https://doi.org/10.15218/zjms.2026.019

Adverse childhood experiences and their impact on mental and physical health among university students in Erbil city

Received: 26/5/2025 Accepted: 15/7/2025

Ruya Hussein Bahaulddin[1*] **Samir Mahmood Othman**[1]

Abstract

Background and objective: Adverse childhood experiences (ACEs) have been linked to a broad spectrum of long-term health and behavioral consequences. Despite growing global research, limited evidence exists from Middle Eastern and conflict-affected settings such as Iraq.

This study aimed to determine the prevalence and types of ACEs among university students in Erbil City, and to examine their associations with mental and physical health outcomes, as well as selected sociodemographic characteristics.

Methods: A cross-sectional study was conducted among 400 undergraduate students from Salahaddin University and Hawler Medical University between November 2024 and February 2025. Eight colleges were randomly selected, and convenience sampling method was used to recruit participants. Data were collected using a culturally adapted version of the WHO ACE-International Questionnaire and a modified CDC Health Appraisal form. ACE scores were grouped into low (0–1), moderate (2–3), and high (≥4). Descriptive statistics, chi-square tests, and multivariable logistic regression were applied.

Results: The mean ACE score was 3.5 (SD = 2.39), with 94.5% of students reporting at least one ACE and 42.8% reporting four or more. The most commonly reported ACEs were community violence (85.8%), bullying (56.8%), and witnessing domestic violence (51.7%). Significant associations were observed between ACE exposure and a range of health outcomes. Students with ≥4 ACEs had significantly higher odds of depression (AOR = 4.94), fatigue (AOR = 3.02), headaches (AOR = 2.53), and indigestion (AOR = 2.55). Male students reported higher rates of childhood physical abuse and bullying, while ethnic minority and rural-background students experienced disproportionately greater exposure to several ACE categories.

Conclusion: The high prevalence of ACEs and their strong associations with adverse health outcomes highlight a significant public health concern among university students in Erbil. These findings underscore the need for trauma-informed interventions in educational and healthcare settings and for policies addressing early-life adversity.

Keywords: Child Abuse, Depression, Gastrointestinal Diseases, Pain, Violence.

[1] **Department of Community Medicine, College of Medicine, Hawler Medical University, Erbil, Kurdistan region, Iraq.**
Correspondence: ruyaozturk19@gmail.com

https://doi.org/10.15218/zjms.2026.019

Introduction

Adverse childhood experiences (ACEs) refer to different forms of early-life trauma, including abuse, neglect, and family dysfunction. Recognized globally as a major public health issue, the concept gained attention following the CDC-Kaiser study (1), which demonstrated associations with chronic diseases and harmful behaviors in adulthood. Later, institutions like the World Health Organization (WHO) broadened the definition to cover experiences like bullying and exposure to violence in communities (2, 3).

Exposure to ACEs during childhood can significantly affect brain development and stress regulation. Such adversity may activate harmful stress pathways, disrupting the hypothalamic–pituitary–adrenal (HPA) axis and causing inflammatory responses (4). These physiological changes can increase the likelihood of developing mental health issues like anxiety and depression, as well as long-term physical conditions such as heart disease and metabolic problems (5).

Beyond physical and mental health, ACEs can affect academic success, social relationships, and behaviors like smoking or substance use (6, 7). These effects often persist into adulthood, influencing socioeconomic status and potentially impacting future generations through cycles of disadvantage (8).

Despite ACEs being reported by over half of adults worldwide, most studies are from high-income nations (5). There remains a lack of research in Middle Eastern contexts, especially in areas like Iraq where cultural norms and conflict may affect both prevalence and disclosure. Existing local evidence suggests elevated rates of childhood adversity and associated health risks (9-11).

Erbil City, the capital of the Kurdistan Region of Iraq, presents a unique context shaped by historical conflict, displacement, and sociocultural norms that may suppress open discussions of trauma. Despite these challenges, to date, no recent studies have systematically assessed ACE prevalence and its health implications using comprehensive tools such as the WHO's ACE-International Questionnaire (ACE-IQ). University students, in particular, represent a critical population undergoing developmental transitions, where the effects of early adversity may manifest in ways that hinder academic and psychosocial growth.

To address this gap, the present study aims to estimate the prevalence and types of ACEs among university students in Erbil City and examine the associations between ACE exposure and selected mental and physical health outcomes. By generating locally relevant data using a standardized tool (the

https://doi.org/10.15218/zjms.2026.019

WHO ACE-International Questionnaire), the study seeks to inform trauma-informed policies and culturally sensitive support strategies in academic and healthcare settings.

Methods

Study design: Cross-sectional study design.

Setting and duration of the study: The study was carried out from November 2024 to February 2025 at Salahaddin University-Erbil and Hawler Medical University, two major public universities located in Erbil City, the capital of the Kurdistan Region of Iraq.

Study population: All undergraduate students enrolled in the two selected universities.

Sampling strategy: A two-phase sampling approach was utilized. Initially, eight colleges were randomly chosen through a lottery draw from a total of 19 colleges located at the main campuses of Salahaddin University-Erbil and Hawler Medical University. Colleges located at the Shaqlawa extension and other remote branches were excluded from sampling frame in advance due to logistical constraints and to facilitate access during data collection. The names of the eligible colleges were written on identical slips of paper, thoroughly mixed in a container, and eight were drawn at random without replacement. The selected colleges were Medicine, Nursing, Dentistry, Health Sciences, Political Sciences, Economics and Administration, Engineering, and Education. In the second phase, convenience sampling was employed to recruit students from the selected colleges. Students were eligible if they were enrolled as undergraduate students in one of the selected colleges, aged 18 years or older, and provided informed consent. Those who met these criteria were invited to participate based on their availability and willingness during the data collection period.

Using Epi Info™ version 7, the required sample size was calculated based on a total student population of approximately 30,000, assuming a 50% expected prevalence, 95% confidence interval, and a 5% margin of error. This yielded a minimum of 384 participants. To account for potential non-responses, 500 students were invited to participate. Of these, 400 students who met the eligibility criteria completed the questionnaire, resulting in a response rate of 80%. Students who did not meet the eligibility criteria or failed to complete the survey were excluded from the final analysis.

Data collection: Data were collected using a self-administered questionnaire available in both online and paper-based formats. Online surveys were distributed via platforms such as Google Forms, Facebook, Telegram, and WhatsApp. Paper-based surveys were administered on campus, with the support and coordination of college

https://doi.org/10.15218/zjms.2026.019

administrative staff, and were completed and returned immediately. This dual-mode approach improved accessibility and minimized interviewer bias.

Study tools: The questionnaire incorporated two validated tools. The first was a culturally adapted and Kurdish-translated version of the World Health Organization's Adverse Childhood Experiences International Questionnaire (ACE-IQ) (4), which assesses 13 domains of adversity: emotional, physical, and sexual abuse; emotional and physical neglect; exposure to household dysfunction (including substance use, incarceration, mental illness, or parental separation); witnessing domestic violence; bullying; community violence; and collective violence. Each item began with, *"*When you were growing up, during the first 18 years of life*"*, followed by specific questions such as, "Did you see or hear a parent or household member in your home being slapped, kicked, punched or beaten up?" *or* "Did a parent, guardian or other household member spank, slap, kick, punch or beat you up?". The tool was forward translated into Kurdish, reviewed by bilingual experts, and pilot tested to ensure linguistic and cultural appropriateness. To enhance cultural sensitivity, a question regarding parental intoxication was replaced with an item on unmet medical needs, and four sexual abuse questions were condensed into two generalized items that avoided explicit or graphic language. Responses were scored dichotomously (Yes = 1, No = 0), and a cumulative ACE score (range: 0–13) was calculated. ACE scores were categorized into three groups: low (0–1), moderate (2–3), and high (≥4), as commonly used in the literature (12, 13). The reliability of the adapted ACE-IQ was verified, with a Cronbach's alpha of (0.736) indicating acceptable internal consistency.

The second tool was a modified version of the CDC Health Appraisal Questionnaire (1), tailored to suit the local context and age group. Gender-specific and irrelevant items were excluded, while questions on somatic complaints, chronic illnesses, and mental health symptoms were retained. The internal consistency of the symptom items from the second tool was assessed using Cronbach's alpha. The physical health symptom items showed acceptable reliability (α = 0.774), while the mental health symptom items showed good reliability (α = 0.799). These analyses were conducted to evaluate coherence among the items, even though they were not combined into a single score. The final instrument consisted of 51 items, including 13 on sociodemographic characteristics, 29 on ACE exposure, and 9 assessing health-risk behaviors and physical and mental health symptoms. A pilot test with 10 students ensured clarity and flow.

https://doi.org/10.15218/zjms.2026.019

Socioeconomic status (SES) was measured using a modified 19-point index. The components included parental education (4 points each), parental occupation (3 points each), home ownership (2 points), car ownership (1 point), and the household crowding index (2 points), calculated by dividing the number of household members by the number of rooms (excluding kitchen and bathroom). Based on total scores, SES was categorized into low (1–6), medium (7–12), and high (13–19) (14).

Ethical aspects: Ethical approval was granted by the Ethics Committee of the College of Medicine, Hawler Medical University. Informed consent was obtained verbally from paper-based participants and electronically from online respondents. All participants were informed of their right to decline or withdraw at any point. No identifying information was collected, ensuring participant anonymity and data confidentiality. All records were securely stored and accessed only by the research team.

Statistical Analysis: Data were entered manually into SPSS version 25.0 and analyzed thereafter. Descriptive statistics (frequencies and percentages) were used to summarize participants' demographic characteristics, ACE categories, and health outcomes. Associations between categorical variables were tested using Pearson's chi-square or Fisher's exact test, depending on data distribution and cell sizes. Health outcomes that showed significant associations in bivariate analysis were considered for multivariable logistic regression. To ensure clarity and avoid overcrowding, only outcomes that remained statistically significant ($P < 0.05$), had narrow confidence intervals, and were considered most relevant to public health and clinical practice were reported. All models were adjusted for age, sex, and socioeconomic status. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported, and P-values <0.05 were considered statistically significant.

Results

Participant Characteristics

A total of 400 undergraduate students completed the survey. The average age was 20.78 years (SD = 2.21), with 258(64.5%) of participants falling within the 20–24 age range. Female students made up the majority (272; 68.0%), and most lived in urban areas (321; 80.3%) and identified as Kurdish (385; 96.3%). The vast majority was single (370; 92.5%). "Nearly half of the participants (192; 48.0%) were classified as having high socioeconomic status based on a composite index of parental education, occupation, and household assets." (Table 1).

https://doi.org/10.15218/zjms.2026.019

Table 1. Sociodemographic characteristics of participants (n = 400)

Variable	No.	Percentage (%)
Gender		
Male	128	(32.0)
Female	272	(68.0)
Age group (years)		
<20	125	(31.3)
20-24	258	(64.5)
25-29	14	(3.50)
30+	3	(0.80)
Residence		
Urban	321	(80.3)
Rural/suburban	79	(19.8)
Ethnicity		
Kurd	385	(96.3)
Arab	4	(1.00)
Turkmen	6	(1.50)
Others	5	(1.30)
Socioeconomic Status		
Low SES	101	(25.3)
Medium SES	107	(26.8)
High SES	192	(48.0)
Marital status		
Single	370	(92.5)
Married	30	(7.50)
Total	400	(100.0)

https://doi.org/10.15218/zjms.2026.019

Prevalence of Adverse Childhood Experiences (ACEs)

The mean ACE score among participants was 3.5 (SD = 2.39), with scores ranging from 0 to 11. A large majority of students (378; 94.5%) reported experiencing at least one ACE, and 171(42.8%) had experienced four or more. Community violence, bullying, and exposure to domestic violence were the most frequently cited ACEs. In contrast, the lowest reported experiences were related to household substance use, mental illness, and incarceration of a family member. (Figures 1 and 2).

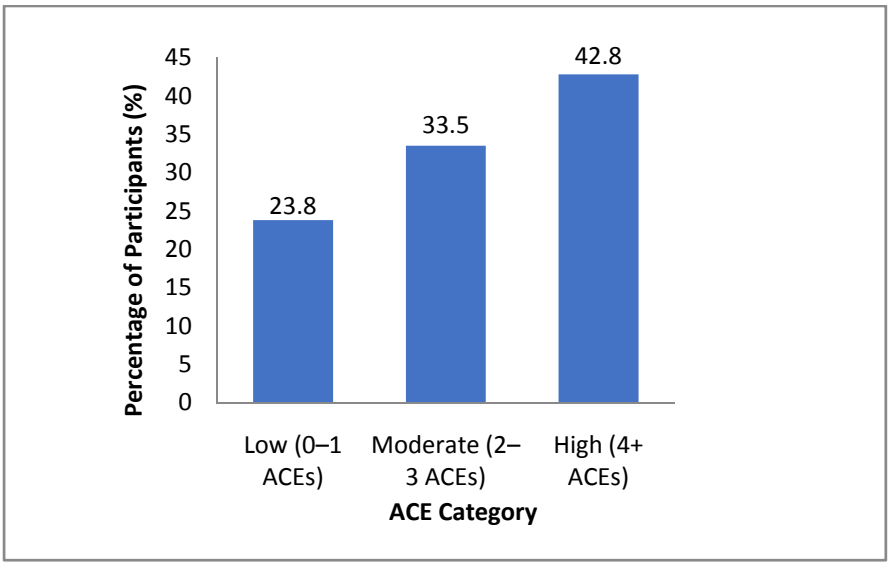

Figure 1. Distribution of ACE score categories among university students in Erbil (N = 400)

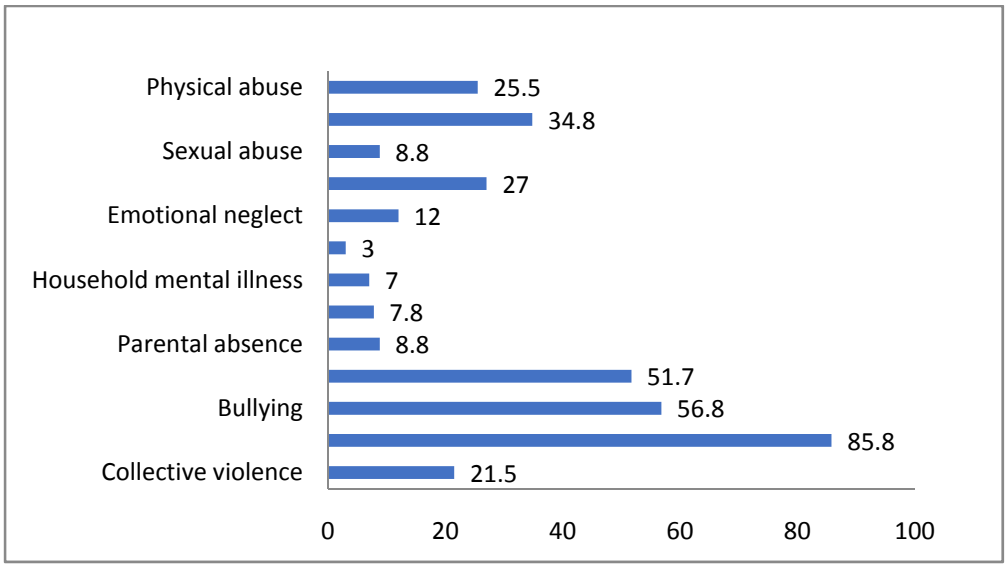

Figure 2. Prevalence of individual adverse childhood experiences (ACEs) among participants

https://doi.org/10.15218/zjms.2026.019

Associations Between Sociodemographic Characteristics and ACEs

Significant associations were found between certain ACEs and sociodemographic characteristics. Males were more likely than females to report physical abuse (34.4% vs. 21.3%, P = 0.005) and bullying (64.1% vs. 53.3%, P = 0.043). No statistically significant associations were found between ACE types and socioeconomic status (SES). Regarding ethnicity, Fisher's exact test revealed significant differences across ethnic groups in the prevalence of contact sexual abuse (8.1% among Kurds, 25.0% Arabs, 33.3% Turkmen, 20.0% others; P = 0.041), emotional neglect (11.2% Kurds, 25.0% Arabs, 33.3% Turkmen, 40.0% others; P = 0.040), and community violence (86.5% Kurds, 50.0% Arabs, 50.0% Turkmen, 100.0% others; P = 0.017).In terms of place of residence, students from rural or suburban areas reported significantly higher exposure to physical neglect (38.0% vs. 24.3%, P = 0.017), collective violence (31.6% vs. 19.0%, P = 0.016), and bullying (69.6% vs. 53.6%, P = 0.011) compared to their urban counterparts.

Association Between ACEs and Mental Health Symptoms

Mental health symptoms were prevalent among participants. The most common were uncontrolled anger (175; 43.8%), sleep problems (152; 38.0%), and panic ((124; 31.0%). ACE exposure was significantly associated with all assessed mental health symptoms (P <0.05). A clear dose–response pattern was observed, with symptom prevalence increasing alongside ACE exposure (Table 2).

Logistic regression analysis (Table 3) confirmed these associations. Compared to students with 0–1 ACEs, those with 2–3 ACEs had 2.3 times greater odds of depression (AOR = 2.33; 95% CI: 1.43–3.79), while those with 4+ ACEs had nearly fivefold increased odds (AOR = 4.94; 95% CI: 2.83–8.60). Similar dose–response trends were found for situational panic, sleep problems, persistent fatigue, and uncontrolled anger.

Association Between ACEs and Physical Health Conditions

Gastrointestinal complaints were common, with abdominal pain (238; 59.5%) and indigestion (131; 32.8%) among the most frequently reported. ACE exposure was significantly associated with several GI symptoms (Table 2). Students with 4 or more ACEs were over three times more likely to report constipation (AOR = 3.05; 95% CI: 1.51–6.16) compared to those with low ACE exposure (Table 3).

Cerebrovascular symptoms were commonly reported, particularly headaches (204; 51.0%) and dizziness (168; 42.0%). ACE exposure was significantly associated with several

https://doi.org/10.15218/zjms.2026.019

cerebrovascular complaints (Table 3). Students with 4 or more ACEs had significantly higher odds of reporting frequent headaches (AOR = 2.53; 95% CI: 1.48–4.30), as shown in Table 3.

Additional symptoms such as persistent fatigue (196; 49.0%), frequent back pain (180; 45.0%), and eczema (50; 12.5%) were also significantly associated with high ACE exposure (Table 2). Students with 4 or more ACEs were substantially more likely to report frequent back pain and persistent fatigue, as reflected in the adjusted odds ratios presented in Table 3.

Additionally, smoking was most common health risk behavior of (55; 13.8%), followed by alcohol use (16; 4.0%) and street drug use (6; 1.5 Males were significantly more likely than females to engage in smoking (32.8% vs. 4.8%, P ≤0.001) and alcohol use (9.4% vs. 1.5%, P ≤0.001). A significant association was found between ACE exposure and smoking (P <0.001), but not alcohol or drug use (Table 2).

Table 2. Association Between ACE levels and health outcomes

Health outcome	0-1ACEs No. (%)	2–3ACEs No. (%)	4+ACEs No. (%)	P-value*
More sensitive than most people	7 (7.40)	24 (17.9)	52 (30.4)	<0.001
Situational panic	14 (14.7)	37 (27.6)	73 (42.7)	<0.001
Uncontrolled anger	26 (27.4)	50 (37.3)	99 (57.9)	<0.001
Trouble refusing requests	10 (10.5)	26 (19.4)	61 (35.7)	<0.001
Sleep problems	22 (23.2)	53 (39.6)	77 (45.0)	0.002
Crying spells	5 (5.30)	10 (7.50)	29 (17.0)	0.004
Nervousness	12 (12.6)	24 (17.9)	54 (31.6)	0.001
Depression	11 (11.6)	35 (26.1)	68 (39.8)	<0.001
Worry about illness	19 (20.0)	45 (33.6)	63 (36.8)	0.016
Smoking	4 (4.20)	15 (11.2)	34 (21.1)	<0.001
Alcohol drinking	3 (3.20)	3 (2.20)	10 (5.80)	0.249
Street drug use	1 (1.10)	1 (0.70)	4 (2.30)	0.580†
High blood pressure	3 (3.20)	12 (9.00)	20 (11.7)	0.061
Frequent headaches	38 (40.0)	63 (47.0)	103 (60.2)	0.004
Attacks of dizziness	32 (33.7)	57 (42.5)	79 (46.2)	0.139
Seizures/convulsions/fits	1 (1.10)	6 (4.50)	31 (18.1)	<0.001
Loss of consciousness	4 (4.20)	9 (6.70)	24 (14.0)	0.014
Stomach ulcer	3 (3.20)	13 (9.70)	24 (14.0)	0.018
Vomited blood	2 (2.10)	0 (0.00)	9 (5.30)	0.019

https://doi.org/10.15218/zjms.2026.019

Abdominal pain	41 (43.2)	88 (65.7)	109 (63.7)	0.001
Indigestion	20 (21.1)	42 (31.3)	69 (40.4)	0.005
Constipation	12 (12.6)	38 (28.4)	57 (33.3)	0.001
Frequent loose stool	8 (8.4)	16 (11.9)	42 (24.6)	0.001
Persistent fatigue	29 (30.5)	71 (53.0)	96 (56.1)	<0.001
Frequent back pain	24 (25.3)	50 (37.3)	106 (62.0)	<0.001
Eczema	4 (4.20)	17 (12.7)	29 (17.0)	0.011
Venereal disease	0 (0.00)	0 (0.00)	3 (1.80)	0.256†
Thyroid disease	0 (0.00)	0 (0.00)	4 (2.30)	0.088†

† Fisher's Exact Test. * Chi-square test.

Table 3. Adjusted Odds Ratios for key Health Outcomes by ACE Exposure Level

Health outcome	**2–3 ACEs**				**4+ ACEs**			
	B	**P-value**	**AOR**	**95% CI**	**B**	**P-value**	**AOR**	**95% CI**
Depression	0.844	0.001	2.326	1.430–3.786	1.597	<0.001	4.936	2.832–8.603
Situational panic	0.768	0.034	2.154	1.062–4.368	1.247	0.002	3.481	1.581–7.663
Sleep Problems	0.557	0.022	1.746	1.085–2.811	0.857	0.005	2.356	1.299–4.275
Persistent fatigue	0.939	0.001	2.56	1.46–4.48	1.106	<0.001	3.02	1.75–5.22
Frequent back pain	0.566	0.058	1.76	0.98–3.17	1.594	<0.001	4.92	2.78–8.71
Frequent Headaches	0.328	0.234	1.389	0.808–2.387	0.926	0.001	2.525	1.484–4.296
Indigestion	0.508	0.110	1.662	0.892–3.098	0.937	0.002	2.553	1.406–4.636
Constipation	0.939	0.011	2.557	1.235–5.294	1.114	0.002	3.047	1.508–6.158

Note: *B* = Regression coefficient; AOR = Adjusted Odds Ratio; CI = Confidence Interval. Odds ratios are adjusted for age, sex, and socioeconomic status. The reference group for all comparisons is students with 0–1 ACEs.

https://doi.org/10.15218/zjms.2026.019

Discussion

Our findings highlight a high burden of adverse childhood experiences (ACEs) among university students in Erbil, with notable associations observed with both mental and physical health outcomes. To the best of our knowledge, this is the first study conducted in Erbil to comprehensively assess these relationships using the WHO ACE-IQ. The application of this standardized and internationally validated tool enhances the comparability of findings with global research.

The study identified a notably high prevalence of ACEs, with 94.5% of students having experienced at least one form of adversity and 42.8% reporting exposure to four or more. These rates exceed global estimates, such as the 60% prevalence reported in a global review (15), and align more closely with findings from conflict-affected or culturally similar regions, including Saudi Arabia (80.3%) (9), Oman (88%) (10), and Pakistan (98%) (13). The elevated rates in this study may reflect regional conflict, instability, and high levels of community violence.

Among individual ACEs, the most commonly reported were community violence (85.8%), bullying (56.8%), and witnessing domestic violence (51.7%). These findings are consistent with results from developing and post-conflict countries using the ACE-IQ tool, such as Pakistan (13), and Uganda (16).

Bullying prevalence in this study also mirrors school-based research in Erbil (17), though it contrasts with much lower rates reported in Baghdad (18), and countries like the UAE (19), and United Kingdom (20). Domestic violence emerged as the most prevalent household dysfunction, aligning with prior findings of intimate partner violence in Erbil (21), and exceeding figures reported in Western countries (20, 22, 23).

In contrast, household substance abuse was the least reported ACE (3%), likely due to legal restrictions and cultural stigma. Emotional abuse emerged as the most frequently reported form of maltreatment (34.8%), aligning with global patterns (22, 24, 25), while sexual abuse was less frequently reported (8.8%), likely reflecting cultural barriers to disclosure.

Sociodemographic differences in ACE exposure were also noted. Male participants were more likely to report experiences of physical abuse and being bullied, consistent with gender norms and findings from previous studies (26, 27). Students from ethnic minority backgrounds and rural areas reported higher exposure to specific adverse experiences. Although the small subgroup size may limit the representativeness of this finding, it is supported by previous research highlighting disproportionate ACE exposure among marginalized ethnic groups (28). Students from rural or

https://doi.org/10.15218/zjms.2026.019

suburban areas reported greater exposure to physical neglect, collective violence, and bullying. While not widely documented in previous studies, these context-specific disparities may reflect differences in safety, resources, or community dynamics.

The study found a strong, graded association between ACE exposure and mental health symptoms. Students who reported four or more adverse childhood experiences showed notably elevated odds of depression (AOR = 4.94), and significantly higher odds of panic, sleep problems, fatigue, and uncontrolled anger. These results align with studies from Iraq (11), Oman (29), and UAE (30). These outcomes are likely influenced by the long-term effects of childhood adversity on emotional regulation and stress response systems, which heighten vulnerability to mood and anxiety symptoms (31).

ACEs were also significantly associated with physical health complaints, particularly among students with high exposure. Strongest associations were observed for back pain (AOR = 4.92), fatigue (AOR = 3.02), and recurring headaches (AOR = 2.53). Gastrointestinal symptoms such as constipation (AOR = 3.05), and indigestion (AOR = 2.55) were also significantly linked to high ACE exposure. These results support the concept of biological embedding (4), which proposes that early adversity can produce long-term physiological alterations such as dysregulation of the hypothalamic–pituitary–adrenal (HPA) axis, chronic low-grade inflammation, and altered immune function. These alterations have been associated with heightened central nervous system sensitivity and increased risk of chronic pain conditions (32). Recent evidence also indicates that ACEs may disrupt gut microbiota composition, impair gut barrier integrity, and affect neuroimmune signaling via the gut–brain axis (33, 34). Such disruptions may contribute to gastrointestinal symptoms and modulate pain processing, further amplifying somatic complaints in adulthood (35).

Among the examined risky behaviors, smoking was the only outcome significantly associated with ACE exposure. This finding is consistent with international studies suggesting that individuals with a history of childhood adversity may engage in health-risk behaviors, such as smoking, as a maladaptive coping strategy to manage emotional distress (9, 10, 23). Engagement in such behaviors may serve as a pathway linking early traumatic experiences to the emergence of health comorbidities later in life (6).

Limitations

1. Cross-sectional design (causal inference).

2. Self-reported data (recall and social desirability biases—particularly for

https://doi.org/10.15218/zjms.2026.019

sensitive experiences like sexual abuse).

3. Convenience sampling from two public universities limits the generalizability of findings.

Conclusions and Recommendations

This study revealed a high prevalence of adverse childhood experiences (ACEs) among university students in Erbil, with strong associations between greater ACE exposure and poorer mental and physical health outcomes, as well as increased health-risk behaviors like smoking. These findings emphasize the importance of adopting trauma-informed approaches within educational and healthcare environments to address early life adversity and promote student mental and physical health. Preventive efforts should focus on addressing common ACEs—such as community violence, bullying, and domestic violence—through school-based violence prevention programs and parenting education. Integrating life skills and emotional regulation training into curricula, promoting mental health awareness and help-seeking, and expanding access to campus mental health services are essential strategies to support student well-being and mitigate the long-term effects of childhood adversity.

Acknowledgements: The authors are grateful to the students for their participation in the study and would like to thank the faculty and administrative staff for their cooperation during data collection.

Declaration of AI Use: The authors have utilized GPT-4, which is a generative AI language model, during the writing of this manuscript to assist the authors in enhancing language clarity and readability. The authors have reviewed and edited all content to ensure accuracy and integrity, and take full responsibility for the final version of the work.

Funding

This research received no external funding.

Competing interest

The authors declare that they have no competing interests.

References

1. CDC. About the CDC-Kaiser ACE Study. Atlanta, GA: Centers for Disease Control and Prevention, 2021. (Accessed May 21, 2025, at https://www.cdc.gov/violenceprevention/aces/about.html)

2. Cronholm PF, Forke CM, Wade R, Bair-Merritt MH, Davis M, Harkins-Schwarz M, et al. Adverse childhood experiences. Am J Prev Med. 2015;49(3):354–61. https://doi.org/10.1016/j.amepre.2015.02.001

3. WHO. Adverse Childhood Experiences International Questionnaire (ACE-IQ). Geneva: World Health Organization,

https://doi.org/10.15218/zjms.2026.019

2020. (Accessed May 4, 2025, at https://www.who.int/publications/m/item/adverse-childhood-experiences-international-questionnaire-(ace-iq))

4. Berens AE, Jensen SKG, Nelson CA. Biological embedding of childhood adversity: from physiological mechanisms to clinical implications. BMC Med. 2017;15(1):135. https://doi.org/10.1186/s12916-017-0895-4

5. Hughes K, Bellis MA, Hardcastle KA, Sethi D, Butchart A, Mikton C, et al. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. Lancet Public Health. 2017;2(8):e356–e366. https://doi.org/10.1016/S2468-2667(17)30118-4

6. Campbell JA, Walker RJ, Egede LE. Associations between adverse childhood experiences, high-risk behaviors, and morbidity in adulthood. Am J Prev Med. 2016;50(3):344-52. https://doi.org/10.1016/j.amepre.2015.07.022

7. Metzler M, Merrick MT, Klevens J, Ports KA, Ford DC. Adverse childhood experiences and life opportunities: shifting the narrative. Child Youth Serv Rev. 2017;72:141-9. https://doi.org/10.1016/j.childyouth.2016.10.021

8. Yehuda R, Lehrner A. Intergenerational transmission of trauma effects: putative role of epigenetic mechanisms. World Psychiatry. 2018;17(3):243-57. https://doi.org/10.1002/wps.20568

9. Almuneef M, Hollinshead D, Saleheen H, AlMadani S, Derkash B, AlBuhairan F, et al. Adverse childhood experiences and association with health, mental health, and risky behavior in the Kingdom of Saudi Arabia. Child Abuse Negl. 2016;60:10-7. https://doi.org/10.1016/j.chiabu.2016.09.003

10. Al Azri Z, Al-Abri K, Al Sawafi A, Jaju S, Al Qadire M. Adverse childhood experiences and risky behaviors in Oman: a cross-sectional study. Prev Med Rep. 2024;44:102809. https://doi.org/10.1016/j.pmedr.2024.102809

11. Al Shawi AF, Sarhan YT, Altaha MA. Adverse childhood experiences and their relationship to gender and depression among young adults in Iraq: a cross-sectional study. BMC Public Health. 2019;19(1):1687. https://doi.org/10.1186/s12889-019-7957-9

12. Manyema M, Norris SA, Richter LM. Stress begets stress: the association of adverse childhood experiences with psychological distress in the presence of adult life stress. BMC Public Health. 2018;18(1):835. https://doi.org/10.1186/s12889-018-5767-0

13. Mahmood S, Fatmi Z. Prevalence of adverse childhood experiences (ACEs) and its association with current mental

https://doi.org/10.15218/zjms.2026.019

wellbeing among young adults in Pakistan. Child Abuse Negl. 2025;163:107318. https://doi.org/10.1016/j.chiabu.2025.107318

14. Omer W, Al Hadithi T. Developing a socioeconomic index for health research in Iraq. East Mediterr Health J. 2017;23(10):670-7. https://doi.org/10.26719/2017.23.10.670

15. Madigan S, Deneault A, Racine N, Park J, Thiemann R, Zhu J, et al. Adverse childhood experiences: a meta-analysis of prevalence and moderators among half a million adults in 206 studies. World Psychiatry. 2023;22(3):463-71. https://doi.org/10.1002/wps.21122

16. Muwanguzi M, Kaggwa MM, Najjuka SM, Mamun MA, Arinaitwe I, Kajjimu J, et al. Exploring adverse childhood experiences (ACEs) among Ugandan university students: its associations with academic performance, depression, and suicidal ideations. BMC Psychol. 2023;11(1):11. https://doi.org/10.1186/s40359-023-01044-2

17. Ahmed B, Al-Hadithi T. Bullying among school adolescents in Erbil City of Iraq. Zanco J Med Sci. 2019;23(2):194-205. https://doi.org/10.15218/zjms.2019.025

18. AlShawi AF, Lafta RK. Relation between childhood experiences and adults' self-esteem: a sample from Baghdad. Qatar Med J. 2015;2014(2):14. https://doi.org/10.5339/qmj.2014.14

19. Al-Darmaki F, Al Sabbah H, Haroun D. Prevalence of bullying behaviors among students from a national university in the United Arab Emirates: a cross-sectional study. Front Psychol. 2022;13:768305. https://doi.org/10.3389/fpsyg.2022.768305

20. Nation A, Pacella R, Monks C, Mathews B, Meinck F. Prevalence of violence against children in the United Kingdom: a systematic review and meta-analysis. Child Abuse Negl. 2023;146:106518. https://doi.org/10.1016/j.chiabu.2023.106518

21. Malik IA, Shabila NP, Al-Hadithi TS. Women's knowledge of the domestic violence legislation in Erbil, Iraq and their response to spousal violence. J Fam Violence. 2017;32(1):47-53. https://doi.org/10.1007/s10896-016-9829-8

22. Swedo EA, Aslam MV, Dahlberg LL, Niolon PH, Guinn AS, Simon TR, et al. Prevalence of adverse childhood experiences among U.S. adults — Behavioral Risk Factor Surveillance System, 2011–2020. MMWR Morb Mortal Wkly Rep. 2023;72(26):707-15. https://doi.org/10.15585/mmwr.mm7226a2

23. Wiehn J, Hornberg C, Fischer F. How adverse childhood experiences relate to single and multiple health risk

https://doi.org/10.15218/zjms.2026.019

behaviours in German public university students: a cross-sectional analysis. BMC Public Health. 2018;18(1):1005. https://doi.org/10.1186/s12889-018-5926-3

24. Mathews B, Pacella R, Scott JG, Finkelhor D, Meinck F, Higgins DJ, et al. The prevalence of child maltreatment in Australia: findings from a national survey. Med J Aust. 2023;218(S6):S13-S18. https://doi.org/10.5694/mja2.51873

25. Majid M, Ab Rahman A, Taib F. Adverse childhood experiences and health risk behaviours among the undergraduate Health Campus students. Malays J Med Sci. 2023;30(1):152-61. https://doi.org/10.21315/mjms2023.30.1.13

26. Moody G, Cannings-John R, Hood K, Kemp A, Robling M. Establishing the international prevalence of self-reported child maltreatment: a systematic review by maltreatment type and gender. BMC Public Health. 2018;18(1):1164. https://doi.org/10.1186/s12889-018-6044-y

27. Cosma A, Bjereld Y, Elgar FJ, Richardson C, Bilz L, Craig W, et al. Gender differences in bullying reflect societal gender inequality: a multilevel study with adolescents in 46 countries. J Adolesc Health. 2022;71(5):601-8. https://doi.org/10.1016/j.jadohealth.2022.05.015

28. O'Connor M, Slopen N, Becares L, Burgner D, Williams DR, Priest N. Inequalities in the distribution of childhood adversity from birth to 11 years. Acad Pediatr. 2020;20(5):609-18. https://doi.org/10.1016/j.acap.2020.01.004

29. Alsawafi A, Fotouhi A, AlAdawi S, Jaju S, Al Qadire M, Al Azri Z. Adverse childhood experiences (ACE) and its association with mental health outcomes: cross-sectional study. Int J Soc Psychiatry. 2024. https://doi.org/10.1177/00207640241300950

30. Murphy A, England D, Elbarazi I, Horen N, Long T, Ismail-Allouche Z, et al. The long shadow of accumulating adverse childhood experiences on mental health in the United Arab Emirates: implications for policy and practice. Front Public Health. 2024;12:1397012. https://doi.org/10.3389/fpubh.2024.1397012

31. Kurbatfinski S, Dosani A, Dewey DM, Letourneau N. Proposed physiological mechanisms underlying the association between adverse childhood experiences and mental health conditions: a narrative review. Children. 2024;11(9):1112. https://doi.org/10.3390/children11091112

32. Bussières A, Hancock MJ, Elklit A, Ferreira ML, Ferreira PH, Stone LS, et al. Adverse childhood experience is

https://doi.org/10.15218/zjms.2026.019

associated with an increased risk of reporting chronic pain in adulthood: a systematic review and meta-analysis. Eur J Psychotraumatol. 2023;14(2):2284025. https://doi.org/10.1080/20008066.2023.2284025

33. Kazemian N, Zhou T, Chalasani N, Narayan A, Cedeño Laurent JG, Olvera Alvarez HA, et al. Long-term impact of childhood adversity on the gut microbiome of nursing students. Int J Environ Res Public Health. 2024;21(1):68. https://doi.org/10.3390/ijerph21010068

34. Zhang H, Wang Z, Wang G, Song X, Qian Y, Liao Z, et al. Understanding the connection between gut homeostasis and psychological stress. J Nutr. 2023;153(4):924-39. https://doi.org/10.1016/j.tjnut.2023.01.026

35. Eilers H, Aan Het Rot M, Jeronimus BF. Childhood trauma and adult somatic symptoms. Psychosom Med. 2023;85(5):408-16. https://doi.org/10.1097/PSY.0000000000001208