Prevalence and factors associated with depressive symptoms in rural and urban Mexican older adults: evidence from the Mexican Health and Aging Study 2018

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Abstract

Objective. To determine the prevalence and factors related to depressive symptoms in older Mexican adults in urban and rural areas. **Materials and methods.** Cross-sectional study. We examined older adults from a sample taken from the Mexican Health and Aging Study (MHAS-2018). 14 230 older Mexicans were screened for self-reported depressive symptoms. **Results.** The prevalence of depressive symptoms was 29.8% (33.4% rural vs. 28.9% urban). In the rural and urban population, the probability of a high prevalence of depressive symptoms was higher in older adults with multimorbidity ≥3, severe pain, and fair/poor SRH. Only in the urban population the prevalence of depressive symptoms increased with lower schooling. **Conclusion.** Identification of the factors related to depressive symptoms may help healthcare professionals provide better treatment for specific groups in the population.

Keywords: depressive symptoms; older adults; multimorbidity; self-reported health; pain

Resumen

Objetivo. Determinar la prevalencia y los factores relacionados con síntomas depresivos en adultos mayores mexicanos en áreas urbanas y rurales. **Material y métodos.** Estudio transversal. Se examinó a adultos mayores de una muestra tomada de la Encuesta Nacional sobre Salud y Envejecimiento (Enasem-2018). 14 230 mexicanos mayores fueron evaluados para detectar síntomas depresivos por autorreporte. **Resultados.** La prevalencia de síntomas depresivos fue de 29.8% (33.4% rural vs. 28.9% urbano). En la población rural y urbana, la probabilidad de una alta prevalencia de síntomas depresivos fue mayor en los adultos mayores con multimorbilidad ≥3, dolor severo y autorreporte de salud regular/mala. Sólo en la población urbana la prevalencia de síntomas depresivos aumentó con la disminución de los años de educación. **Conclusión.** La identificación de factores relacionados con los síntomas depresivos puede ayudar a los profesionales de la salud a brindar un mejor tratamiento a grupos específicos de la población.

Palabras clave: síntomas depresivos; adultos mayores; multimorbilidad; autorreporte de salud; dolor

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Depression is a mental health disorder that may affect both the physical and mental health of people and has become an important public health problem, elderly adults being the most vulnerable group.[1] According to estimates by the World Health Organization (WHO), 322 million people live with depression worldwide, and its prevalence increases with age, given that, in the 55-to-74-year-old age group, 7.5% of women and 5.5% of men have depression.[1]

It is estimated that 48.1 million people are living with depressive symptoms in the Americas region, while in the United States 17.4 million people have depression.[1] Similarly, epidemiological studies show a wide range in the prevalence of depressive symptoms among older adults in studies from Sweden, with 9.1%; from Chile, and from Malaysia, with up to 59.1%.[2-4] In Mexico, the National Health and Nutrition Survey 2012 (Ensanut 2012) and Ensanut 100k found a prevalence of depressive symptoms of 19.6 and 21.4%, respectively, in adults aged over 20 years.[5] Similarly, García-Peña and colleagues reported a prevalence of depressive symptoms of 21.7% in older adults in México, among whom women showed a higher proportion of depressive symptoms (24.7%) than men (16.2%).[6]

One of the factors that has generated significant changes in Mexico has been the urbanization process. According to information obtained by the Population and Housing Census, urban growth has been greater than rural growth, because internal migration has contributed to generate higher growth rates among urban populations than among rural ones. Another change caused by urbanization is the variation in educational levels, lifestyle, social policy, and the coverage and use of health services between rural and urban areas.[7] Thus, the effect of urbanization appears to have reduced the social support provided by family and friends, especially in rural areas, leading to an increasing number of people who exhibit depressive symptoms.[7] Educational levels and income may be lower in rural areas than in urban areas; some research has shown that and lower educational and income levels are associated with depressive symptoms.[8] The results of the Canadian Longitudinal Study on Aging (CLSA) in the urban and rural populations of older adults show no differences in the prevalence of depressive symptoms,[9] while others report lower prevalence of depression in urban populations, or lower prevalence of depression in rural populations.[10]

The prevalence of depressive symptoms in older adults is related to other risk factors such as age, sex, chronic pain, multimorbidity, place of residence and Self-Reported Health (SRH). Due to the aging of the population, there may be differences in SRH status between urban and rural populations. SRH is an im-portant indicator associated with both morbidity and mortality in older adults and with the general health of the population.[11] Studies have reported that older adults with depressive symptoms present a negative (fair/poor) SRH.[12-14] Chronic pain becomes more frequent as age increases,[15] because, among other reasons, it can be associated with chronic diseases whose prevalence is higher in older adults,[16] while it can also be associated with the presence of depressive symptoms.

Although various research studies conducted on a global level have examined the relationship between depressive symptoms and rural and urban populations,[7,17] in Mexico, only the prevalence of depressive symptoms in low-income women in rural communities has been studied.[18] The study of depressive symptoms among the rural population is complicated, due to presence of unfavorable conditions that cause an impact on the evaluation of population's health. Therefore, investigating and analyzing the factors associated with depressive symptoms would help us explain the differences between rural and urban populations in Mexico.

In order to address some of these issues, we have conducted a cross-sectional analysis of the fifth wave of a population-based cohort study –the 2018 Mexican Health and Aging Study. The objectives were: I) To determine the prevalence of and factors related to depressive symptoms in older Mexican adults in urban and rural areas; and II) To determine whether there are differences in the prevalence of depressive symptoms among these demographic groups.

Materials and methods

Data

The MHAS is the first nationally-representative longitudinal study of aging in Mexico. The MHAS cohort was established in 2001 and included adults from rural and urban regions from all 32 states in Mexico. Participants were reinterviewed in 2003, 2012, 2015, and 2018. The MHAS surveys are conducted under the supervision of coordinators from both Mexico and the United States and are partially funded by the National Institute of Aging at the United States' National Institutes of Health (NIH R01AG018016) and Mexico's National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía*, Inegi). The MHAS data files and documentation are available for public use at www.enasem.org.[19] The MHAS was approved, in the United States, by the institutional review boards and ethics committees of the University of Texas Medical Branch and, in Mexico, by Inegi and the National Institute of Public Health. Moreover, the present study adhered to the ethical

guidelines set out in the Declaration of Helsinki and obtained signed informed consent from all participants and their next-of-kin.

Study population

The sample used by the present study comprised 14 230 adults aged 50 years and older and taken from the MHAS-2018 survey, of whom 1 969 were excluded due to missing responses.

Measurement of variables

Measurement of depressive symptoms

The dependent variable on which the present study was based was depressive symptoms, evaluated using a nine-item scale modified from the Center for Epidemiological Studies Depression scale (CES-D), which asked respondents whether, in the past week, they had experienced the following symptoms a majority of the time: (a) feeling depressed; (b) feeling that everything they did was difficult; (c) feeling that they had restless sleep; (d) feeling happy (reverse coded); (e) feeling alone; (f) feeling that they enjoyed life (reverse coded); (g) feeling sad; (h) feeling tired, and (i) feeling very energetic (reverse coded). Older adults with scores ranging from 0 to 4 were categorized as having low depressive symptoms, while a score ≥ 5 indicates high depressive symptoms. The Spanish language version of the CES-D shows good levels of sensitivity and specificity (80.7 and 68.7%, respectively) for the screening of depressive symptoms in older adults.[20]

Covariates

In accordance with previous studies, the present study included a number of sociodemographic and health-related covariates in the analyses, such as age, sex, place of residence, and level of educational attainment.[3,11,21] Place of residence was categorized into urban and rural areas according to the household information recorded by the interviewers; in Mexico, a rural area is classified as having a population of less than 2 500 inhabitants.[22] The population was divided by age, recorded in years and categorized into two groups (<65 years and ≥65 years), and sex (men/women). The variable education years was categorized in the present study into an absence of formal education/1-9 years/≥10 years.[21]

Health-related covariates comprised SRH, pain, use of glasses, use of an auditory device, current smoker, number of visits to a dentist over the past year, presence of chronic diseases, and multimorbidity. Older adults

were classified as having prevalent SRH concerns and categorized into two groups: excellent/very good/good and fair/poor, depending on their answer to the question, "Would you say your health is Excellent/very good/good/fair/poor?". Older adults were classified in relation to having pain and categorized into two groups (yes/no), depending on their answer to the question, "Do you often suffer from pain?". The range of intensity of the respondents' pain was measured on a Likert scale and placed into one of three categories (no pain, mild-moderate, and severe pain), depending on their answer to the question, "How is your pain the majority of the time?" Respondents were categorized into two groups (yes/no) depending on their answer to the question, "Does this pain limit your usual activities, such as household chores or your job?". The respondents were asked whether they wore glasses (yes/no), wore an auditory device (yes/no), currently smoked cigarettes (yes/no), and had visited a dentist over the past year (yes/no). The presence of chronic conditions such as diabetes, hypertension, heart attack, asthma, and arthritis (yes/no) were measured by self-reporting, while multimorbidity was defined as presenting three or more chronic conditions.

Statistical analysis

A bivariate analysis with Pearson's Chi-square test between rural and urban areas was conducted by covariates. Subsequently, a binary logistic regression and an estimated odds ratio (OR) were applied with a 95% confidence interval (95% CI) for the association between the depressive symptoms (low depressive symptoms=0; and, high depressive symptoms=1) and the independent variables, adjusted for confounders (model I). Finally, models were constructed stratifying by place of residence (model II= Urban; and, model III= Rural) and adjusting for the variables mentioned above. Model diagnostic tests were conducted using the Hosmer-Lemeshow goodness-of-fit test and evaluating the influence statistics and outliers. The analysis was performed using Stata 15 software.*

Results

Population characteristics

The mean age of the respondents was 64.7 (±10.4) years, and, overall, 57.2% of them were women (8 138). Fur-

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* StataCorp. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC, 2017.

thermore, 80.8% of the respondents reported having had ≤ 9 years of education, 19.9% lived in a rural area, 58.2% wore glasses, 2.1% wore an auditory device, 11.5% currently smoked, and only 39.7% had visited a dentist over the past year. With regard to health characteristics, 60.2% of adults reported having at least one chronic condition and 25.8% had two or more, while diabetes (25.2%), hypertension (44.9%), and arthritis (12.5%) were the most frequent diseases. Additionally, 39.9% of people reported frequent pain, and 9.3%, severe pain.

Prevalence of depressive symptoms

The prevalence of depression was 29.8%, with the rural population presenting a higher prevalence of depressive symptoms than the urban population (33.4% vs. 28.9%; *p*<0.001). Women presented a higher prevalence of depressive symptoms than men (*p*<0.001), while older adults aged ≥65 years reported a higher prevalence of depressive symptoms than adults aged <65 years (*p*<0.001). Older adults who wear glasses showed a significantly higher prevalence of depressive symptoms than those use do not wear glasses (*p*<0.001) (table I).

Older Mexican adults who reported asthma (45.6%), arthritis (47.8%), and having suffered a heart attack

Table I
Sociodemographic and health variables by depressive symptoms (DS) in older Mexican adults. Results of MHAS 2018 (n=14 230)

	Low DS (n=9 986) n (%)	High DS (n=4 244) n (%)	p*
Age (years)			
< 65	5 344 (72.2)	2062 (27.8)	<0.001
≥ 65	4 642 (68.0)	2182 (32.0)	
Sex			
Male	4 828 (79.3)	1 264 (20.7)	<0.001
Female	5 158 (63.4)	2 980 (36.6)	
Education years			
No education	1 112 (58.6)	785 (41.4)	<0.001
1-9	6 612 (68.8)	2 993 (31.2)	
≥10	2 262 (82.9)	466 (17.1)	
Wears glasses			
No	4 287 (72.1)	1 657 (27.9)	<0.001
Yes	5 699 (68.8)	2 587 (31.2)	
Wears an auditory device			
No	9 793 (70.3)	4 144 (29.7)	0.104
Yes	193 (65.9)	100 (34.1)	

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Currently smokes			
No	8 789 (69.8)	3 799 (30.2)	0.010
Yes	1 197 (72.9)	445 (27.1)	
Dental visits			
No	5 831 (68.0)	2 748 (32.0)	<0.001
Yes	4 155 (73.5)	1 496 (26.5)	
Presence of chronic diseases			
Diabetes	2 280 (63.5)	1 312 (36.5)	<0.001
Hypertension	4 042 (63.2)	2 350 (36.8)	<0.001
Heart attack	328 (57.2)	245 (42.8)	<0.001
Asthma	448 (54.4)	375 (45.6)	<0.001
Arthritis	926 (52.2)	848 (47.8)	<0.001
Multimorbidity			
0	4 461 (78.7)	1 204 (21.3)	<0.001
1	3 443 (70.3)	944 (29.7)	
2	1 701 (59.5)	491 (40.5)	
≥3	381 (46.9)	129 (53.1)	
Pain			
No pain	6 976 (81.5)	1 582 (18.5)	<0.001
Mild-moderate	2 506 (57.6)	1 842 (42.4)	
Severe	504 (38.1)	820 (61.9)	
Self-reported health (SRH)			
Excellent/very good	976 (91.7)	88 (8.3)	<0.001
Good	3 484 (84.8)	625 (15.2)	
Fair	5 082 (66.3)	2 589 (33.7)	
Poor	444 (32.0)	942 (68.0)	
Place of residence			
Urban	8 101 (71.1)	3 298 (28.9)	<0.001
Rural	1 885 (66.6)	946 (33.4)	

* Chi-square test; MHAS: 2018 Mexican Health and Aging Study

(42.8%) exhibited a higher prevalence of depressive symptoms. Older adults with three or more chronic conditions had a greater prevalence of depressive symptoms than those with either none or one of such conditions (*p*<0.001). Table I shows the sociodemographic and health characteristics by depressive symptoms.

Rural population

Women exhibited a higher prevalence of depressive symptoms than men (*p*<0.001), while older adults ≥65 years reported a higher prevalence of depressive symptoms than adults aged <65 years (*p*<0.001). Older adults with three or more chronic conditions exhibited a greater prevalence of depressive symptoms than those with

none, one, or two of such conditions (*p*<0.001). Older adults with severe pain reported a higher prevalence of depressive symptoms than those with no pain (*p*<0.001). Depressive symptoms were more prevalenty among older adults with a poor SRH than among those with a good SRH (*p*<0.001). Table II shows a comparison of the prevalence of depressive symptoms between rural and urban Mexican older adults.

Table II
Prevalence of depressive symptoms in rural and urban older Mexican adults.
Results of MHAS 2018 (n=14 230)

	Urban population (n=11 399)			Rural population (n=2 831)		
	Low DS (n=8 101) n (%)	High DS (n=3 298) n (%)	*p**	Low DS (n=1 885) n (%)	High DS (n=946) n (%)	*p**
Sex						
Men	3 821 (80.2)	946 (19.8)	<0.001	1 007 (76.0)	318 (24.0)	<0.001
Women	4 280 (64.5)	2 352 (35.5)		878 (58.3)	628 (41.7)	
Age (years)						
< 65	4 303 (73.1)	1 581 (26.9)	<0.001	1 041 (68.4)	481 (31.6)	0.027
≥ 65	3 798 (68.9)	1 717 (31.1)		844 (64.5)	465 (35.5)	
Education years						
No education	688 (57.3)	513 (42.7)	<0.001	424 (60.9)	272 (39.1)	<0.001
1-9	5 266 (69.1)	2 352 (30.9)		1 346 (67.7)	641 (32.3)	
≥10	2 147 (83.2)	433 (16.8)		115 (77.7)	33 (22.3)	
Wears glasses						
No	3 176 (73.3)	1 159 (26.7)	<0.001	1 111 (69.1)	498 (30.9)	<0.001
Yes	4 925 (69.7)	2 139 (30.3)		774 (63.3)	448 (36.7)	
Wears an auditory device						
No	7 930 (71.2)	3 214 (28.8)	0.153	1 863 (66.7)	930 (33.3)	0.253
Yes	171 (67.1)	84 (32.9)		22 (57.9)	16 (42.1)	
Currently smokes						
No	7 101 (70.9)	2 914 (29.1)	0.299	1 688 (65.6)	885 (34.4)	<0.001
Yes	1 000 (72.3)	384 (27.7)		197 (76.4)	61 (23.6)	
Dental visits						
No	4 473 (68.4)	2 067 (31.6)	<0.001	1 358 (66.6)	681 (33.4)	0.975
Yes	3 628 (74.7)	1 231 (25.3)		527 (66.5)	265 (33.5)	
Multimorbidity						
0	3 520 (80.0)	878 (20.0)	<0.001	941 (74.3)	326 (25.7)	<0.001
1	2 821 (71.4)	1 130 (28.6)		622 (65.9)	322 (34.1)	
2	1 427 (60.3)	939 (39.7)		274 (55.8)	217 (44.2)	
≥3	333 (48.7)	351 (51.3)		48 (37.2)	81 (62.8)	
Pain						
No pain	5 653 (82.3)	1 218 (17.7)	<0.001	1 323 (78.4)	364 (21.6)	<0.001
Mild-moderate	2 031 (59.0)	1 412 (41.0)		475 (52.5)	430 (47.5)	
Severe	417 (38.4)	668 (61.6)		87 (36.4)	152 (63.6)	
SRH‡						
Excellent/very good	867 (92.1)	74 (7.9)	<0.001	109 (88.6)	14 (11.4)	<0.001
Good	2 935 (85.5)	499 (14.5)		549 (81.3)	126 (18.7)	

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Fair	3 972 (66.3)	2 021 (33.7)	1 110 (66.1)	568 (33.9)
Poor	327 (31.7)	704 (68.3)	117 (33.0)	238 (67.0)

* Chi-square test
‡ Self-reported health
MHAS: 2018 Mexican Health and Aging Study; DS: depressive symptoms

Urban population

The women of the sample exhibited a higher prevalence of depressive symptoms than the men ($p<0.001$), while older adults aged ≥65 years reported a higher prevalence of depressive symptoms than adults aged <65 years ($p<0.001$). Older adults who do not visit the dentist presented a higher prevalence of depressive symptoms than those who do ($p<0.001$). Older adults with three or more chronic conditions exhibited a greater prevalence of depressive symptoms than those with none, one, or two of such conditions ($p<0.001$). Older adults with severe pain reported a higher prevalence of depressive symptoms than those adults with no pain ($p<0.001$), while they were more frequent among older adults with a poor SRH than among those with a good SRH ($p<0.001$).

Multivariable analysis

The probability of presenting depressive symptoms was higher in women with a lack of formal education who currently smoke and who present both a lack of visits to the dentist and comorbidities ≥3. Similarly, the presence of severe pain, having a fair/poor SRH, and being from a rural population were also associated with a high level of depressive symptoms in older adults (table III, model I).

Among both urban and rural older adults, the probability of presenting a high level of depressive symptoms was higher in women than in men (OR=1.78; $p<0.001$ and OR=1.87; $p<0.001$, respectively). Moreover, having three or more comorbidities increases the probability of exhibiting a high level of depressive symptoms in older adults of the urban and rural populations (OR=1.83; $p<0.001$ and OR=2.16; $p<0.001$, respectively). Similarly, severe pain increases the probability of exhibiting a high level of depressive symptoms in both populations (urban OR=4.52; $p<0.001$ and rural OR=4.64; $p<0.001$). Having a fair/poor SRH increases the probability of experiencing a high level of depressive symptoms in the older adults of the urban and rural population (OR=2.58; $p<0.001$ and OR=2.15; $p<0.001$, respectively) (table III,

model II and model III). Finally, other variables were observed to be related to the presence of a high level of depressive symptoms in the urban population, such as: a lack of formal education (OR=2.19; $p<0.001$), being a current smoker (OR=1.28; $p<0.001$), and not visiting the dentist (OR=1.34; $p<0.001$).

Discussion

The present cross-sectional study used data from a nationally-representative sample of older adults in Mexico. The main contribution of this study was the identification of rural–urban differences in the associations between depressive symptoms and factors related in older Mexican adults. Overall, older adults in the rural population were more likely to experience depressive symptoms relative to those in the urban population, even after adjusting for potential confounding factors.

Depression is a multifactorial mental illness with a probability of occurring that depends on the presence of one or more risk factors; however, it remains necessary to determine the multiple interactions among these factors. In the present study, depressive symptoms were associated with sex differences (women), multimorbidity, pain severity and fair/poor self-reported health in both the urban and rural populations. Education years, dental visits and currently smokes were only associated with the urban population. There are various possible reasons why, in Mexico, older adults in the rural populations were more likely to experience depressive symptoms than those in the urban populations.

It is estimated that 21% of the Mexican population lives in rural areas.[23] Older adults in rural areas are usually isolated, both socially and geographically, live on limited resources, and experience difficulties in accessing and paying for health services; this has led to mental disorders that go untreated, as older adults living in rural areas have a lower income than those living in urban areas.[24]

Research carried out on adults over 60 years of age has reported a prevalence of depressive symptoms corresponding to 18.5[25] and 34.7%, while living in a rural area is associated with depressive symptoms.[26] The

results of the Canadian Longitudinal Study on Aging in older adults reported a prevalence of 16.3 and 17.1% in rural and urban populations, respectively. Also, no statistically significant differences were detected in the odds of depressive symptoms between rural and urban areas.[9] The present study found a prevalence of 33.4 and 28.9% in rural and urban populations; furthermore, living in a rural area increases the probability of a high level of depressive symptoms among older adults.

Women were observed to be more likely to exhibit a high level of depressive symptoms than men in both urban and rural populations –a finding reported by other studies, which also found that women are approximately twice as likely than men to have depressive symptoms throughout their life.[27] Several studies have reported similar differences according to sex. In China, the prevalence of depressive symptoms was higher in women than in men (24.2 vs. 19.4%), in rural than urban populations (29.2 vs. 20.5%), respectively.[28] It is important, therefore, that health professionals and services pay attention to the special needs of both urban and rural populations, making an early diagnosis to promote

Table III

ADJUSTED ODDS RATIOS FOR THE ASSOCIATIONS BETWEEN DEPRESSIVE SYMPTOMS AND RELATED VARIABLES IN OLDER ADULTS, WITH THE ANALYSIS STRATIFIED BY PLACE OF RESIDENCE (URBAN AND RURAL POPULATION). RESULTS OF MHAS 2018

	Model I		Model II		Model III	
	Whole sample n=14 230		*Urban population n=11 399*		*Rural population n=2 831*	
Variables	OR (95%CI)	*p value*	OR (95%CI)	*p value*	OR (95%CI)	*p value*
Sex (Men ref.)						
Women	1.81 (1.66-1.97)	<0.001	1.78 (1.61-1.97)	<0.001	1.87 (1.55-2.25)	<0.001
Age categories (<65 years ref.)						
≥65	0.94 (0.86-1.02)	0.193	0.91 (0.83-1.00)	0.067	1.09 (0.91-1.30)	0.338
Education years (≥10 years ref.)						
1-9	1.39 (1.23-1.57)	<0.001	1.40 (1.23-1.59)	<0.001	1.13 (0.73-1.76)	0.566
No education	2.06 (1.76-2.42)	<0.001	2.19 (1.83-2.62)	<0.001	1.46 (0.92-2.34)	0.108
Currently smokes (No, ref.)						
Yes	1.22 (1.07-1.39)	0.003	1.28 (1.11-1.47)	0.001	0.94 (0.67-1.31)	0.719
Wears glasses (No, ref.)						
Yes	1.06 (0.97-1.15)	0.142	1.06 (0.97-1.17)	0.178	1.05 (0.88-1.25)	0.554
Wears an auditory device (No, ref.)						
Yes	1.19 (0.91-1.57)	0.190	1.20 (0.89-1.60)	0.223	1.19 (0.58-2.40)	0.626
Dental visits (Yes, ref.)						
No	1.28 (1.18-1.40)	<0.001	1.34 (1.22-1.48)	<0.001	1.04 (0.86-1.26)	0.650
Multimorbidity (No diseases ref.)						
1	1.09 (0.99-1.20)	0.071	1.09 (0.98-1.22)	0.106	1.07 (0.88-1.31)	0.470
2	1.45 (1.30-1.62)	<0.001	1.46 (1.29-1.65)	<0.001	1.43 (1.12-1.81)	0.003
≥3	1.88 (1.59-2.23)	<0.001	1.83 (1.52-2.21)	<0.001	2.16 (1.43-3.26)	<0.001
Pain severity (No pain ref.)						
Mild/moderate	2.40 (2.20-2.62)	<0.001	2.36 (2.14-2.61)	<0.001	2.58 (2.14-3.09)	<0.001
Severe	4.53 (3.97-5.16)	<0.001	4.52 (3.91-5.23)	<0.001	4.64 (3.43-6.27)	<0.001
SRH (Excellent/Very good/good ref.)						
Fair/poor	2.50 (2.26-2.76)	<0.001	2.58 (2.31-2.88)	<0.001	2.15 (1.73-2.68)	<0.001
Residence (Urban ref.)						
Rural	1.11 (1.00-1.23)	0.035	–	–	–	–

OR: Odds Ratio; CI: Confidence Interval; SRH: Self-Reported Health; Model I: Log likelihood: -7 420.3677; Hosmer-Lemeshow: 0.507, Model II: Log likelihood: -5 831.2327; Hosmer-Lemeshow: 0.811, Model III: Log likelihood: -1 580.3104; Hosmer-Lemeshow: 0.357; MHAS: 2018 Mexican Health and Aging Study

timely and optimal treatment and, also, creating services and environments that will benefit older adults, reducing the inequality between men and women.

The presence of pain and multimorbidity was associated with depressive symptoms in older adults of both the urban and rural population in Mexico. Older adults in rural (OR=2.16) and urban (OR=1.83) populations with three or more chronic degenerative conditions are observed to be more likely to present a high level of depressive symptoms than those with less serious chronic conditions. On the other hand, there are few studies that evaluate multimorbidity related to depressive symptoms in older adults in a rural population. Based on the results of the China Health and Retirement Longitudinal Study, the presence of multimorbidity was associated with increased odds of finding depressive symptoms in older adults.[29] Also, the presence of chronic pain and number of medical illnesses reported were strongly associated with depressive symptoms in older adults.[30]

As the population ages, the prevalence of chronic and disabling diseases increases.[31] Furthermore, the presence of chronic pain is more frequent as age increases, as it may be associated with chronic conditions whose prevalence is higher in older adults.[16] The health conditions occurring in older people represent a great challenge for healthcare systems. Therefore, there is a need, in Mexico, for public policies and programs that will promote the integration of mental health services into primary care, taking into account the differences between urban and rural populations, providing adequate treatment, and contributing to improve the emotional state of older adults.

Few studies have proven that older adults exhibiting depressive symptoms also have a poorer SRH. Camargo-Casas and colleagues found, in adults aged over 60 in Colombia, an association between depressive symptoms and a poor/fair SRH and multimorbidity (OR=5.59; *p*<0.001).[14] Jiang H and colleagues reported that poor SRH increases the probability of a high level of depressive symptoms in older adults in rural populations compared to those in urban populations.[32] The present study identified an association between a high level of depressive symptoms in both urban and rural populations and a fair/poor SRH and multimorbidity. The results found by the present study may indicate that various chronic conditions and the presence of a high level of depressive symptoms occur more frequently in older adults and, therefore, are better indicators for the self-reporting of poor health.

One of the intermediate social determinants related to the well-being of older people is their level of education and income. Currently, the educational level is an important factor in the processes that affect mental health, mainly in terms of the development of depressive symptoms in rural and urban populations. Several studies concluded that the lower the level of formal education, the greater the risk of presenting depressive symptoms in old age.[5,33] The present study revealed that a low level of educational attainment was associated with the presence of a high level of depressive symptoms among urban populations only.

The fact that no association was found between the educational level and depressive symptoms could be explained by the socioeconomic level of rural older adults. The inequalities between the rural and urban populations with regard to health outcomes are explained by the educational level and income. Therefore, the socioeconomic conditions of the rural population can be improved by developing policies to benefit the health of rural older adults and reduce health inequalities between the rural and urban populations.[32]

The present study found that older adults from the urban population with a high level of depressive symptoms are more likely to have not visited the dentist in the last year, in contrast to those presenting a low level of depressive symptoms. A high level of depressive symptoms may have a negative impact on oral health, leading to a higher prevalence of caries,[34] tooth loss,[35] and oral health-related quality of life (OHRQoL).[36]

Limitations

Two limitations of the present study were its cross-sectional design and the use of the self-report questionnaire to evaluate depressive symptoms as a substitute for a confirmed clinical diagnosis. However, the questionnaire used in the present study has been validated in Spanish and measures depressive symptoms in older adult populations with a sensitivity of 80.7% and a specificity of 68.7%.[20] On the other hand, one of the advantages of the present study is that the sample was representative of adults aged 50 years and above in Mexico and represented both urban and rural populations, enabling an evaluation of both the aging process and the impact of chronic diseases.

Conclusions

It was found that women had a higher prevalence of depressive symptoms in both populations. Moreover, various factors were found to be associated with depressive symptoms in both the rural and urban populations of Mexico. Therefore, the early and timely detection and identification of factors related to depressive symptoms may help healthcare professionals provide better treat-

ment to specific groups of the population. It is necessary to ensure access to healthcare services and generate strategies that have a positive impact on the quality of adherence to treatment, for the purpose of substantially improving the state of health of older adults.

Declaration of conflict of interests. The authors declare that they have no conflict of interests.

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