9]	1.03 [1.0–1.0]
	Medium	17,187 (78.0)	4,850 (22.0)	0.88 [0.8–0.9]	1.03 [0.9–1.1]
	Rich	16,466 (7.8)	4,687 (22.2)	0.89 [0.8–0.9]	1.07 [1.0–1.2]
	Richer	17,028 (81.6)	3,843 (18.4)	0.74 [0.7–0.8]	0.91 [0.8–1.0]
Residence area	Urban	66,968 (78.6)	18,215 (21.4)	Ref.	Ref.
	Rural	15,350 (75.5)	4,979 (24.5)	0.82 [0.7–0.9]	0.92 [0.9–1.0]
Physical disability	Yes	1,596 (56.9)	1,212 (43.2)	2.01 [1.9–2.2]	1.59 [1.4–1.8]
Daily smoking	Yes	1,143 (80.3)	281 (19.7)	0.90 [0.7–1.01]	–
Drinking alcoholic beverages	Yes	9,131 (81.3)	2,099 (18.7)	0.84 [0.8–0.9]	1.10 [1.0–1.2]
Health Insurance	Yes	20,492 (79.2)	5,392 (20.8)	0.93 [0.9–1.0]	1.04 [1.0–1.1]
Body Mass Index	Underweight	2,646 (77.7)	762 (22.4)	Ref.	–
	Normal weight	24,476 (78.1)	6,873 (21.9)	0.98 [0.9–1.1]	–
	Overweight	29,776 (79.0)	7,926 (21.0)	0.92 [0.8–1.0]	–
	Obesity	18,776 (76.9)	5,655 (23.2)	1.04 [0.2–1.2]	–
T2DM	Yes	2,989 (64.6)	1,639 (35.4)	1.66 [1.5–1.8]	1.35 [1.2–1.5]
High blood pressure	Yes	6,851 (65.2)	3,665 (34.9)	1.70 [1.6–1.8]	1.36 [1.3–1.5]
Fruit and vegetable consumption	Low	28,070 (74.6)	9,577 (35.4)	Ref.	Ref.
	Medium	39,483 (80.0)	9,850 (20.0)	0.78 [0.7–0.8]	0.86 [0.8–0.9]
	High	14,765 (79.7)	3,767 (20.3)	0.80 [0.7–0.8]	0.94 [0.9–1.0]

* Each factor has been independently adjusted for sex, categorized age, year, region of living, education, wealth index, residence area, physical disability, drinking alcoholic beverages, health insurance, type 2 diabetes mellitus, high blood pressure as well as fruit and vegetable consumption.
PR: Prevalence ratio. CI 95%: Confidence interval at 95%
Source: self-made

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Discussion

In this study, 23,194 Peruvians with depressive symptoms were found (23.2% of the total). Concerning the sociodemographic variables, we observed that males were more likely to present symptoms of depression. This result is consistent with numerous previously conducted studies supporting a morphologic and pathophysiologic basis for a differential presentation and response by sex (Birur et al., 2017; Calvó-Perxas et al., 2015; Eid et al., 2019; Hernández-Yépez et al., 2022; Kong et al., 2013; Sramek et al., 2016); for example, a study by Kong et al. (2013), demonstrated that sex differences exist in the morphological alterations of the cortico-limbic-striatal system in patients with depression. Finally, in an investigation carried out by Birur et al. (2017), sex differences were found in the peripheral immune system in patients with depression since depressed females, unlike healthy or depressed men, had elevated levels of interleukin (IL)-6 and leptin; in addition, compared to the non-depressed females, men had elevated levels of IL-8, interferon-γ, and leptin, and reduced levels of IL-5.

Regarding the region, we found that residents of the highlands of Peru were more likely to manifest depressive symptoms. In the year 2022, an investigation was conducted on the adult population of Peru utilizing data derived from the Encuesta Nacional de Hogares (ENDES) spanning the years 2018 to 2020. Following a meticulous geospatial analysis, a discernible correlation was observed, indicating a concurrence of depressive disorder across the three years under examination, particularly within the departments of the southern highlands, which concurrently represented regions characterized by pronounced economic depression (Martina Chávez et al., 2022).

In contrast to the results found in this research where males had a greater tendency to depression, the evidence points out that the presence of depressive symptoms in females may be associated with the social and cultural challenges faced by this gender, as was found in a cohort study carried out on child-bearing women, in which depressive symptoms were significantly higher among women who reported gender discrimination compared with women without perceived gender discrimination (Stepanikova et al., 2020).

Regarding age, being 70 years or older was also associated with the presence of depressive symptoms. This result is consistent with that published by Baldeón-Martínez et al. (2019), who observed that being older than 75 was a sociodemographic variable related to depression. Similarly, a study by Martina et al. (2017) based on the ENDES identified that 30% of the Peruvian elderly were 75 years of age or older and that this age range was significantly associated with depression symptoms. Older adults have many comorbidities and have witnessed the loss of several close people, which could explain the frequent depressive manifestations (Baldeón-Martínez et al., 2019).

Furthermore, an association was established between the residence's location and the presence of depressive symptoms, with the inhabitants of rural areas showing the least probability of exhibiting depression; this could be due to a more communal and less stressful lifestyle compared to urban areas. Our results agree with the study conducted by Saltos et al. (2021), where higher levels of depression were recorded in the urban area: people in this area had very high levels of depression, with a prevalence of 48.7%. In contrast, another study revealed that rural residents perceive less social support, experience greater loneliness, and have a less precise and defined purpose in life (Salinas, 2020).

Higher education was found to be associated with depression; however, compared to the study by Liu et al. (2019), whose results indicated an increase in depressive symptoms in proportion to the time of academic training, probably due to the pressure of studying more specialized courses and financial concerns; in this study, the results showed that having a higher education decreased the probability of presenting depressive symptoms.

Having some physical disability proved to be associated with depression. In line with these results is the retrospective cohort study by Luna-Orozco et al. (2020), where the authors revealed that adults with physical limitations compared to those without limitations presented a 68% increased risk for the development of depressive symptoms. Likewise, our article is in agreement with the study by Chao (2014), in which the researchers found that physical disability can contribute to the presence of depression due to the reduction of physical activities and social support.

Another associated factor found was the consumption of alcoholic beverages. Similarly, an investigation carried out in Peruvian male adults revealed that drinking alcohol was a risk factor associated with depression (Estrada-Durand & Salinas-Salas, 2019). Nevertheless, our results differ from those found by Gémes et al. (2019), who argue that those who did not drink alcohol had a higher risk of depression than those who consumed up to seven alcoholic drinks per week. Since alcohol intoxication affects the brain, it is expected that alcohol addiction is associated with numerous mood disorders, among which depression stands out. The consumption of this substance generates biological changes in the brain, such as an increase in protein monocyte chemoattractant-1 and high-

sensitivity C-reactive protein, the same as those observed in men, but not women, with clinical depression (Kelley & Dantzer, 2011).

Furthermore, the presence of T2DM or hypertension were factors associated with depression; these chronic conditions can contribute to psychological stress and have a negative impact on the quality of life, which could exacerbate depressive symptoms. In accordance with this result is the work of the Mexican researchers Galindo-Vázquez et al. (2020), who observed a high presence of depressive symptoms in individuals who manifested one or more medical comorbidities. Similarly, Collazos-Perdomo et al. (2020) found a difference in prevalence between patients with and without hypertension, 17.4% and 12.6% correspondingly; there is probably a bidirectional relationship (Collazos-Perdomo et al., 2020) influenced by the abnormal functioning of the autonomic nervous system in connection with an increased sympathetic activity and poor vagal control in affected individuals (Scalco et al., 2005).

Consuming fruits and vegetables influenced the presence of depressive symptoms; Ocean et al. (2019) uncovered that the effects of increasing the frequency of fruit and/or vegetable consumption on mental well-being were comparable to the effects of many shocking events in life. For example, if an individual who consumed vegetables daily stopped eating them completely, they would thereby suffer a loss of mental stability greater than that of being widowed.

The novel associated factor was referring to the year in which the data had been collected since there was a greater probability of finding people with depression among those surveyed during 2021 than those surveyed during the years 2019 and 2020. This finding may be due to the greater time in quarantine accumulated due to confinement by COVID-19, since it has been shown that spending less time outdoors is associated with severe symptoms of depression (Young et al., 2022). Furthermore, in a study carried out by Lei et al. (2020) research revealed that the prevalence of depression in people affected by COVID-19 was higher than in those who had not been affected.

Strengths and Limitations

It is crucial to point out this work's strengths. First, we employed a nationally representative database, rigorously selecting the study population and subsequent sampling. Furthermore, it is essential to clarify that the ENDES uses mechanisms to avoid the duplication of participants in the different cycles of the survey. In other words, it is doubtful that the same individual has been tested in more than one of these years. This is achieved through a rigorous sampling design and selection procedures intended to ensure that each year's participants are different. Therefore, although we cannot state with absolute certainty that no duplication of participants exists, the methodologies used by ENDES significantly minimize this possibility, allowing us to treat the data as independent sets for each year.

It remains nevertheless also essential to highlight some limitations due to the nature of the study. As this is a cross-sectional study, it is not possible to determine the causal relationships between the variables of interest. In turn, the PHQ-9 instrument only allows the assessment of depressive symptoms within the 14 days prior to the survey.

Conclusion, Implications, and Future Directions

In conclusion, we have identified in this study several factors associated with depressive symptoms among the Peruvian population, including sex, age (70 years or older), survey year, residence in a rural area, educational level, regional residence, physical disability, alcohol consumption, presence of Type 2 Diabetes Mellitus, high blood pressure, higher-than-low fruit consumption, and the year the survey was conducted.

Given our findings, several implications become manifest for the Peruvian mental healthcare system. Firstly, targeted interventions could be developed for individuals in identified high-risk categories, such as those living in rural areas or those over the age of 70. Secondly, the association between higher education and depressive symptoms necessitates further investigation to develop educational interventions that could be integrated into mental health promotion programs. We also recommend that the Peruvian mental healthcare system place a greater emphasis on holistic care, taking into account the interaction between physical health conditions, such as T2DM and high blood pressure, and mental health. This could include integrating mental health services into primary care settings or developing multidisciplinary teams comprising general practitioners, psychologists, and other specialists.

For future research, it would be beneficial to delve deeper into the causative relationships between these associated factors and depressive symptoms, possibly through longitudinal studies or randomized controlled trials. This could further inform targeted interventions and public health policies aimed at reducing the prevalence of depression in Peru.

Author contribution
Gianella Zulema ZEŃAS-TRUJILLO: methodology, investigation, data management, interpretation, writing original draft, writing review and editing.
Víctor Juan VERA-PONCE: conceptualization, design, methodology, funding acquisition, investigation, project administration, data management, formal analysis, supervision, writing review and editing.

Ethical statement
This manuscript is the authors' original work. Human participants have been not involved in this study. This study was based on a secondary analysis of existing public datasets of the ENDES. All data was submitted anonymously, so potential harm to primary study participants was minimal. No ethical approvement, informed consent or data handling policy was needed.

Data availability
This manuscript was based on analyzing existing public domain survey datasets that are freely available online with all identifier information removed. (https://proyectos.inei.gob.pe/microdatos/)

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