Cumulative Exposure to Childhood Trauma and Its Association with Adult Health-Risk Behaviors: Regional Epidemiological Evidence from Sulaimani, Iraqi Kurdistan

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ABSTRACT

Adverse childhood experiences (ACEs)—encompassing abuse, neglect, and household dysfunction—are major public health determinants linked to long-term behavioral and psychological morbidities. While global data on ACEs is extensive, localized epidemiological evidence across distinct governorates in Iraq remains limited. This study investigated the prevalence of 10 distinct ACE categories among adolescents and adults in Sulaimani Governorate and evaluated their dose-response relationships with health-risk behaviors and psychiatric sequelae in adulthood.

Methods:
In a retrospective cross-sectional design, 948 participants aged 18 years and older across Sulaimani Governorate were sampled from community, clinical, institutional, and rehabilitation settings. Exposure to childhood trauma was evaluated using a culturally adapted version of the CDC/WHO ACE questionnaire. Primary adult outcomes—including cigarette smoking, alcohol misuse (AUDIT), illicit drug abuse (DAST-10), depressive symptoms (PHQ-9), marital instability (divorce), and obesity—were statistically correlated with cumulative ACE scores using comparison of means and chi-square analyses ($p < 0.05$).
Results:
Overall, 59.4% of participants reported at least one category of childhood adversity, with 26.0% experiencing ≥ 4 ACEs. Physical abuse (18.5%), emotional abuse (14.4%), emotional neglect (14.2%), and physical neglect (13.9%) were the most prevalent traumatic categories reported. Significant graded relationships were demonstrated between cumulative ACE scores and adult health-risk outcomes, including cigarette smoking ($p = 0.008$), alcoholism ($p = 0.040$), illicit drug abuse ($p = 0.006$), clinical depression ($p = 0.030$), and marital dissolution ($p = 0.003$).
Conclusion:
Childhood adversity is highly prevalent in Sulaimani Governorate and demonstrates a strong graded correlation with adult psychological distress and risky health behaviors. These findings highlight the urgent necessity for governorate-specific child protection frameworks, public education campaigns, and trauma-informed mental health intervention systems.
Keywords: Adverse childhood experiences; Child maltreatment; Health-risk behaviors; Depression; Public health; Sulaimani Governorate; Iraq.

INTRODUCTION

Adverse Childhood Experiences (ACEs)—comprising physical, emotional, and sexual abuse, physical and emotional neglect, as well as multi-factorial household dysfunction—are recognized globally as critical social determinants of health. Childhood trauma initiates complex neurobiological and psychological cascades that fundamentally alter physiological stress-response systems. Sustained exposure to severe, extended adversity without

- **Publisher:** University of Sulaimani, **ISSN (Print):** 1813-0852, **ISSN (Online):** 2617-3034
- **Journal Websitehttps://sjh.univsul.edu.iq/, Volume:** [S], **Issue:** [3], **Year:** [2026], **DOI:** [10.17656/jzsb.12630]
- **Submission Date:** [01/08/2026], **Revised Date:** [01/08/2026], **Accepted Date:** [25/10/2026], **Published Date:** [04/11/2026]

adequate socio-emotional buffering leads to "toxic stress". At the biological level, toxic stress triggers persistent dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, characterized by hypersecretion of corticotropin-releasing factor (CRF) and chronic glucocorticoid elevations. Over time, this sustained neuroendocrine activation impairs hippocampal neurogenesis and alters dendritic morphology in prefrontal and limbic structures, impairing stress resilience, emotional regulation, and cognitive adaptability into adulthood.

Extensive international research, spearheaded by the landmark CDC-Kaiser Permanente study, has demonstrated a strong, graded dose-response relationship between cumulative childhood trauma and adult health-harming behaviors. Individuals exposed to multiple ACEs exhibit significantly heightened risks for mood and anxiety disorders, substance dependence, obesity, and interpersonal instability. For example, maladaptive health behaviors such as nicotine dependence and substance misuse frequently manifest as self-medicating coping mechanisms to manage underlying psychological wounds and neurochemical derangements. Furthermore, early adversity impacts structural family stability, reducing adult stress tolerance in domestic roles and leading to higher rates of marital dissolution and intergenerational trauma transmission.

Childhood adversity and maltreatment are major global public health concerns, but their prevalence and impact are heavily influenced by local political, economic, and sociocultural dynamics. In Iraq and the Kurdistan Region, decades of armed conflict, economic instability, and forced displacement have heightened family distress and altered community safety nets. Previous regional research has begun to document these patterns. For instance, studies conducted in Erbil and central Iraqi provinces (such as Baghdad and Mosul) have highlighted high rates of physical punishment, domestic violence exposure, and psychological distress among children and youth. Research in Erbil demonstrated a significant prevalence of corporal punishment in domestic and educational settings, while studies in Baghdad found strong correlations between childhood exposure to violence and subsequent psychiatric disorders.

However, significant gaps remain in understanding how these childhood exposures specifically translate into long-term behavioral health risks—such as substance abuse, severe depression, obesity, and marital breakdown—within the unique demographic and social environment of Sulaimani Governorate. While governorates in the Kurdistan Region share overarching legal and political frameworks, regional variations in urbanization, socioeconomic distribution, and local support services affect both the occurrence of ACEs and the public reporting of sensitive behaviors like drug use or domestic abuse. Therefore, examining the specific cumulative dose-response relationships between ACEs and adult health-risk outcomes in Sulaimani fills a crucial regional empirical gap and provides local policymakers with targeted data.

Aims of the Study:

Specifically, this study aimed to:

1. Determine the prevalence and co-occurrence of 10 categories of adverse childhood experiences among a representative sample of adolescents and adults (aged 18–87 years) across Sulaimani Governorate.
2. Quantify the graded dose-response relationship between cumulative ACE exposure and specific adult health-risk outcomes, including cigarette smoking, alcohol misuse, illicit drug abuse, clinical depression, and marital dissolution.

2. MATERIALS AND METHODS

2.1 Study Design and Population

This study utilized a retrospective cross-sectional survey design to investigate the association between Adverse Childhood Experiences (ACEs) and adult health-risk behaviors in Sulaimani Governorate, Iraq. A total of 948 adolescents and adults aged 18 years and older (range: 18–87 years) were enrolled through multi-stage random sampling across general community settings, secondary and tertiary hospitals, correctional facilities, and substance rehabilitation centers.

- **Inclusion Criteria:** Participants aged 18 years or older residing in Sulaimani Governorate who provided informed consent.
- **Exclusion Criteria:** Individuals unable to comprehend the questionnaire due to severe cognitive impairment, acute psychiatric crisis, or refusal to participate.

2.2 Instrumentation and Measurement Tools

Data were collected using a structured, self-administered questionnaire divided into demographic characteristics, childhood trauma evaluation, and adult behavioral/mental health assessments. All instruments were translated into Kurdish (Sorani) following a forward-backward translation protocol and modified in consultation with a panel of local pediatricians, psychiatrists, and sociologists to ensure cultural appropriateness and content validity.

1. **Adverse Childhood Experiences (ACE) Questionnaire:**

Childhood adversity occurring prior to age 18 was assessed using an adapted version of the standardized CDC-Kaiser Permanente / WHO ACE instrument. The scale consists of **10 items** covering three main domains:

- *Child Abuse (3 items):* Physical abuse, emotional abuse, and sexual abuse.
- *Child Neglect (2 items):* Physical neglect and emotional neglect.
- *Household Dysfunction (5 items):* Domestic violence against the mother, household substance abuse, household mental illness, parental separation/divorce, and incarcerated household member.

Each item was scored dichotomously (0 = No, 1 = Yes). A cumulative ACE score ranging from 0 to 10 was calculated for each participant by summing affirmative responses. Unanswered items were recorded as negative responses ("No") to ensure conservative statistical estimates.

2. **Alcohol Use Disorders Identification Test (AUDIT):**

Alcohol misuse was screened using the 10-item WHO AUDIT instrument. Items assess alcohol consumption frequency, dependence symptoms, and alcohol-related problems, with individual item scores ranging from 0 to 4 (total score range: 0–40). A cutoff score of ≥ 8 was defined to indicate hazardous alcohol use / alcoholism.

3. **Drug Abuse Screening Test (DAST-10):**

Illicit drug use and non-medical prescription drug abuse over the preceding 12 months were evaluated using the 10-item DAST-10. Each item requires a binary "Yes/No" response (1 point per affirmative answer, with item 3 reverse-coded). A composite score of ≥ 3 was set as the threshold for moderate-to-severe drug abuse requiring clinical evaluation.

4. **Patient Health Questionnaire (PHQ-9):**

Adult depressive symptoms over the prior two weeks were measured using the 9-item PHQ-9 scale. Items are scored on a 4-point Likert scale ranging from 0 ("Not at all") to 3 ("Nearly every day") (total score range: 0–27). A score of ≥ 10 was designated as the threshold for clinically significant depression.

5. **Marital Status and Demographics:**

Marital stability was evaluated through direct self-report questions categorizing current marital status and history of divorce. Participants reporting

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- **Submission Date:** [01/08/2026], **Revised Date:** [01/08/2026], **Accepted Date:** [25/10/2026], **Published Date:** [04/11/2026]

current divorce or a history of prior marital dissolution were categorized into the divorce history group.

2.3 Ethical Considerations

Ethical approval for this study was obtained from the institutional review board/ethics committee. Informed verbal and written consent was acquired from all participants prior to questionnaire administration, ensuring complete confidentiality, voluntary participation, and anonymity.

2.4 Statistical Analysis

Statistical analysis was performed using SPSS version 22.0. Categorical variables were reported as frequencies and percentages. One-way Analysis of Variance (ANOVA) and compare-means analyses were conducted to test differences in cumulative ACE scores across behavioral outcome groups. Statistical significance was established at $p < 0.05$.

3. RESULTS

The participants were 948; 529 male, 419 female; aged between 18–87 years old from Sulaimani Governorate, most of whom had a high school education or higher (60.02%). Among 948 participants, **59.4%** of respondents reported at least one of the 10 categories of ACEs, and around **26.0%** experienced 4 or more.

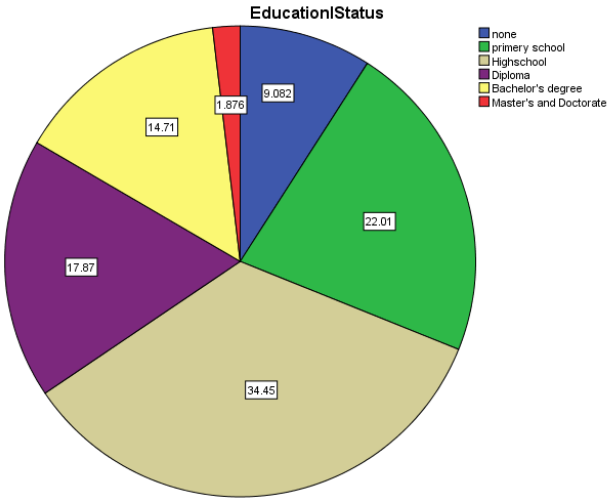


Figure 1: Distribution of Participants by Educational Attainment

- **Prevalence and Co-occurrence of Adverse Childhood Experiences (ACEs)**
  Among the 948 respondents, **59.4%** reported experiencing at least one of the 10 categories of adverse childhood experiences during their youth, and approximately **26.0%** experienced 4 or more cumulative ACEs [1].

NO. of ACEs	In number
0	384
1	107
2	97
3	114
4	119
5	73
6	26
7	17
8	9
9	2
Total	948

Table 1: Cumulative Frequency Distribution of Adverse Childhood Experiences (ACEs)

- **Most Common ACEs:** Physical abuse (18.5%) was the most common ACE reported, followed by emotional abuse (14.4%), emotional neglect (14.2%), physical neglect (13.9%), mother treated violently (9.7%), incarcerated family member (6.9%), mental illness in the family (5.9%), parental divorce (5.7%), sexual abuse (5.6%), and substance abuse in the family (5.2%).

adverse childhood experiences		Responses	
		N	Percent
	Sexual_Abuse	53	5.6%
	Emotional_Neglect	134	14.2%
	Emotional_Abuse	136	14.4%
	Physical_Neglect	131	13.9%
	PHysical_Abuse	175	18.5%
	Mother treated violently	91	9.7%
	incarceratedFamilyMember	65	6.9%
	MentalIllnessINtheFamily	55	5.9%
	parental_Devorce	54	5.7%
	SubstanceAbuseIntheFamily	49	5.2%

- **Table 2: Prevalence and Ranking of Specific Adverse Childhood Experience Types**
- **Health-Risk Outcomes & Graded Associations:**

1. **Smoking:** 24.1% of participants (228 cases) were current smokers, showing a significant positive graded association with increasing ACE scores ($p = 0.008$).

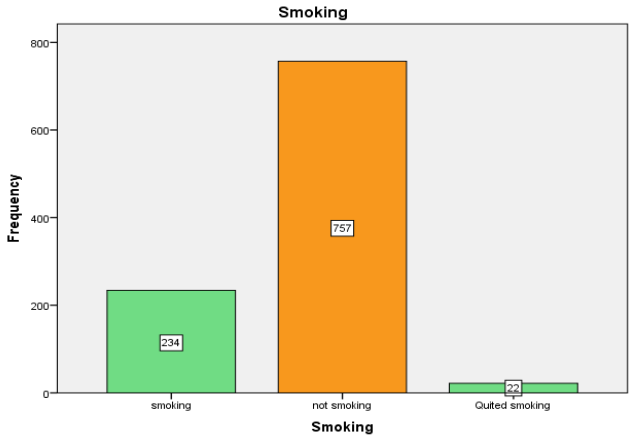


Figure (2): Smoking frequency in Bar chart

2. **Alcohol Misuse & Alcoholism:**

A total of **154 participants** fulfilled standardized screening criteria for alcoholism (AUDIT score $>$ 8). Results demonstrate a significant graded increase in alcohol misuse frequency with an increasing number of ACEs ($p = 0.040$) .

3. **Illicit Drug Abuse:**

Substance screening using the DAST-10 instrument identified **79 cases** meeting the threshold for drug abuse (score ≥ 3). The risk of illicit or non-medical prescription drug abuse escalated significantly with higher cumulative ACE scores ($p = 0.006$) .

4. **Clinical Depression:**

Screening via the PHQ-9 tool revealed that **19.04%** ($n = 180$) of participants reported scores ≥ 10, indicating moderate-to-severe depressive symptoms. A significant positive correlation was identified between increasing ACE exposure and depressive morbidity ($p = 0.030$)

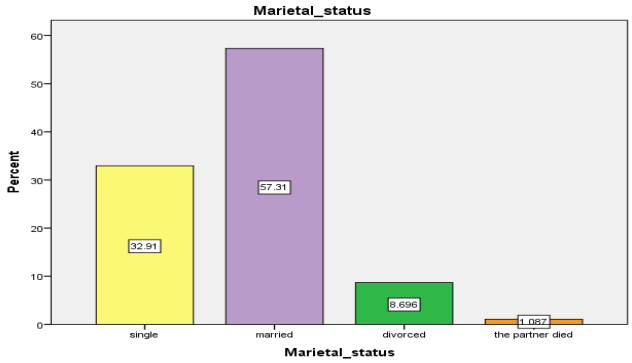


Figure (3): marital status frequency in Bar chart

Variables	NO. of ACEs means±std. deviation	P value
Smoking	2.39±2.1	0.008
Alcoholism	3.96±2.04	0.040
Drug abuse	4.54±2.03	0.006
Depression	4.62±2.96	0.030
Rate of divorce	4.67±2.37	0.003

Table 3: Summary of Statistical Associations Between Cumulative ACE Scores and Adult Health-Risk Outcomes

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4. DISCUSSION

The findings of this study confirm that Adverse Childhood Experiences are highly prevalent within Sulaimani Governorate, with nearly 60% of respondents reporting exposure to at least one form of childhood adversity and over a quarter experiencing four or more categories [1]. Consistent with international findings, physical and emotional abuses and neglects were among the most frequently reported adversities [1, 42]. These results align closely with regional multi-country surveys in Eastern Europe [42] and studies from Saudi Arabia [43, 50], reinforcing that early trauma co-occurs across populations. Furthermore, the observed differences compared to western baseline studies [1, 33]—such as lower explicit disclosures of sexual abuse or substance use—reflect cultural stigmas inherent to the regional population, where victims may underreport sensitive experiences [1, 43].

These regional nuances are further reflected when comparing our findings with other post-conflict and urban areas in Iraq. For instance, studies conducted in Erbil documented high frequencies of physical discipline and corporal punishment among school children [56], aligning with our observation that physical abuse is the most prevalent form of childhood adversity in the region [1]. Similarly, investigations in Baghdad [57] and Mosul [58] have established significant correlations between childhood trauma exposure and subsequent psychological distress, anxiety, and behavioral dysregulation. While those studies highlight the broader psychological tolls of cumulative regional instability [57, 58], the present study provides the first comprehensive empirical gradient in Sulaimani, mapping how these adversities directly translate into specific adult health-risk behaviors such as substance abuse, depression, and marital dissolution [1].

The graded relationships observed between cumulative ACE scores and adult health-harming behaviors—including cigarette smoking [20, 21, 44], alcohol misuse [45, 46], illicit drug use [47, 48], clinical depression [49, 51], and marital dissolution [53]—mirror foundational neurobiological models of toxic stress [4, 9, 10]. Chronic HPA-axis activation [17, 19] and structural neurodevelopmental alterations [11] resulting from early childhood trauma impair adult emotional regulation and coping strategies, often resulting in maladaptive behaviors like substance self-medication and interpersonal instability [20, 21, 53].

Limitations:

Several limitations should be considered when interpreting these findings. First, the retrospective self-reporting of Adverse Childhood Experiences may be subject to recall bias or underreporting due to social stigma, particularly concerning sexual abuse and substance use [1, 34]. Second, the cross-sectional design establishes correlations but prevents definitive causal inferences regarding adult health outcomes . Future prospective longitudinal studies within Iraqi populations are warranted to validate these temporal relationships.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion:

Childhood adversity is a pervasive public health issue in Sulaimani Governorate, with multi-typic exposures occurring frequently in sync [1]. Cumulative ACE scores demonstrate a powerful graded relationship with adult health-risk behaviors and psychological morbidity, including smoking, substance abuse, depression, obesity, and marital dissolution [1].

Recommendations:

- **Public Health Interventions:** Implement parental education programs focused on positive reinforcement, non-violent

discipline, and emotional communication [1].

- **Clinical Screening:** Train primary healthcare providers and pediatricians to routinely screen for family dysfunction and developmental red flags [1, 22].
- **Governmental Policy:** Establish comprehensive child protection policies and specialized multidisciplinary centers across the governorate to provide immediate protection, psychological rehabilitation, and family support services [1, 31].

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پوختە

ئەزموونە نەرێنییەکانی منداڵی -(ACEs) کە سووکایەتیکردن، پشتگوێخستن و تێکچوونی کارکردنی ماڵان لەخۆدەگرێت- دیاریکەری سەرەکی تەندروستی گشتین کە پەیوەندییان بە نەخۆشییە درێژخایەنەکانی ڕەفتار و دەروونییەوە هەیە. لە کاتێکدا کە زانیارییە جیهانییەکان لەسەر ACEsبەرفراوانن، بەڵگەی پەتازانیی ناوچەیی لە سەرانسەری پارێزگا جیاوازەکان لە عێراقدا سنووردارە. ئەم توێژینەوەیە لێکۆڵینەوەی لە بڵاوبوونەوەی 10 پۆلی جیاوازی ACEلە نێوان هەرزەکاران و گەورەسااڵن لە پارێزگای سلێمانی کردووە و پەیوەندییەکانی ژەمە دەرمان و وەڵامدانەوەیان لەگەڵ ڕەفتارە مەترسیدارە تەندروستییەکان و لێکەوتە دەروونییەکان لە تەمەنی گەورەییدا هەڵسەنگاندووە.

لە دیزاینێکی بڕبڕەیی پاشگەزبوونەوەیدا، 948 بەشداربووی تەمەن 18 ساڵ و سەرووتر لە سەرانسەری پارێزگای سلێمانی لە شوێنەکانی کۆمەڵایەتی، کلینیکی، دامەزراوەیی و چاکسازییەوە نمونەیان لێوەرگیرا. بەرکەوتن بە زەبر و زەنگی منداڵی بە بەکارهێنانی وەشانێکی کولتووری گونجاوی

الرغم من وفرة البيانات العالمية حول هذه التجارب، إلا أن الأدلة الوبائية المحلية في محافظات العراق المختلفة لا تزال محدودة. هدفت هذه الدراسة إلى تقصي مدى انتشار 10 فئات من تجارب الطفولة الضارة بين المراهقين والبالغين في محافظة السليمانية، وتقييم علاقة "الجرعة والاستجابة" (أي مدى تأثير تراكم هذه التجارب) على السلوكيات المحفوفة بالمخاطر الصحية والآثار النفسية في مرحلة البلوغ.اعتمدت الدراسة تصميماً مقطعياً استعراضياً شمل 948 مشاركاً (18 عاماً فما فوق) من محافظة السليمانية، تم اختيارهم من بيئات متنوعة تشمل المجتمع العام، والمرافق الطبية، والمؤسسات، ومراكز التأهيل. تم تقييم التعرض لصدمات الطفولة باستخدام نسخة مُكيَّفة ثقافياً من استبيان تجارب الطفولة الضارة (ACE)المعتمد من قبل مراكز السيطرة على الأمراض (CDC)ومنظمة الصحة العالمية .(WHO) كما تم تحليل الارتباط إحصائياً بين النتائج الصحية لدى البالغين -بما في ذلك تدخين السجائر، وإساءة استخدام الكحول، وتعاطي المخدرات غير المشروعة، وأعراض الاكتئاب، وعدم الاستقرار الزوجي (الطلاق)، والسمنة- وبين الدرجات التراكمية لتجارب الطفولة الضارة، وذلك باستخدام مقارنة المتوسطات واختبار "مربع كاي.($p<0.05$) "

أفاد 59.4% من المشاركين بتعرضهم لفئة واحدة على الأقل من تجارب الطفولة الضارة، بينما تعرض 26.0% منهم لأربع فئات أو أكثر. وكانت أكثر أنواع الصدمات شيوعاً هي: الإساءة الجسدية (18.5%)، والإساءة العاطفية (14.4%)، والإهمال العاطفي (14.2%)، والإهمال الجسدي (13.9%). وأظهرت النتائج وجود علاقات طردية ذات دلالة إحصائية بين الدرجات التراكمية لتجارب الطفولة الضارة وبين النتائج الصحية السلبية لدى البالغين، بما في ذلك تدخين السجائر($p=0.008$) ، وإساءة استخدام الكحول($p=0.040$) ، وتعاطي المخدرات غير المشروعة($p=0.006$) ، والاكتئاب السريري($p=0.030$) ، وتفكك العلاقات الزوجية.($p=0.003$) تنتشر تجارب الطفولة الضارة بشكل واسع في محافظة السليمانية، وتُظهر ارتباطاً قوياً ومتدرجاً مع المعاناة النفسية والسلوكيات الصحية الخطرة في مرحلة البلوغ. تسلط هذه النتائج الضوء على الحاجة الملحة لوضع أطر لحماية الطفل خاصة بالمحافظة، وإطلاق حملات توعية عامة، وتطوير أنظمة للتدخل في مجال الصحة النفسية تأخذ في الاعتبار طبيعة الصدمات التي تعرض لها الأفراد.

الكلمات المفتاحية: تجارب الطفولة الضارة؛ سوء معاملة الأطفال؛ السلوكيات المحفوفة بالمخاطر الصحية؛ الاكتئاب؛ الصحة العامة؛ محافظة السليمانية؛ العراق.

پرسیارنامەی CDC/WHO ACE هەڵسەنگێندرا. دەرەنجامە سەرەتاییەکانی گەورەسااڵن- لەوانەش جگەرەکێشان، خراپ بەکارهێنانی کحول(AUDIT) ، بەکارهێنانی مادده هۆشبەرە نایاساییەکان(DAST-10) ، نیشانەکانی خەمۆکی(PHQ-9) ، ناسەقامگیری هاوسەرگیری (جیابوونەوە)، و قەڵەوی- لە ڕووی ئامارییەوە پەیوەندییان هەبوو لەگەڵ نمرەکانی ACE کەڵەکەبوو بە بەکارهێنانی بەراوردکردنی ماناوەندی و شیکارییەکانی کای-چوارگۆشە ($p<0.05$).

بە گشتی، 59.4%ی بەشداربووان لانیکەم یەک پۆلی ناخۆشی منداڵییان ڕاپۆرت کردووە، لەگەڵ 26.0% کە تووشی ≤4 ACEبوون. دەستدرێژی جەستەیی (18.5%)، ئازاردانی سۆزداری (14.4%)، پشتگوێخستنی سۆزداری (14.2%)، و پشتگوێخستنی جەستەیی (13.9%) باوترین پۆلە زەبربەخشەکان بوون کە ڕاپۆرتکراون. پەیوەندییە پلەبەندییە بەرچاوەکان لە نێوان نمرەکانی ACE کەڵەکەبوو و دەرئەنجامەکانی مەترسی تەندروستی گەورەسااڵن نیشاندرا، لەوانە جگەرەکێشان($p=0.008$) ، کحولیخواردن ($p=0.040$)، بەکارهێنانی مادده هۆشبەرە نایاساییەکان ($p=0.006$)، خەمۆکی کلینیکی($p=0.030$) ، و هەڵوەشاندنەوەی هاوسەرگیری.($p=0.003$)

ناخۆشیەکانی منداڵی لە پارێزگای سلێمانی زۆر باڵوە و پەیوەندییەکی پلەبەندی بەهێز لەگەڵ ناڕەحەتی دەروونی گەورەسااڵن و ڕەفتارە تەندروستییە مەترسیدارەکان نیشان دەدات. ئەم دۆزینەوانە ئاماژە بە پێویستی بەپەلە دەکەن بۆ چوارچێوەی پاراستنی منداڵان تایبەت بە پارێزگاکان، هەڵمەتەکانی پەروەردەی گشتی، و سیستەمی دەستێوەردانی تەندروستی دەروونی ئاگادارکراوی زەبر.

وشەی سەرەکی: ئەزموونە نەرێنییەکانی منداڵی؛ خراپ مامەڵەکردن لەگەڵ منداڵان؛ ڕەفتارەکانی مەترسی تەندروستی؛ خەمۆکی؛ تەندروستی گشتی؛ پارێزگای سلێمانی؛ عێراق

ملخص

تُعد تجارب الطفولة الضارة- (ACEs) والتي تشمل الإساءة، والإهمال، وخلل البيئة الأسرية- من المحددات الرئيسية للصحة العامة، وترتبط بمشكلات سلوكية ونفسية طويلة الأمد. وعلى

- **Publisher:** University of Sulaimani, **ISSN (Print):** 1813-0852, **ISSN (Online):** 2617-3034
- **Journal Websitehttps://sjh.univsul.edu.iq/, Volume:** [S], **Issue:** [3], **Year:** [2026], **DOI:** [10.17656/jzsb.12630]
- **Submission Date:** [01/08/2026], **Revised Date:** [01/08/2026], **Accepted Date:** [25/10/2026], **Published Date:** [04/11/2026]