

Association of Adverse Childhood Experiences with Depression in Latino Migrants Residing in Tijuana, Mexico

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ABSTRACT

Context: Physical, sexual, and emotional abuse in childhood—adverse childhood experiences (ACEs)—are associated with poor mental and physical health.

Objective: To determine the prevalence of ACEs and their relationship to depression among Latino migrants in Mexico, which has not been previously examined.

Methods: A total of 110 Latinos aged 18 years and older residing in Tijuana, Mexico, completed interviewer-administered questionnaires, including the ACE scale (range = 0 to 10 items), at baseline in 2015. We studied the prevalence of ACEs (score on the ACE scale) and the presence of depressive symptoms (Patient Health Questionnaire-9). Multivariate logistic regression models were used to estimate the association between the ACE score and depressive symptoms.

Results: Overall, 82% of participants were men, and 82% reported being deported from the US. At least 1 ACE was reported by 64% of participants, and 33% reported 3 or more ACEs. Those who reported ever being incarcerated were significantly more likely to have 3 or more ACEs compared with no ACEs (56% vs 28%; $p = 0.039$). Symptoms of mild, moderate, or severe depression were identified in 14% of participants. In multivariate analyses, for each additional ACE item reported, participants were significantly more likely to meet criteria for depressive symptoms (adjusted odds ratio = 1.42; 95% confidence interval = 1.13-1.78; $p = 0.002$).

Conclusion: Among Latino migrants residing in the US-Mexico border region, ACEs were pervasive and associated with depression symptoms. Programs and policies targeting migrants in this region should consider addressing both ACEs and depression.

INTRODUCTION

Exposure to repeated or multiple emotional trauma is linked to mental and physical health conditions, including anxiety disorders, major depression, and heart disease; traumatic events occurring during childhood can be particularly harmful.¹⁻³ Adverse childhood experiences (ACEs) are defined as traumatic experiences that occur before age 18 years. Exposure to traumatic events can be assessed via the 10-item US Centers for Disease Control and Prevention-Kaiser Permanente ACE scale; it was validated in more than 17,000 US adults. The scale probes for experiences of abuse, neglect, and household dysfunction. Such ACEs have been proposed to disrupt neurodevelopment and increase the likelihood of mental health disorders.⁴⁻⁸

Although ACEs have been examined in American populations, including US-based Latinos, the largest study of the association between traumatic childhood events and depression in later stages of life was

conducted in a mostly white, middle- and upper-class, and educated population affiliated with a large health maintenance organization.⁹ The ACE scale has subsequently been fielded in diverse populations.¹⁰⁻¹² The current study assesses the prevalence and relationship between ACEs and depression symptoms in a sample of Latino migrants residing in Tijuana, Mexico, a major migrant- and deportee-receiving community. This study provides insight into factors that may affect Latino migrants' mental health.

In both the US and Mexico, childhood abuse and neglect are concerning social and public health issues. In the US, approximately 3.2 million children reported abuse or neglect in 2014.¹³ Childhood abuse, a dimension of the ACE scale, has been associated with subsequent development of mental health problems, including posttraumatic stress disorder, borderline personality disorder, dissociative symptoms, and depression.¹⁴⁻¹⁷ In Mexico, 62% of boys and girls have experienced abuse at some

point in their lives, and the prevalence has increased by 50% between 2013 and 2015.¹⁸ Neglect (27%) and physical abuse (23.7%) are the most prevalent forms of childhood abuse in Mexico.¹⁸⁻²⁰ A 2008 study examining ACEs among 178 pregnant women in Mexico City, Mexico, reported that 60% experienced at least 1 ACE; 45% of women reported physical abuse, and 47% reported problematic parental alcohol consumption.²¹ The prevalence of ACEs in a Mexican internal migrant or Mexico-US transnational migrant population is unknown, as are implications for resilience after these traumatic events.

Depression is also pervasive, and the Centers for Disease Control and Prevention estimates that it affects 7.6% of persons age 12 years or older in the US.²² In Mexico the reported prevalence of depression ranges between 12% and 20%,²³ but other studies showed higher rates (20%-59%) in US-Mexico border populations.^{24,25} This study complements prior literature by examining the experiences of a largely male migrant population.

Given the relationships between mental illness and physical health, it is important to further elucidate potential contributors to poor mental health in adulthood. Such data can support the development or implementation of interventions to prevent or to treat mental illness across

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the life course. This study aims to 1) assess the prevalence of ACEs among Latino migrants in Tijuana and 2) assess the relationship between ACEs and current depression symptoms in this population.

METHODS

Study Setting, Design, and Participants

This study examined baseline questionnaire data collected from 110 adults aged 18 years and older participating in a tattoo removal study. The study site was a free clinic situated in the *Zona Norte* (Tijuana's red-light district). Clinic patients included very poor, homeless, and uninsured individuals as well as injection drug users. The clinic advertised the tattoo removal study widely via posters inside consultation rooms and in windows facing the community, so that any individual aged 18 years and older was eligible to be screened for participation. The sample for this study is composed of community members and the

clinic's patients, although we are unable to differentiate the number of persons that comprise these 2 groups. The clinic's patients are primarily migrants (ie, migrants to the US, migrants within Mexico, or international migrants from other countries, such as Central America).

The parent study involved the screening of 147 participants, of which 22 were excluded for the following reasons: Breastfeeding ($n = 1$), color tattoos ($n = 14$; these persons were excluded because the laser was not designed to remove non-black tattoos), positive HIV test or HIV test refusal ($n = 4$), and short-term plans to relocate away from Tijuana ($n = 3$). These individuals did not undergo baseline interviews. Among the remaining 125 participants, 15 were excluded because of the absence of data corresponding to the ACEs scale. Thus, the final sample was composed of 110 individuals.

Trained bilingual interviewers administered questionnaires to the participants in a private room using Qualtrics cloud-based questionnaire software (Qualtrics, Provo, UT). The study protocol was approved by the human subjects protection programs at the University of California San Diego, the Universidad Autónoma de Baja California, Tijuana; and the free clinic where the study was implemented.

Measures

The baseline (Spanish or English) questionnaire (lasting approximately 45 minutes) addressed the following topics: 1) demographics (eg, age, sex, marital status, homeless status, self-rated economic status, employment status, and possession of a Mexican Federal Voter Identification [ID] card—Mexico's main government identification); 2) US migration and incarceration history, either in Mexico or the US; 3) drug use (lifetime);

Table 1. Adverse Childhood Experiences (ACE) scale and item prevalence and depression prevalence in a community sample of adults attending a free health care clinic in Tijuana, Mexico in 2015 (N = 110)

Category	ACE scale question	No. (%)	Depression, no. (%) ^a
Abuse			
Emotional	Before your 18th birthday, did a parent or other adult in the household often or very often swear at you, insult you, put you down, or humiliate you? Or act in a way that made you afraid that you might be physically hurt?	35 (31.8)	8 (22.8)
Physical	Before your 18th birthday, did a parent or other adult in the household often or very often push, grab, slap, or throw something at you? Or ever hit you so hard that you had marks or were injured?	32 (29.1)	8 (25.0)
Sexual	Before your 18th birthday, did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way? Or attempt to have or actually have oral, anal, or vaginal intercourse with you?	19 (17.3)	4 (21.1)
Household dysfunction			
Mother treated violently	Before your 18th birthday, was your mother or stepmother often or very often pushed, grabbed, slapped, or had something thrown at her? Or sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?	19 (17.3)	4 (21.1)
Household substance abuse	Before your 18th birthday, did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?	37 (33.6)	8 (21.6)
Household mental illness	Before your 18th birthday, was a household member depressed or mentally ill, or did a household member attempt suicide?	14 (12.7)	5 (35.7)
Parental separation or divorce	Before your 18th birthday, was a biological parent ever lost to you through divorce, abandonment, or other reason?	25 (22.7)	7 (28.0)
Incarcerated household member	Before your 18th birthday, did a household member go to prison?	29 (26.4)	6 (20.7)
Neglect			
Emotional	Before your 18th birthday, did you often or very often feel that no one in your family loved you or thought you were important or special? Or that your family didn't look out for each other, feel close to each other, or support each other?	26 (23.6)	7 (26.9)
Physical	Before your 18th birthday, did you often or very often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or that your parents were too drunk or high to take care of you or take you to the doctor if you needed it?	24 (21.8)	6 (25.0)

^a Percentage of participants with depression is based on the number shown in the No. (%) column to the left.

4) lifetime self-reported health diagnoses of chronic conditions by a clinician; and 5) self-rated health status. In the next paragraph, we provide additional details for these variables.

The Mexican Voter ID Card was included in this analysis because it is a required document for accessing federally funded health and social programs in Mexico; possession of this ID was ascertained via a yes/no question. Homeless status was a dummy variable created from the question “Where did you sleep most of the nights during the last 6 months?” and homelessness was registered for every participant who answered affirmatively to at least 1 of the following options: A church, a drug dealer’s house, a shelter, the streets, by the river, an abandoned building, or a park. Self-rated economic status was ascertained by the question “How do you define your current economic situation?”; response categories were collapsed, and we focused on “poor” and “very poor” categories (vs good/very good/refuse to answer). Persons who reported no to the question: “Do you currently have a job?” were defined as unemployed. Lifetime drug use was ascertained as positive for participants who selected any drug from a list of illegal drugs (marijuana, cocaine,

crack, PCP [phencyclidine], methamphetamines, heroin, etc). For the question “Have you ever received, from a doctor or a nurse, a diagnosis of ... HIV, diabetes, or cancer?”, persons who responded affirmatively to any of these conditions were classified as having a chronic health condition. Variables included in this analysis were selected on the basis of their association with depression risk, according to extant literature.

Primary Variables

Our primary independent variable was the ACE scale, which ranges from 0 to 10 items and includes 3 subcategories: *Abuse* (3 items), *neglect* (2 items), and *household dysfunction* (5 items; Table 1).^{1,7} The dependent variable was the score on the Patient Health Questionnaire-9 (PHQ-9), which has been validated in national US samples, including Latinos, to detect mild depression (5 to 9 points), moderate depression (10 to 14 points), moderately severe depression (15 to 19 points), and severe depression (20 to 27 points).^{26,27} We dichotomized the data as follows: 0 referred to no or minimal depression (ie, PHQ-9 score: ≤ 4 points), and 1 referred to mild/moderate/severe depression (ie, PHQ-9 ≥ 5 points).

Statistical Analysis

We conducted descriptive analyses to characterize the study population using χ^2 or analysis of variance tests for categorical and continuous variables respectively, to compare differences across groups. We examined the proportion of participants reporting each ACE scale item (Table 1). Next, we examined the unadjusted association between our independent variables and number of ACEs, as defined by the number of items reported (ie, 0 ACEs, 1-2 ACEs, ≥ 3 ACEs; Table 2) as well as all independent variables and PHQ-9 scores (Table 3). We estimated a binary logistic regression model to examine the association between the ACE scale (range = 0 to 10 items) with mild/moderate/severe depression (vs no/minimal depression; Table 4). We also estimated the association between the 3 ACE subcategories and depression (Table 5). Regression models were adjusted for demographics, health status, and economic indicators.

RESULTS

ACE Prevalence and Participant Characteristics

Table 1 provides each ACE item and the proportion of participants that reported each item before their 18th

Table 2. Participant characteristics stratified by number of adverse childhood events (ACEs), in adults aged 18 years and older attending a free health care clinic in Tijuana, Mexico in 2015

Characteristic	Number of ACE items, n (%)			Total (N = 110)	p value ^a
	0 items, 40 (36)	1 or 2 ACEs, 34 (31)	≥ 3 ACEs, 36 (33)		
Demographics					
Men	35 (88)	29 (85)	26 (72)	90 (82)	0.185
Mean age (SD), y	41 (8)	41 (9)	40 (9)	41 (9)	0.962
Has voter ID card	25 (63)	27 (79)	22 (61)	74 (67)	0.191
Cohabiting partner	12 (30)	17 (50)	11 (30)	40 (36)	0.138
Homeless	28 (70)	21 (59)	23 (63)	71 (65)	0.603
Poor/very poor economic status	27 (68)	19 (56)	20 (56)	66 (60)	0.479
Traumatic events					
Ever deported	26 (79)	25 (83)	24 (86)	75 (82)	0.768
Ever incarcerated	11 (28)	16 (47)	20 (56)	47 (43)	0.039
Substance use					
Ever used illegal drugs	28 (70)	29 (85)	33 (92)	88 (80)	0.041
Used illegal injection drugs in last 6 months	14 (41)	14 (47)	17 (49)	45 (46)	0.816
Physical health and disease					
Mild/moderate/severe depression symptoms	2 (5)	2 (6)	9 (26)	13 (12)	0.010
Self-rated fair/poor general health status	5 (13)	10 (29)	10 (28)	25 (23)	0.152
Ever diagnosed with cancer, diabetes, or HIV	17 (43)	16 (47)	16 (44)	50 (45)	0.925

^a Statistical significance level: $p < 0.05$.

ID = identification; SD = standard deviation.

birthday. Overall, household substance abuse (33.6%) and emotional abuse (31.8%) were the most commonly reported ACEs, whereas household mental illness was the least commonly reported item (12.7%). In the abuse category, emotional abuse was most commonly reported (31.8%); in household dysfunction, substance abuse was most prevalent (33.6%); and in the neglect category, emotional neglect was most commonly reported (23.6%). Table 1 also shows the prevalence of depression (ie, ≥ 5 points on the PHQ-9 scale) for each ACE item; it ranged from 20% and 30%, with the exception of household mental illness (36%). Overall, 14% of participants (15 of 110 participants) met criteria for mild, moderate, or severe depression. Additional analyses found that only 10 individuals (9%) met criteria for moderate or severe depression (data not shown); given the small sample, we focused on mild/moderate/severe depression as a combined group.

Table 2 shows participants' characteristics, including stratified by the number of ACEs reported (ie, 0 ACEs; 1-2 ACEs; ≥ 3 ACEs). Slightly more than one-third of participants (36.4%) reported never experiencing ACEs, although most did experience ACEs: 30.9% of participants reported experiencing 1 or 2 ACEs, and 3 or more ACEs were reported by 32.7% of participants. Regarding their demographic and social characteristics, participants were predominantly male (82%) and, on average, were 41 years old; 96% of participants were Mexico-born (data not shown). One-third of participants lacked the Mexican Voter ID card, 65% reported being homeless at the time of the interview, 30% were married or in a civil union, 82% had been deported from the US, and 43% had ever been incarcerated. Additionally, 85% had ever migrated to the US (data not shown). Overall, 60% rated their economic status as poor/very poor. Nearly half of participants reported injecting drugs in the prior 6 months (46%), and 80% mentioned past use of illegal drugs, excluding marijuana. Also, 44% reported having ever been diagnosed with cancer, diabetes, or HIV, and 17% had ever experienced forced sex. About 1 in 4 participants rated their health as fair/poor (23%).

Regarding the relationship between participants' demographic and social characteristics and ACEs, we observed that individuals reporting 3 or more ACEs were more likely to have been incarcerated (56% vs 47% among those reporting 1-2 ACEs and 28% among those reporting 0 ACEs; $p = 0.039$). Those reporting 3 or more ACEs also were more likely to have ever experienced forced sex (31% vs 15% for reports of 1-2 ACEs and 5% among those reporting 0 ACEs; $p = 0.012$).

Factors Independently Associated with Depression

Table 4 presents results from a multivariate logistic regression model examining the relationship between ACEs and mild, moderate, or severe depression symptoms (ie, PHQ-9 ≥ 5 points), while controlling for demographic, health, and economic covariates. Results indicate that ACEs are positively associated with mild, moderate, or severe depression, such that the likelihood of depression was significantly

Table 3. Bivariate relationship: Participant characteristics and their association with depression symptoms^a in 110 adults attending a free health care clinic in Tijuana, Mexico in 2015

Characteristic	Minimum or no depression symptoms, n = 15 (%)	Mild/moderate/severe depression symptoms, n = 95 (%)	p value
Demographics			
Men	10 (67)	79 (83)	0.131
Mean age (SD), y	41 (8.2)	36 (9.5)	0.041
Voter ID card	10 (68)	57 (60)	0.518
Cohabiting partner	5 (35)	7 (47)	0.372
Homeless	8 (55)	60 (63)	0.372
Poor/very poor economic status	9 (59)	50 (53)	0.682
Traumatic events			
Ever deported	13 (84)	67 (70)	0.284
Ever incarcerated	6 (42)	45 (47)	0.740
Substances			
Ever used illegal drugs	12 (80)	76 (80)	1.000
Used illegal injection drugs last 6 months	7 (45)	55 (58)	0.376
Physical health and disease			
Self-rated fair/poor general health status	(4)23	26 (27)	0.766
Ever diagnosed with cancer, diabetes, or HIV	5 (36)	26 (27)	0.490

^a Depression symptoms were evaluated using the Patient Health Questionnaire-9. ID = identification; SD = standard deviation.

Table 4. Logistic regression model of ACE scale and depression symptoms in a community sample of adults ages 18 years and older attending a free health care clinic in Tijuana, Mexico in 2015 (n = 110)

Variable	Adjusted OR	95% CI	p value
ACE scale (per additional item) ^a	1.42	1.13-1.78	0.002
Age (continuous variable)	0.93	0.86-1.02	0.121
Male sex	1.77	0.35-8.81	0.483
Cohabiting partner	1.99	0.46-8.66	0.355
Homeless	0.41	0.07-2.28	0.284
Self-rated fair/poor general health status	0.57	0.08-3.90	0.575
Poor/very poor economic status	3.84	0.72-20.63	0.116
Ever used illegal drugs	1.97	0.19-20.03	0.566
Ever diagnosed with cancer, diabetes, or HIV	0.30	0.06-1.50	0.151

^a The ACE scale ranges from 0 to 10 items. ACE = Adverse Childhood Experiences; CI = confidence interval; HIV = human immunodeficiency virus; OR = odds ratio.

Table 5. Logistic regression model of ACE subscales and depression symptoms in adults aged 18 years and older attending a free health care clinic in Tijuana, Mexico in 2015

ACE category	Model 1 ^a		Model 2 ^b	
	Adjusted OR	95% CI	Adjusted OR	95% CI
Abuse	1.88	(1.12-3.17)	2.31	(1.27-4.18)
Neglect	2.15	(1.12-4.15)	2.42	(1.26-5.68)
Household dysfunction	1.75	(1.21-2.53)	2.29	(1.40-3.72)

ACE = Adverse Childhood Experiences; CI = confidence interval; OR = odds ratio.

^a Model 1: Adjusted by age and sex.

^b Model 2: Adjusted by age, sex, cohabiting partner status, homelessness, chronic diseases, self-rated health status, employment, and self-reported economic status.

increased by 42% for each additional point on the ACE scale (adjusted odds ratio [AOR] = 1.42; 95% confidence interval: 1.13-1.78; $p = 0.002$). Other variables were not statistically significant in their association with depression symptoms.

Table 5 presents data on the relationship between the 3 ACE subcategories and depressive symptoms; all were statistically significant. In Model 1, which included adjustments for age and sex, the AORs ranged from 1.75 for persons reporting items in the household dysfunction category to 2.15 for persons reporting items pertaining to neglect. These AORs were further elevated in Model 2, which was further adjusted for cohabiting partner status, homelessness, chronic diseases, self-rated health status, employment, and self-reported economic status. This model provided even higher and more homogeneous AORs, ranging between 2.29 and 2.42 for the 3 ACE subcategories.

DISCUSSION

This study examined the association between ACEs and depression symptoms in a sample composed primarily of male Latino migrants residing in Tijuana, a metropolis that is a major migrant sending, receiving, and transit community. To our knowledge, this is the first study examining the association between ACEs and depression in a vulnerable sample in the US-Mexico border region. Our results are comparable to those obtained in a recently published meta-analysis that included 184 studies, in which maltreated children were 2.66 (95% confidence interval: 2.38-2.98) to 3.73 (95% confidence interval: 2.88-4.83) times more likely to experience depression in adulthood.⁴

Our participants reported a higher prevalence of ACEs than has been reported in US-based populations.^{1,9} Childhood stressors appear to increase the likelihood of depression in adulthood, and their effect may be compounded by the experience of additional adversity in adulthood. An investigation conducted in newly recruited US soldiers showed that those who experienced episodic emotional maltreatment during childhood were 50% more likely to develop a major depressive disorder shortly after a stressful event.²⁸ Our study participants experienced multiple stressors (eg, deportation, homelessness, incarceration) that could have contributed to current depressive symptoms among those who were already vulnerable because of prior ACEs.

Study limitations include the following. It is difficult to establish causality between ACEs and depression, especially among adults, given that their responses may be affected by recall or social desirability biases. To address generalizability of our findings, it is worth mentioning that our sample has some characteristics (eg, primarily male, high volume of deportees) that preclude further generalizations to the broader population, even in Tijuana. Future studies should include a greater number of participants, especially migrant women, as well as other communities within Tijuana to reduce the possibility of selection bias. Similar studies should be conducted in diverse geographic areas to understand the scope of ACEs across Mexico and Latin America. Additionally, we were unable to corroborate physical health status; this should also be examined in future studies via the use of biomarkers and medical assessments. Because of the stigma associated with experiencing

sexual abuse, some degree of underreporting of ACEs is to be expected among men, more so than among women.²⁹⁻³¹ Finally, controlling for variables that could be mediators in the association between ACEs and depression (eg, homelessness, chronic diseases) could result in underestimation of the total effect of the traumatic events. Despite these limitations, the findings are robust and consistent with previously published research.

CONCLUSION

Our study findings have potential implications for future research and practice. Our analysis expands the existing body of evidence addressing the association between ACEs and adulthood depression. Furthermore, our findings may contribute to the understanding that males, migrants, and deportees living in border regions not only face the challenges of their current circumstances but also past adversity. Resilience in adulthood can be supported by promoting access to mental health services, especially among individuals who are the most socially and economically disenfranchised. Health systems should support the routine use of ACEs as a mental health screening tool; this should be accompanied by training clinicians to implement the ACE scale during clinical encounters. Lastly, social support networks for migrants, including migrant-led services, could be promoted to foster and support the recovery process.^{32,33} ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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