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Resilience as a Protective Factor against Alcohol Use and Anxiety in Adolescents during the Pandemic

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ABSTRACT

Introduction. The COVID-19 pandemic saw an increase in substance use and anxiety among adolescents. Although resilience can have a protective effect against both, there is a dearth of studies examining these relationships in Mexico. **Objective.** To determine the association between resilience and the frequency of alcohol use, as well as anxiety symptomatology, among high school students in southern Veracruz during the COVID-19 pandemic. **Method.** A cross-sectional, analytical study was administered at nine high schools in southern Veracruz. Online questionnaires were used to assess students' resilience, alcohol consumption patterns, and frequency of anxiety symptoms. These assessments were conducted using three instruments: RESI-M for resilience, ASSIST for alcohol consumption, and DASS-21 for anxiety symptomatology. Descriptive and associative statistics were used. **Results.** A total of 2,194 adolescents were included, of whom 78.6% had a low or medium level of resilience; 28.3% reported lifetime alcohol use, and 22.0% had used alcohol in the past three months. A total of 25.8% of the adolescents had symptoms of severe or extremely severe anxiety. Adolescents with lower levels of resilience, as well as its dimensions showed a higher frequency of alcohol consumption ($\chi 2$ = 24.7; p < .001) and anxiety levels ($\chi 2$ = 185.45; p < .001). **Discussion and Conclusion.** These findings suggest an association between resilience, alcohol consumption, and anxiety. Further studies are required to determine whether an intervention focused on promoting resilience reduces alcohol consumption and anxiety levels.

Keywords: Mental health, alcohol use, high school students, COVID-19 pandemic.

RESUMEN

Introducción. Durante la pandemia de COVID-19, se registró un aumento en el consumo de sustancias y la ansiedad entre los adolescentes. La resiliencia podría tener un efecto protector contra ambos, sin embargo, México carece de estudios que aborden estas relaciones. **Objetivo.** Determinar la relación de la resiliencia sobre la prevalencia del consumo de alcohol y la ansiedad, en estudiantes de bachillerato durante la pandemia de COVID-19. **Método.** Se diseñó un estudio transversal, analítico en nueve bachilleratos del sur de Veracruz. Mediante el uso de cuestionarios en línea, se evaluaron los niveles de resiliencia, así como las frecuencias del consumo de alcohol, y los síntomas de ansiedad utilizando los instrumentos RESI-M, ASSIST, y DASS-21, respectivamente. **Resultados.** Se incluyó a 2194 adolescentes, de los cuales el 78.6% mostró grado bajo o medio de resiliencia, el 28.3% han consumido alcohol alguna vez en su vida, y 22.0% lo consumieron los últimos tres meses. El 25.8% de los adolescentes presentó sintomatología de ansiedad severa o extremadamente severa. Los adolescentes con menores niveles de resiliencia, así como en sus dimensiones mostraron mayor frecuencia del consumo de alcohol ($\chi 2$ = 24.7; p < .001) y mayores niveles de ansiedad ($\chi 2$ = 185.45; p < .001). **Discusión y conclusión.** Estos hallazgos sugieren un vínculo entre la resiliencia, el consumo de alcohol, y la ansiedad. Se requiere de estudios para validar si la intervención enfocada en la promoción de la resiliencia reduce los niveles de consumo de alcohol y los niveles de ansiedad.

Palabras clave: Salud mental, alcohol, estudiantes de bachillerato, pandemia de COVID-19.

INTRODUCTION

During the COVID-19 pandemic, over two years of limited physical and social interaction contributed to the emergence of mental health problems (Leeb et al., 2020; Morales Chainé et al., 2021; Thompson et al., 2021). Globally, the prevalence of anxiety and depression increased by 25.2% and 20.5% respectively, among individuals aged 10-17 in comparison with 2020 (Capasso et al., 2021; Racine et al., 2021).

During lockdown, increased stress and more intense personal and family dynamics were associated with increased alcohol use (Capasso et al., 2021; Mojica-Perez et al., 2022; Soriano-Sánchez & Jiménez-Vázquez, 2022; Thompson et al., 2021). Research conducted during lockdown in 33 countries in Latin America and the Caribbean observed an increase in the frequency of heavy episodic drinking, particularly among individuals with anxiety symptoms (Garcia-Cerde et al., 2021; Quadri et al., 2023). Likewise, higher levels of alcohol consumption were reported in Mexico compared with the years before the COVID-19 pandemic (Barrera-Núñez et al., 2022; Capasso et al., 2021; Fernández Hernández et al., 2021; Ibarrola-Peña et al., 2023; Morales Chainé et al., 2021).

Various factors in an individual's internal and social environment influence the use of alcohol and other substances. Resilience, crucial for rapid adaptation and recovery from stressful or traumatic events, enhances an individual's physical and mental well-being. It involves maintaining a positive attitude, effectively regulating emotions, seeking support when needed, and learning from challenging experiences (Verdolini et al., 2021). Individuals with lower resilience have been reported to be more vulnerable to developing psychopathology and substance use (Sandra &, 2021; Tudehope et al., 2022; Verdolini et al., 2021; Zhang et al., 2020).

Despite evidence of increased alcohol consumption and anxiety symptomatology during the pandemic, in Mexico, there has been limited research addressing issues related to resilience skills in adolescents. This study therefore sought to determine the association between resilience and frequency of alcohol use, as well as anxiety symptomatology, among high school students in southern Veracruz during the COVID-19 pandemic.

METHODS

Study Design

A cross-sectional, analytical, observational study was administered to adolescents at nine public high schools in the municipalities of Acayucan, Chinameca, Cosoleacaque, Jaltipan, Juan Rodríguez Clara, Minatitlán, Sayula de Alemán, Soteapan and Zaragoza in southern Veracruz, Mexico, during the period from May to June 2021. These schools were selected based on the cooperation achieved with the authorities and the support provided for the implementation of the research.

Participants

A non-probabilistic sample of 4,580 students from the selected high schools, including both boys and girls ages 14 to 18, enrolled in the February-June 2021 semester, who voluntarily agreed to participate in the study and completed the inventories in full, were invited to participate. However, students with a prior psychiatric or psychological diagnosis by a specialist or who had received mental health treatment, whether pharmacological or non-pharmacological, were excluded. Moreover, students who did not voluntarily agree to participate were not included in the study. The response rate was 51.50%.

Instruments

Socioeconomic Data

This consisted of multiple-choice questions (available in Appendix I) related to sociodemographic data such as age, sex, semester, family structure, whether they engaged in sports or physical activity, or had any regular hobbies, the educational attainment of the head of the household, and students' work history outside the home.

Mexican Resilience Scale (RESI-M)

This instrument consists of a Likert-type questionnaire with 43 items ranging from 1 to 4 points (from "strongly disagree" to "strongly agree"), grouped into five dimensions: 1: strength and self-confidence (comprising the clarity individuals have about their goals, the effort they put into achieving them, and the confidence, optimism, strength and tenacity with which they cope with challenges); 2: social competence (the ease with which individuals relate to others); 3: family support (the loyal, supportive relationships existing within a family); 4: social support (the affective bonds between individuals in social groups such as friends and teachers); and 5: structure (the ability to organize both activities and time). RESI-M scores range from 43 to 172 points, with higher scores indicating higher levels of resilience, and the following cut-off points: < 50% low, 51-75% medium, and >76% high. This criterion was used at both the general level and the level of each dimension. The scale has a Cronbach's α total consistency of .93, explaining 43.6% of variance, and has been used in adolescent populations (Palomar Lever & Gómez Valdez, 2010; Gómez-Azcarate et al., 2014; Blanco et al., 2018; Rodríguez et al., 2015).

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST)

The second version of ASSIST, developed by the World Health Organization (Group, 2002), seeks to identify both licit and illicit substance use, assess the level of risk associated with drug use, and determine the most appropriate intervention for the individual. For alcohol use, the questionnaire comprises seven questions eliciting information about past use, frequency of use in the past three months, desire to use substances, problems caused, and activities not undertaken due to use, concerns of those close to the user, and attempts to reduce or stop use. To determine the type of risk, the scores obtained from items 2 to 7 are added and classified as follows: low risk: 0-10; moderate risk: 11-26; and high risk: 27 or more. This instrument is both reliable and valid, making it suitable for research, diagnosis, and interventions targeting the adolescent population (Linage & Lucio, 2013; Casas Muñoz et al., 2022; Tiburcio Sainz et al., 2016).

The Depression, Anxiety and Stress Scale - 21 (DASS-21)

Anxiety symptomatology was assessed using the anxiety subscale (items 2, 4, 7, 9, 15, 19, and 20) of the DASS-21 developed by Lovibond & Lovibond (1995). To score this subscale, the scores of the corresponding items should be added: the higher the total score, the greater the degree of symptomatology. It was scored as follows: 0-4 mild anxiety, 5-7 moderate, 8-9 severe, ≥10 extremely severe symptomatology. The instrument used has been validated and administered to the Mexican adolescent population (Camacho et al., 2016; Daza et al., 2002; Maciel-Saldierna et al., 2022).

Procedure

Permission was sought from the directors of the selected schools to disseminate and request the participation of students to complete the questionnaires. Students who agreed to participate through a letter of consent or informed consent form completed the questionnaires using a Google Forms format. For data analysis, groupings were made by region based on geographic proximity, as follows: Cosoleacaque, Chinameca and Jaltipan (Region I), Acayucan, Sayula de Alemán, Juan Rodríguez Clara (Region II), Minatitlán (Region III), Soteapan, and Zaragoza (Region IV).

Statistical analysis

Qualitative variables were analyzed as frequencies and percentages, and the chi-square test was used to determine the association between the frequencies of each of the dependent variables (frequency of anxiety, alcohol consumption, sociodemographic characteristics) and the independent variable (resilience). All data were analyzed using SPSS 25 for macOS (IBM Corp., 2017). A 95% confidence level was considered for all statistical tests, and a value of $p \leq .05$ was considered statistically significant. The statistical power of the chi-square tests was calculated using GPower software version 3.1 (Faul et al., 2007), to determine the probability of finding significant statistical differences.

Ethical considerations

The project was evaluated and approved by the Bioethics in Research and Investigation Committee of the Medicine Faculty of the Universidad Veracruzana, Minatitlán Campus (FOLIO: F-001-CI-2022). The informed consent procedure was followed for the adult population and the informed assent procedure for the adolescent population, in keeping with the Declaration of Helsinki and the General Health Law of Mexico. These ethical considerations are detailed in the relevant section of the study.

RESULTS

A total of 2,359 adolescents were invited, of whom 167 refused to participate, yielding a sample of 2194, 58.9% of whom were female and 41.1% male. The mean age was 16.6 ± 1.1 years (range 14-20 years). In addition, 97.7% of the adolescents were single and 13.9% reported working as well as studying. In regard to the educational attainment of the heads of household, 52.9% had completed high school or less, while 63.9% of the participants reported living in nuclear families (Table 1).

Resilience

Thirty percent (n = 658) of the adolescents had low, 48.8% (n = 1070) had medium, and 21.2% (n = 466) had high levels of resilience. In terms of the dimensions, 35.5% (n = 778) and 23.2% (n = 509) of the participants showed high and low levels of strength and self-confidence, respectively. At the same time, 46.4% (n = 1018) showed low and 19.6% (n = 429) high levels of social competence. In regard to family support, 29.0% (n = 636) of the adolescents showed low and 36.2% (n = 795) high levels. Regarding social support, 17.7% (n = 389) of the participants had low and 40.5% (n = 890) high levels. Finally, in terms of structure, 34.1% (n = 748) of the adolescents had low and 22.4% (n = 493) high levels.

Significant associations were observed between gender ($\chi 2$ = 23.83; $p < .001$), region ($\chi 2$ = 43.56; $p < .001$), semester ($\chi 2$ = 11.98; p = .017), family structure ($\chi 2$ = 27. 82; $p < .001$), engaging in physical activity ($\chi 2$ = 30.43; $p < .001$), and having a hobby ($\chi 2$ = 22.51; $p < .001$) and levels of resilience (Table 1).

Table 1
Distribution of Sociodemographic Variables Based on Resilience Levels in Adolescents from Public High Schools in Southern Veracruz.

Sociodemographic Variables		*Resilience [n (%)]*			*Total*	*p-value*
		Low	*Medium*	*High*		
Sex	Female	426 (32.9)	633 (48.9)	234 (18.1)	1293	< .001
	Male	232 (25.7)	437 (48.5)	232 (25.7)	901	
Age	14-15 years	128 (31.9)	200 (49.8)	73 (18.2)	401	
	16-17 years	420 (30.2)	671 (48.3)	297 (21.3)	1388	.152
	> 18 years	110 (27.1)	199 (49.1)	96 (23.7)	405	
Region	I	297 (33.6)	424 (48.0)	162 (18.3)	883	
	II	155 (32.7)	217 (45.8)	101 (21.3)	473	< .001
	III	88 (33.4)	132 (50.1)	43 (16.3)	263	
	IV	118 (20.5)	297 (51.6)	160 (27.8)	575	
Semester	Second	225 (32.0)	350 (49.7)	128 (18.2)	703	
	Fourth	200 (32.3)	290 (46.8)	129 (20.8)	619	.017
	Sixth	233 (26.7)	430 (49.3)	209 (23.9)	872	
Occupation	Works and studies	98 (29.5)	130 (42.6)	77 (25.2)	305	.051
	Only studies	560 (29.6)	940 (49.7)	389 (20.5)	1889	
Family structure	Nuclear	371 (26.4)	698 (49.8)	332 (23.6)	1401	< .001
	Single parent	287 (36.1)	372 (46.9)	134 (16.8)	793	
Guardian/parent's educational attainment	High school or less	338 (29.1)	577 (47.9)	246 (21.1)	1161	
	High school	205 (32.8)	294 (47.0)	126 (20.1)	625	.414
	University degree	115 (28.1)	199 (48.7)	94 (23.0)	408	
Engages in physical activity	Yes	365 (26.7)	663 (48.6)	334 (24.5)	1362	< .001
	No	293 (35.2)	407 (48.9)	132 (15.8)	832	
Hobbies	Yes	508 (27.9)	903 (49.6)	406 (22.3)	1817	< .001
	No	150 (39.7)	167 (44.2)	60 (15.9)	377	

Alcohol consumption

It was found that 71.7% (n = 1574) of the adolescents had never consumed alcohol in their lives, while 28.2% (n = 620) had, and 22.0% (n = 483) had done so in the last three months. A higher frequency of alcohol consumption was found among adolescents over 18 ($\chi^2 = 14.2$; $p < .01$), in higher semesters ($\chi^2 = 9.1$; $p < .001$), those who worked and studied ($\chi^2 = 19.0$; $p < .001$), had single parents ($\chi 2 = 6.04$; $p = .014$), in Region III ($\chi 2 = 33.9$; $p < .001$), and whose guardians/parents held undergraduate degrees or higher ($\chi 2 = 20.4$; $p < .001$). Other sociodemographic variables, such as gender, engagement in physical activity, and hobbies, did not show significant differences (Table 2).

When identifying the level of risk for alcohol consumption through ASSIST, we found that 9.2% (n = 201) of the adolescents were at medium risk and .4% (n = 8) at high risk. We observed an association between the level of risk for alcohol consumption and adolescents who worked ($\chi 2 = 30.6$; $p < .001$). Conversely, sex, age, region, semester, guardians'/parents' educational attainment, family

Table 2
Distribution of Alcohol Consumption among Adolescents from Public High Schools in Southern Veracruz.

Sociodemographic variables		*Alcohol Consumption*		*p-value*
		Yes n (%)	*No n (%)*	
Sex	Female	377 (29.2)	916 (70.8)	.263
	Male	243 (27)	658 (73)	
Age	14-15 years	92 (22.9)	309 (77.1)	< .001
	16-17 years	387 (27.9)	1001 (72.1)	
	> 18 years	141 (34.8)	264 (65.2)	
Semester	Second	169 (24)	534 (76.0)	< .001
	Fourth	160 (25.8)	459 (74.2)	
	Sixth	291 (33.4)	581 (66.6)	
Region	I	274 (31)	609 (69%)	< .001
	II	144 (30.4)	329 (69.6)	
	III	92 (35)	171 (65)	
	IV	110 (19.1)	465 (80.9)	
Occupation	Works and studies	118 (38.7)	187 (61.3)	< .001
	Only studies	502 (26.6)	1387 (73.4)	
Family structure	Nuclear	371 (26.5)	1030 (73.5)	< .014
	Single parent	249 (31.4)	544 (68.6)	
Guardian/parent's educational attainment	High school or less	291 (25.1)	870 (74.9%)	< .001
	High school	179 (28.6)	446 (71.4)	
	University degree	150 (36.8)	258 (63.2)	
Engages in physical activity	Yes	389 (28.6)	973 (71.4)	.688
	No	231(27.8)	601 (72.2)	
Hobbies	Yes	510 (28.1)	1307 (71.9)	.663
	No	110 (29.2)	267 (70.8)	

Note: Values are represented as frequencies (prevalences); Chi-square test, *$p \leq 0.05$.

structure, engaging in sports or exercise showed no association with the level of risk ($p > .05$).

We observed that students who reported having consumed alcohol had lower resilience than those who did not ($\chi 2 = 24.7$; $p < .001$). Likewise, adolescents who scored lower on the dimensions of strength and self-confidence, family support, and structure had a higher frequency of alcohol use (Table 3). A high risk of alcohol use was associated with low family ($\chi 2 = 11.0$; $p = .026$) and social support ($\chi^2 = 9.8$; $p = .043$). The statistical power of the chi-squared tests was greater than .80.

Anxiety

It was found that 61.5% ($n = 1350$) of the adolescents had mild, 12.6% ($n = 277$) had moderate, 6.8% ($n = 149$) had severe, and 19.1% ($n = 418$) had extremely severe anxiety symptoms. There was a significant difference in the frequency of anxiety symptoms between women and men. Fifty-five per cent ($n = 711$) of women had mild anxiety, while 24.0% ($n = 310$) had extremely severe anxiety ($\chi^2 = 67.82$; $p < .001$). Conversely, 70.9% ($n = 639$) of males had a mild degree of anxiety and 12.0% ($n = 310$) had an extremely severe degree of anxiety.

Table 3
Distribution Levels of Resilience and its Components based on Anxiety Symptomatology and Alcohol Consumption in Adolescents from Public High Schools in Southern Veracruz.

	Anxiety Symptomatology [n (%)]					*Alcohol Consumption [n (%)]*		
Level	*Mild*	*Moderate*	*Severe*	*Extremely Severe*	*p-value*	*No*	*Yes*	*p-value*
				Resilience				
Low	274 (20.3)	115 (41.5)	62 (41.6)	207 (49.5)		430 (27.3)	228 (36.8)	
Medium	709 (52.5)	125 (45.1)	71 (47.7)	165 (39.5)	< .001	776 (49.3)	294 (47.4)	< .001
High	367 (27.2)	37 (13.4)	16 (10.7)	46 (11.0)		368 (23.4)	98 (15.8)	
				Strength and Self-confidence				
Low	202 (15.0)	91 (32.9)	44 (29.5)	172 (41.1)		331 (21.0)	178 (28.7)	
Medium	576 (42.7)	118 (42.6)	66 (44.3)	147 (35.2)	<.001	653 (41.4)	254 (41.0)	< .001
High	572 (42.4)	68 (24.5)	39 (26.2)	99 (23.7)		590 (18.4)	188 (30.3)	
				Social Competence				
Low	539 (39.9)	147 (53.1)	90 (60.4)	242 (57.9)		722 (45.8)	296 (47.7)	
Medium	500 (37.0)	85 (30.7)	43 (28.9)	119 (28.5)	< .001	545 (34.6)	202 (32.5)	.641
High	311 (23.0)	45 (16.2)	16 (10.7)	57 (13.6)		307 (19.4)	122 (19.6)	
				Family Support				
Low	285 (21.1)	101 (36.5)	55 (36.9)	195 (46.7)		396 (25.1)	240 (38.7)	
Medium	481 (35.6)	104 (37.5)	52 (34.9)	126 (30.1)	< .001	549 (34.8)	214 (34.5)	< .001
High	584 (43.3)	72 (26.0)	42 (28.2)	97 (23.2)		629 (39.9)	166 (26.7)	
				Social support				
Low	183 (13.6)	55 (19.9)	32 (21.5)	119 (28.5)		271 (17.2)	118 (19.0)	
Medium	567 (42.0)	123 (44.4)	60 (40.3)	165 (39.5)	< .001	648 (41.1)	267 (43.1)	.257
High	600 (44.4)	99 (35.7)	57 (38.3)	134 (32.1)		655 (41.6)	235 (37.9)	
				Structure				
Low	363 (26.9)	118 (42.6)	66 (44.3)	201 (48.1)		490 (31.1)	258 (41.6)	
Medium	*623 (46.1)*	*117 (42.2)*	*60 (40.3)*	*153 (36.6)*	< .001	*711 (45.1)*	*242 (39.0)*	<.001
High	*364 (27.0)*	*42 (15.2)*	*23 (15.4)*	*64 (15.3)*		*373 (23.6)*	*120 (19.3)*	

A significant association was observed between levels of resilience ($\chi 2$ = 185.45; p < .001) and its specific factors [strength and self-confidence ($\chi 2$ = 163.51; p < .001), social competence ($\chi 2$ = 65.84; p < .001), family support ($\chi 2$ = 34.56; p < .001), social support ($\chi 2$ = 57.67; p < .001), structure ($\chi 2$ = 93.72; p < .001)], and frequency of anxiety symptoms (Table 2). The statistical power of the chi-squared tests was greater than .80.

An association was also found between the degree of anxiety symptomatology and the frequency of alcohol consumption, since 38.0% (n = 159) of those with extremely severe anxiety had consumed alcohol ($\chi 2$ = 39.4; p < .001).

DISCUSSION AND CONCLUSION

This study sought to determine the association between resilience and alcohol consumption and anxiety symptomatology in high school adolescents during the COVID-19 pandemic, observing that adolescents with lower levels of resilience and most of its components displayed a higher frequency of alcohol consumption and higher anxiety symptomatology, making it possible to establish an association between them.

The sample in the present study included more than 15% of high school students in an area of southern Vera-

cruz, including urban and rural populations, where one in three adolescents presented low levels of resilience, mainly females, consistent with findings in other healthy populations (Hjemdal et al., 2011; Tusaie et al., 2007). Given that resilience is a psychobiological factor that influences an individual's response to adverse life events, its absence may play a crucial role in the difficulty of adapting and successfully coping with these events. This in turn may result in various problems affecting emotional well-being, academic and work performance, and interpersonal relationships, with significant consequences for mental health and addictions (Hjemdal et al., 2011; Mesman et al., 2021; Tudehope et al., 2022; Verdolini et al., 2021; Wattick et al., 2023; Zhang et al., 2020).

The majority of adolescents who consumed alcohol showed low levels of resilience, including the domains of strength, self-confidence, family support, and structure, suggesting the possibility of emotional deficits that could increase their vulnerability to both alcohol consumption and the development of anxiety symptoms, as observed in other populations (Kennedy et al., 2019; Thompson et al., 2021; Tudehope et al., 2022; Zhang et al., 2020). Becoña (2007) notes that when faced with stressful life situations, individuals rely on three key factors: the first includes temperament and personal characteristics, while the second consists of the subject's reflective capacity and cognitive abilities. We believe that people with greater reflective capacity can evaluate their decisions more effectively and have a better sense of direction in life. In addition, family and social support were found to be associated with the prevalence of alcohol use in this study.

Despite the restrictions imposed during the pandemic, the observed lifetime frequency of drinking was significant, yet low compared to other studies on Mexican adolescents ages 12 to 19 during the pandemic, with estimated prevalences of 66.8% (Noh Moo et al., 2023) and 39.8% in the 2016 National Survey on Drug, Tobacco and Alcohol Use (Resendiz-Ezcobar et al., 2018; Villatoro-Velázquez et al., 2017). Notwithstanding the restrictions imposed by the health authorities and the limited access to and availability of alcoholic beverages during this period, and the fact that adolescents generally consume alcohol outside the home, which may have delayed and limited the onset of first-time consumption of this substance, an increase in alcohol consumption was observed in comparison with other regions of Mexico. This finding is consistent with the reductions found in other reports (Barrera-Núñez et al., 2022; Dumas et al., 2020; Jeong, 2023).

In addition, alcohol consumption in the past three months was both lower than in other studies in Mexico (40.8% Barrera-Núñez et al., 2022; 30.3% Jiménez-Padilla et al., 2022; 24.5% Noh Moo et al., 2023) and equal to or higher than in others (20.6% Ramírez-Toscano et al., 2023; 9.3% González-Bautista et al., 2019). Higher prevalences have been reported in other Latin American countries, such as Guatemala, Chile, and Argentina. Likewise, a decrease in the prevalence of alcohol use among individuals ages 15-18 was observed during the pandemic (47% to 38.5%, Monzon et al., 2024; past month alcohol use fell from 45.5% to 33.4%, Libuy et al., 2024). Quantity, frequency, episodic heavy drinking and alcohol-related problems were significantly reduced by 89%, 42%, 71%, and 143% respectively (Conde et al., 2021).

Factors such as social distancing policies, restricted access to alcohol, limited social interaction with friends, increased family cohesion, and home-based education may have significantly contributed to the decrease in alcohol consumption and related problems (Libuy et al., 2024; Conde et al., 2021). At the same time, the interaction between depression and anxiety symptoms, drug availability, association with drug-using peers, lack of parental supervision, boredom, negative affect coping, and increased adult drinking in the household are risk factors associated with higher alcohol use among adolescents (Lundahl & Cannoy, 2021; Barrera-Núñez et al., 2022; Ibarrola-Peña et al., 2023; Morales Chainé et al., 2021; Jiménez-Padilla et al., 2022). These conflicting results underscore the importance of fully characterizing the impact of the pandemic on adolescent substance use patterns.

In addition, the sociodemographic characteristics of the adolescents, such as belonging to a single-parent family, having guardians/parents with a higher educational level, working, and being from Region III (Minatitlán), were associated with a higher frequency of alcohol use. Previous research has shown that living in a single-parent family may be a risk factor for adolescent substance use (Oshi et al., 2018). It has also shown that adolescents who work and have their own financial resources can purchase alcohol without relying on their parents, in addition to which the influence of coworkers could lead them to adopt these behaviors (González-Bautista et al., 2019). Likewise, higher income was found to be positively associated with higher alcohol consumption during the COVID-19 pandemic (Garcia-Cerde et al., 2021).

High school students in Region III, which includes Minatitlán, showed a higher frequency of alcohol consumption compared to other regions. This situation could be related to the indigenous practices and traditions existing in some of these regions, resulting in a lower incidence of alcohol consumption. Previous reports on Mexican adolescents suggest that living in indigenous communities may have a protective effect on alcohol consumption (González-Bautista et al., 2019; Ozer & Fernald, 2008). In addition, the increase in the prevalence of alcohol use among adolescents may be due to decreased perceived risk and increased permissiveness. There is a positive correlation between social acceptance of alcohol use and its frequency among these groups (Cortés et al., 2021; Telumbre-Terrero et al., 2020).

Conversely, over 25% of the adolescents studied had severe or extremely severe levels of anxiety symptomatology, which is consistent with several studies reflecting similar data indicating that during the COVID-19 pandemic, one in five adolescents experienced clinically high anxiety symptoms (Maciel-Saldierna et al., 2022; Racine et al., 2021). This was because adolescents were affected by multiple stressors, including overcrowding, loneliness, fear, and high rates of infection. This situation was compounded by the disruption of daily routines, including school attendance and extracurricular activities (Morales Chainé et al., 2021; Wattick et al., 2023).

As a result, depression and anxiety symptoms are likely to have increased in this population, which in turn has been associated with an increased risk of substance use (Garcia-Cerde et al., 2021; Ibarrola-Peña et al., 2023; Mojica-Perez et al., 2022; Morales Chainé et al., 2021; Thompson et al., 2021; Wattick et al., 2023; Libuy et al., 2024). This may explain the greater frequency of alcohol use among adolescents with high levels of anxiety in this sample.

The association between lower scores for resilience and higher scores for anxiety has already been reported in other studies (Hjemdal et al., 2011; Verdolini et al., 2021; Zhang et al., 2020). Resilience is critical to adolescent mental health and should receive more attention in research, prevention, and clinical care, with a contextualized approach to early intervention (Tudehope et al., 2022; Verdolini et al., 2021). To move forward, it is critical to conduct longitudinal research that validates resilience interventions from an early age, promotes healthy emotional development, and identifies risk and protective factors during adolescence. This will enable more effective approaches to mental health and addiction prevention.

Although this study presents significant findings, it is important to recognize its limitations when interpreting results. The cross-sectional design prevents the establishment of causal relationships between variables, making it unclear whether low resilience leads to increased alcohol use and anxiety symptoms, or vice versa. Longitudinal or quasi-experimental studies are therefore required to clarify these relationships. In addition, the study's reliance on self-reported measures of resilience, alcohol use, and anxiety may introduce response bias. Moreover, the inventories used have not yet been validated for Mexican adolescent populations, potentially affecting the accuracy and reliability of the results. Furthermore, although the sample includes adolescents from various socioeconomic backgrounds, the fact that they were only drawn from public schools may limit the generalizability of the findings. Replication of this study in diverse adolescent populations is therefore critical to corroborating findings. It is also essential to validate the instruments used in these populations to increase reliability.

In conclusion, the study suggests that low levels of resilience may have increased the risk of alcohol use and anxiety symptomatology among students during the pandemic. In addition, the study suggests that emotional resilience could play a role in reducing alcohol use and anxiety symptoms among high school students. Further intervention research is required to establish causality and determine whether strategies used to promote resilience reduce alcohol use and anxiety symptomatology.

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Conflict of interest

The authors declare they have no conflicts of interest.

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Authors' contributions

AAPL and JCSF performed the statistical analysis, wrote up the methodology, results, tables, and figures, and reviewed all the other sections.
AAPL, ESM, JCSF and FV conducted the literature review, assisted with writing the introductory and discussion sections, and reviewed the final draft.

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