

Prevalence and Interplay between Borderline Personality Disorder and Adverse Childhood Experiences Among Saudi Arabian University Students: A Case Study

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Abstract: *Study:* Borderline personality disorder (BPD) is a personality disorder characterized by instability in affect regulation, impulse control, and social interactions. There has been a long-term curiosity among researchers about the reasons for underlying BPD. One such implication is Adverse Childhood Experiences (ACE). This study aimed to find out the correlation between BPD and ACE in the context of Saudi Arabian University students. Adverse Childhood Experiences (ACE) play a significant role in the personality traits leading to BPD in adults, and we hypothesize that there is a significant relationship between ACEs and the occurrence of BPD among young college students at King Abdulaziz University. There is very limited published data regarding Gulf countries, including case reports, reviews, and meta-analyses.

Material and Methods: The study was conducted among Saudi Arabian University students aged between 18 and 30. This cross-sectional study at King Abdul-Aziz University involved a total of 1970 subjects. The questionnaire comprised sociodemographic characteristics, the Mclean Screening Instrument for BPD (MSI-BPD), and the Adverse Childhood Experiences (ACE) Questionnaire for Adults.

Results: Our study found that amongst the total subjects undertaken, 41.2% were at a high risk of developing BPD. This is in direct correlation with 61.4% that suffered previous childhood trauma. Amongst the total subjects undertaken for the study, 43.6% of university students experienced ACE; symptoms were associated with smoking, having at least one family member diagnosed with a mental disorder, being divorced, and having a deceased mother.

Conclusion: BPD and ACE are positively correlated, as both have implications for other life-determining factors of the subjects. The study presents the first cross-sectional data set for Saudi Arabian students involving BPD and ACE. This study is significant as it specifically focuses on university students in Saudi Arabia. It suggests that counseling services on all university campuses should be required to facilitate regular evaluation and support for students' mental health.

Keywords: Borderline Personality Disorder, Adverse Childhood Events Saudi Arabian students, cross-sectional study, Personality Disorder, Mclean Screening Instrument for BPD (MSI-BPD), Adverse Childhood Experiences (ACE) Questionnaire for Adults.

Borderline Personality disorder (BPD) is a serious and commonly diagnosed personality disorder prevalent across the world [1]. For a long time, psychologists have been curious to find out the reasons underlying the causes of BPD. It is characterized by a long-standing pattern of mood instability, problematic interpersonal relationships, disrupted self-image that is significant enough to cause extreme distress, and social as well as occupational dysfunctions [2]. BPD affects 1-3% of the overall global population, and its prevalence is thought to be 10% among outpatients, 15-20% among inpatients, and 30-60% among people diagnosed with personality disorders [1]. BPD is a disabling and potentially fatal condition with one of the highest mortality rates of all psychological disorders. The attempted suicide rate among these patients ranges from 38-73%, and the

rate of suicide deaths is 10%. Thus, BPD poses a significant public health risk [2, 3].

Though the etiology of BPD is unknown, genetic and environmental variables are thought to have a significant influence on the development of this disorder [3]. Individuals with BPD are frequently subjected to a variety of childhood traumas, identity malfunctioning, behavioral instability, and anxiety attacks, including abusive and invalidating behavior throughout life [4, 5].

BPD and ACE are interconnected with each other and have serious implications for each other. Usually, subjects who experience a plethora of adverse emotional distress at a young age are more prone to developing ACE. ACE is directly associated with child neglect, abuse ranging from emotional, physical, to sexual abuse.

Exposure to adversities or obstacles at the beginning of life may seriously affect the growth and development of a child's physical and mental health.

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Frequent exposure to difficulties might cause the neuroendocrine-immune system to experience an element of dysregulation. Eventually, this leads to an imbalance in the proper formation of the nervous and mental systems, in addition to an inequality in the child's growth and development compared to his peers, especially if support and protection from the people surrounding the children are absent [6, 7].

The sympathetic nervous system (SNS) and the hormones of the HPA axis are activated after prolonged exposure to ACE, with increased cortisol secretion being the most significant effect. They first aid in the preservation of homeostasis and our general survival. Long-term stress exposure, however, has detrimental effects; SNS activation reduces hunger and gastrointestinal motility while breaking down energy reserves to facilitate rapid escape. Cortisol release and HPA axis activation are typically associated with longer-term survival tactics, such as an increase in appetite for high-fat, high-calorie foods. Stress-related weight increase or decrease can be influenced by activation of the SNS and HPA axis [8, 9].

Moreover, ACE is also associated with subjects growing up in dysfunctional parental homes, such as living with family members who abuse substances [10]. Children who grow up in such toxic environments are unable to comprehend, categorize, control, or tolerate emotional responses; instead, they alternate between emotional repression and severe emotional lability [11]. Indeed, early attachment experiences provide individuals with crucial knowledge about their identities, abilities to control their inner sensations, and behavioral techniques for preserving connections to others. Therefore, caregiver abuse or neglect can affect a child's ability to have a realistic and fair perspective of both oneself and other people [12]. Moreover, an extensive meta-analysis study conducted in the United Kingdom (UK) in 2019 included a review of 97 studies conducted worldwide and found that people exposed to traumatizing childhood experiences -notably emotional abuse and neglect- were 13 times more likely to develop BPD [13].

According to several previous studies, late recognition of BPD manifestations, especially in young groups, can cause major life distress and significantly impact the individual emotional as well as occupational functioning at a susceptible age (5). Cognitive and psychosocial functioning, considered essential for a successful college learning experience, may be problematic for persons affected by BPD [14]. Recent

research suggests that BPD can occur in any typical college and university student population [15]. Moreover, a high risk of dropping out of school and low educational levels are linked to BPD among young college-age groups [16].

There has been an elevation in the occurrence of BPD and related comorbidities in the current decades, especially in developed countries like the United States and the United Kingdom. Moreover, there has been very little published data (case reports, reviews, meta-analysis) in terms of Gulf countries [17-21]. The research gap regarding the relationship between Adverse Childhood Experiences (ACEs) and Borderline Personality Disorder (BPD) in Saudi Arabia could negatively impact mental health interventions by limiting their cultural relevance and effectiveness. Without a thorough understanding of local cultural factors, strategies may be generic and misaligned with the specific needs of individuals. This gap could also hinder proper resource allocation, training for mental health professionals, and the development of targeted prevention programs, ultimately reducing the quality of care and support available to affected students. Addressing this gap would enable more effective and culturally sensitive mental health interventions.

Therefore, we hypothesize that there is a significant relationship between ACEs and the occurrence of BPD among young college students at King Abdulaziz University.

The present study's objective is to extend the literature in this field, aiming to enhance the understanding of these factors within this specific demographic. It is also directed towards finding out the correlation between these two.

METHOD

Setting and Participants

This cross-sectional study was conducted during the month of June 2022 at the University Counseling Center at King Abdul-Aziz University in Jeddah, Saudi Arabia. It was designed to measure the prevalence of BPD and ACE and identify any association between the two. The inclusion criteria for the study require participants to be young college students aged 18-30 who are currently enrolled at King Abdulaziz University and able to understand and respond to the survey instruments in the language used. Participants must also provide informed consent to take part in the research. Conversely, the exclusion criteria include

individuals not enrolled at the university or those outside the specified age range. Additionally, individuals who are unable or unwilling to provide informed consent will be excluded from the study.

The study included 1970 university students at King Abdul-Aziz University, ranging in age from 18 to 25 years, who were willing to participate. The minimum sample size undertaken for this study was estimated to be 1054. The total population size incorporated in the study was 80917. The data was analyzed and processed at SPSS version 23. The data was evaluated with a 3% margin of error and a 95% confidence level. The sample size was calculated using the Raosoft sample size calculator [19].

The study was based on the in-house students of King Abdul-Aziz University. A total of 80917 emails containing an electronic survey were sent to the students. This survey was entirely based on a questionnaire based on BPD and ACE (attached).

Out of the emails sent, only 1970 students were further recruited for the study. Well-informed consent was obtained from the students enrolled in the study, as complete sample reports and study protocols were shared with them before they signed the consent form. As this was a cross-sectional study, no commercial anticipations were involved between the study participants and recruited students.

The questionnaire took approximately 10-15 minutes to complete. During the informed consent process, participants were informed about the confidentiality measures in place, emphasizing that their participation is voluntary and their data remains confidential. A policy for securely disposing of data was established. Records will be stored in the principal investigator's computer for 7 years after the end of the study. Ethical approval was obtained from the King Abdulaziz University Hospital Ethical Committee (Reference No. 208-22).

Variable of Interest

Sociodemographic Characteristics

Information regarding age, nationality, marital status, parental marital status, quality of marital life, number of children in the household, history of psychiatric disorders, family history of psychiatric disorders, and smoking were collected as part of the sociodemographic survey.

Mclean Screening Instrument for BPD (MSI-BPD)

This instrument, formulated by Zanarini *et al.* [22], is a commonly used 10-item questionnaire used to screen for BPD. It has a high internal consistency measure ($\alpha = 0.78$) and can be divided into three major domains: affect dysregulation, impulsivity, self and interpersonal disturbances [23]. The MSI-BPD, as protocol stated in reference [24], comprises of 10 items:

Q.1. Has there been any turmoil in your closest relationships due to frequent arguments or breakups?

Q.2. Have you intentionally hurt yourself (e.g., punched yourself, cut yourself, burned yourself, etc.) or attempted suicide?

Q.3. Have you experienced at least two other problems related to impulsivity (e.g., binge eating, spending too much money, drinking excessively, aggressive verbal attacks)?

Q.4. Are you often very moody?

Q.5. Do you often get very angry Or have you often acted in an angry or sarcastic manner?

Q.6. Are you often suspicious of others?

Q.7. Do you often feel that you are unreal or as if things around you are unreal?

Q.8. Do you feel chronically empty?

Q.9. Have you often felt that you have no idea who you are or that you have no identity?

Q.10. Have you made desperate efforts to avoid feeling abandoned or not to be abandoned (For example, have you called someone repeatedly to reassure yourself that they still care, begged them not to leave you, and hung on to them physically)?

Generally, a score of more than 7 is considered an endpoint and suggests a high sensitivity of the results.

Published evidence suggests that a lower score (5 or 6) can also produce high-sensitivity results.

While screening for BPD among adults with 7 as the endpoint, the sensitivity and specificity values were achieved to be 81 and 89 %, respectively [22]. However, a review report by Zimmerman and Balling [25] comprising 1,473 subjects revealed that a 90% sensitivity could be achieved with a cut-off score of less than 7. It is now evident that higher sensitivity is crucial

for psychological screening tests [25]. Although there is still no definitive recommendation for what exactly this endpoint should be, most researchers in this field use 5 and/or 6 as a limiting factor as it provides 90% sensitivity [26]. A sample of 235 US university students (55% women: mean age = 18.5) provided normative data for the MSI-BPD, with a mean score of 4.83 and a standard deviation of 2.64 [26].

The total score for this instrument ranges from 0 to 10; a score >7 is the cut-off definition for BPD [25]. If an individual scores 5 or 6, further BPD evaluation is recommended [26]. Scores of 4 or less indicate that the level of symptoms is not consistent with BPD. A percentile is also presented, which compares the respondent's scores to a normative sample of university students. A percentile rank close to 50 indicates that the individual's score is typically compared to the normative sample. A percentile of 75, for example, indicates that the respondent scored higher than 75% of people in the normative sample.

Adverse Childhood Experiences (ACE) Questionnaire for Adults

The ACE questionnaire is a 10-item questionnaire that assesses the level of ACE exposure, described as any potential traumatic events, including aspects of the child's environment, that occurred before the age of 18 [27]. The questions are entirely based on postulates formulated by Kaiser Permanente and the Centers for Disease Control and Prevention (CDC) [28]. Murphy *et al.* [29] reported that this questionnaire has adequate internal consistency with a Cronbach's alpha value of 0.88. The questionnaire covers the 10 categories of ACEs pertaining to childhood abuse (emotional, physical, and/or sexual), neglect (emotional and physical), and households with the following: substance abuse, mentally ill members, members with a criminal history, family violence, and parental separation or divorce [28]. Each item is rated on a two-point scale (yes = 1, no = 0), with a total score ranging from 0 to 10. In this study, individuals who exhibited high scores (experiencing 4 or more ACEs) were categorized into the highly vulnerable group (score >4) [29]. We used an Arabic version of the questionnaire, which was formulated by the Office of the California Surgeon General and the Department of Health Care Services, along with the ACEs Aware Clinical Advisory Subcommittee (this version is available on their website. In the current study, the Cronbach's alpha value was 0.733).

The MSI-BPD has been extensively validated in clinical and non-clinical populations, demonstrating

significant reliability, including with inpatient adolescents and women #1. It has also been translated and standardized across various languages such as Spanish, French, Dutch, German, Finnish, Persian, Singaporean, Chinese, and Urdu. Given the high prevalence of borderline personality disorder (BPD), its impacts, and the absence of a reliable tool in Arabic, there is a recognized need for an Arabic version. Saudi Arabia's official language is Arabic, spoken by over 420 million people across 25 countries, highlighting the importance of localized tools [30].

Mclean Screening Instrument for Borderline Personality Disorder (MSI-BPD) was translated into Arabic following ISPOR guidelines for translation and cultural adaptation [31]. Permission was granted by the instrument's developer. Two bilingual consultants at King Abdulaziz Hospital independently translated the tool, and a third consultant helped resolve discrepancies. A back-translation was done by a professional translator, followed by a review. The translation was tested on 10 students at King Abdulaziz University in Jeddah, Saudi Arabia, for clarity and cultural relevance. Feedback was incorporated into the final version, which was reviewed and proofread by consultants before finalizing the Arabic scale.

ACE Questionnaire for Adults, the process of validating the instrument involved culturally adapting it through a method of back-translation and consultation with subject matter experts to ensure both semantic equivalence and content validity. Reliability was assessed using Cronbach's alpha to measure internal consistency, while test-retest reliability was confirmed using the Intraclass Correlation Coefficient (ICC). This rigorous validation process was essential to ensure the instrument was both reliable and valid for use within the Saudi Arabian context, accounting for cultural differences and local relevance. We used the Arabic version of the questionnaire developed by the California Surgeon General's Office and the Department of Health Care Services in collaboration with the ACEs Aware Clinical Advisory Subcommittee. The questionnaire is publicly available on their official website [32].

This article has no conflicts of interest, and no funding was received for the study. The data were collected using a cross-sectional approach through an online survey distributed by the co-authors. Responses were gathered, analyzed, and used to generate the study's results. The research fully adheres to the ICMJE guidelines.

Statistical Analysis

Descriptive Statistics

Data were analyzed and presented using IBM SPSS version 23 (IBM Corp., Armonk, N.Y., US) and GraphPad Prism version 8 (GraphPad Software, Inc., San Diego, CA, US). Categorical and nominal variables are presented as counts and percentages. Continuous variables, on the other hand, are presented as means and standard deviations.

Reliability Statistics

Reliability Analysis was employed using an Alpha (Cronbach) model to study the properties of measurement scales, the items that compose them, and the average inter-item correlation.

Correlation Analyses

Pearson's correlation coefficient was used to correlate variables that were represented by means. Categorical variables were analyzed using the chi-square test. A normal distribution was assumed for performing these statistical tests. Further, Welch's t-test was used to compare the means of the two groups. Dependent study variables were defined using binary outcomes. A Binary Logistic Regression Model (BLRM), with Backward Conditional Elimination with Enter Criteria = 0.05 and Elimination = 0.10, was utilized to determine the significant predictors of any given dependent study variable with 95% confidence intervals (CI). Lastly, a p-value of < 0.05 was used as the criterion to discard the null hypothesis.

RESULTS

This study evaluated the prevalence of BPD and ACEs and their association among 1970 students from King Abdulaziz University.

Socio-Demographic Characteristics

The socio-demographic characteristics of the participant population were as follows: average age: 22.47 ± 3.1 years (minimum = 18, maximum = 30); female sex: 72.6%, $n = 1431$; citizens of Saudi Arabia: 95.0%, $n = 1871$; single: 89.0%, $n = 1753$; with no children: 92.6%, $n = 1824$; with married parents: 74.4%, $n = 1465$; and non-smokers: 82.0%, $n = 1615$, as shown in Table 1. Nearly half of the participants earned less than 2,500 Saudi Riyals (SAR) per month (42.7%, $n = 842$) and rarely played sports (48.4%, $n = 954$); 76.5% had not been diagnosed with a mental

disorder, and 69.1% had no family member diagnosed with a mental disorder. Among those diagnosed with a mental disorder (23.5%, $n = 463$), more than one-third exhibited depressive disorder (39.5%, $n = 183$). A majority of the participants lived in a house with their families (91.0%, $n = 1793$). Nearly half of these participants lived with four to six people in their house or residence (43.8%, $n = 863$), approximately one-third lived with at least seven people (31.2%, $n = 614$), and approximately one-fourth lived with one to three people (21.3%, $n = 420$) (Table 2).

ACE and BPD

Table 3 shows the association between the BPD and ACE scores; there was a significant association between the BPD and ACE scores ($p < 0.001$) according to chi-square analysis. More specifically, the non-risk ACE group included a significantly higher proportion of students categorized into the non-risk BPD group (74.4%, $n = 827$) than those categorized into the at-risk BPD group (25.6%, $n = 285$). Also, the at-risk ACE group included a significantly higher number of participants categorized into the at-risk BPD group (61.4%, $n = 527$) than those categorized into the non-risk BPD group (38.6%, $n = 331$).

Correlation analysis of the study parameters assessed using a 2-tailed t-test at the 0.01 significance level revealed a significant positive correlation between BPD and ACE ($r = 0.533$, $p < 0.001$, $N = 1970$), suggesting that as the ACE score increases, the tendency to have BPD also increases.

Prevalence of BPD

Of the total study population, 41.2% were categorized into the at-risk BPD group (Table 4). The association between BPD and the socio-demographic characteristics of the participants was assessed in detail. Age was found to exhibit a significant association ($p < 0.001$) with BPD according to Welch's t-test at the < 0.05 level. More specifically, the average age of participants was significantly higher in the non-risk BPD group (22.94 ± 3.4 years) than in the at-risk BPD group (21.81 ± 2.5 years). Interestingly, the prevalence of parental divorce/separation was significantly higher in the at-risk BPD group (53.6%, $n = 46.4$) than in the non-risk BPD group (46.4%, $n = 123$) ($p = 0.001$). A significantly higher proportion of participants belonging to the non-risk BPD group were non-smokers (61.7%, $n = 997$) (compared to those in the at-risk BPD group (38.3%, $n = 618$) ($p < 0.001$)).

Table 1: Socio-Demographic Characteristics of the Studied Population (N = 1970)

Demographics	N	Min	Max	Mean	SD
How old are you?	1970	18	30	22.47	3.1
		Count		%	
Total		1970		100.0	
Institution	KAU_ST	1970		100.0	
Node	E-learning	1970		100.0	
What is your gender?	Male	539		27.4	
	Female	1431		72.6	
What is your nationality?	Saudi	1871		95.0	
	Non-Saudi	99		5.0	
What is your marital status?	Single	1753		89.0	
	Married	177		9.0	
	Divorced	36		1.8	
	Widowed	4		0.2	
How many children do you have - if any -?	None	1824		92.6	
	1	45		2.3	
	2	55		2.8	
	3	19		1.0	
	More than 3 children	27		1.4	
What is the current marital status of the parents?	Married	1465		74.4	
	Father is deceased	187		9.5	
	Mother is deceased	39		2.0	
	Divorced or separated	265		13.5	
	Both parents are deceased	14		0.7	
What is the monthly income?	Less than 2,500 SAR	842		42.7	
	2,500-5,000 SAR	293		14.9	
	5,000-1,0000 SAR	340		17.3	
	10,000-15,000 SAR	211		10.7	
	More than 15,000 SAR	284		14.4	
Are you a smoker?	Yes	355		18.0	
	No	1615		82.0	
Do you play sports?	Never	337		17.1	
	Rarely	954		48.4	
	Daily	207		10.5	
	Weekly	352		17.9	
	Monthly	120		6.1	

Table 2: Medical Disorder Diagnosis, Family Mental Health History, and Characteristics of Households in the Studied Population (N = 1970)

Variables		Count	%
Total		1970	100.0
Have you been diagnosed with a mental disorder?	Yes	463	23.5
	No	1507	76.5
Specify n = 463	BPD	59	12.7
	OCD	20	4.3
	Bipolar Disorder	18	3.9
	ADHD	20	4.3
	GAD	88	19.0
	Social phobia	32	6.9
	Depressive disorder	183	39.5
	Schizophrenia	7	1.5
	Another mental disorder	24	5.2
	Mental disorder Not mentioned above	12	2.6
	Has anyone in your family been diagnosed with a mental disorder?	Yes	609
No		1361	69.1
Specify n = 609	BPD	30	4.9
	OCD	72	11.8
	Bipolar disorder	84	13.8
	ADHD	41	6.7
	Depressive disorder	186	30.5
	Generalized Anxiety Disorder	48	7.9
	Social phobia	11	1.8
	Schizophrenia	51	8.4
	Mental disorder not mentioned above	86	14.1
I live in	A house with my family	1793	91.0
	A separate house from the family	124	6.3
	A university residence	53	2.7
How many people live with you in the house or residence?	Does not apply	73	3.7
	1 to 3 people	420	21.3
	4 to 6 people	863	43.8
	7 people or more	614	31.2

Table 3: Association between the Non-Risk and At-Risk Borderline Personality Disorder (BPD) Groups and Non-Risk and At-Risk Adverse Childhood Experience (ACE) Groups among the Studied Population (N =1970)

Variables		Total	Borderline Personality Disorder		p-value
			Non-risk group	At risk group	
Total		1970	1158(58.8%)	812(41.2%)	-
Adverse Childhood Experiences	Non-risk group	1112	827(74.4%)	285(25.6%)	<0.001 ^a
	At risk group	858	331(38.6%)	527(61.4%)	

^a significant using Chi-Square Test at <0.05 level.

Table 4: Overall mean Borderline Personality Disorder (BPD) and Adverse Childhood Experiences (ACE) Scores, Along with Risk Classifications for the Studied Population (N = 1970)

Variables	N	Min	Max	Mean	SD
Borderline Personality Disorder	1970	0	10	5.44	2.8
Adverse Childhood Experiences	1970	0	10	3.18	2.4
		Count		%	
Total		1970		100.0	
Borderline Personality Disorder	Non-risk group	1158		58.8	
	At risk group	812		41.2	
Adverse Childhood Experiences	Non-risk group	1112		56.4	
	At risk group	858		43.6	

Conversely, the prevalence of smoking was significantly higher in the at-risk BPD group (54.6%, n = 194) than in the non-risk BPD group (45.4%, n = 161) ($p < 0.001$). A significantly higher proportion of participants in the at-risk BPD group (63.9%, n = 296) were diagnosed with a mental disorder (compared to those in the non-risk BPD group (36.1%, n = 167)).

The most significant factor predictive of BPD among the students was a history of diagnosis of a mental disorder; this factor showed a positive correlation with BPD ($B = 1.158$, S.E. = 0.118, $\text{Exp}(B) = 3.184$), 95% CI lower = 2.529, 95% CI upper = 4.009). This suggests that a student with a diagnosis of a mental problem had an equal chance of exhibiting BPD. The least significant predictor was age, which showed a negative correlation with BPD ($B = -0.125$, S.E. = 0.020, $\text{Exp}(B) = 0.883$, 95% CI lower = 0.850, 95% CI upper = 0.917). This implies that as the student gets older, there is a 0.125 factor or chance that the student will not exhibit BPD.

ACE Prevalence

We found that 43.6% of the university students who participated were in the at-risk ACE group; most of these participants reported that they had experienced emotional abuse (65%) (Table 5). The association between the ACE and socio-demographic characteristics was assessed. It showed that a significantly higher number of students belonged to the non-risk ACE group than to the at-risk ACE group regardless of sex ($p < 0.001$), nationality ($p < 0.003$), and number of children ($p < 0.0045$) (according to chi-square test at < 0.05 significance level). The number of participants with divorced or separated parents was significantly higher in the at-risk ACE group (69.8%, n =

185) than in the non-risk ACE group (30.2%, n = 80) ($p < 0.001$). In addition, the number of participants who were divorced from their partners was significantly higher in the at-risk ACE group (72.2%, n = 26) than in the non-risk ACE group (27.8%, n = 10) ($p = 0.001$). With regards to income, the number of participants who earned at least 5,000 SAR monthly was significantly higher in the non-risk ACE group than in the at-risk ACE group ($p = 0.007$).

Table 5: Frequency of Adverse Childhood Experiences (ACE) among the Studied Population (N = 1970)

Adverse Childhood Experiences n=1970	Respond Yes n(%)
Physical neglect	517(26.2%)
Parental separation or divorce	491(24.9%)
Household mental illness	659(33.5%)
Household substance misuse	276(14.0%)
Family violence	751(38.1%)
Prison	216(11.0%)
Emotional abuse	1290(65.5)
Physical abuse	760(38.6%)
Emotional neglect	920(46.7%)
Sexual abuse	388(19.7%)

Interestingly, the prevalence of smoking was significantly higher in the at-risk ACE group (61.1%, n = 217) than in the non-risk ACE group (38.9%, n = 138) ($p < 0.001$).

The association between the ACE and mental disorder diagnosis and mental disorder history was then determined using chi-square analysis. The results

revealed a significant association between ACE risk classification and diagnosis of mental disorder and history factors such as (a) confirmed mental disorder diagnosis ($p < 0.001$) and (b) confirmed mental disorder diagnosis of a family member ($p = 0.001$). More specifically, the at-risk ACE group included a significantly higher proportion of those who were diagnosed with a mental disorder (59.6%, $n = 276$) than the non-risk ACE group (40.4%, $n = 187$). Conversely, the non-risk ACE group included a significantly higher proportion of participants who were not diagnosed with a mental disorder (61.4%, $n = 925$) than the at-risk ACE group (38.6%, $n = 582$). Furthermore, the at-risk ACE group included a significantly higher number of students with at least one family member who was diagnosed with a mental disorder (57.5%, $n = 350$) than the non-risk ACE group (42.5%, $n = 259$). Conversely, the non-risk ACE group included significantly more participants without at least one family member (62.7%, $n = 853$) than the at-risk ACE group (37.3%, $n = 508$).

The predictors of ACE were determined using a binary logistic regression model. The following significant risk factors were identified: male sex ($p < 0.001$), Saudi nationality ($p = 0.023$), mother deceased ($p = 0.014$), monthly income level of 2,500 - 5,000 SAR ($p = 0.020$), active smoking ($p < 0.001$), and history of a mental disorder diagnosis of self ($p < 0.001$) and of anyone in their family ($p < 0.001$). The most significant factor predictive of ACE among the students was the deceased status of the mother, which showed a positive correlation with ACE ($B = 1.464$, $S.E. = 0.595$, $\text{Exp}(B) = 4.322$), 95% CI lower = 1.345, 95% CI upper = 13.886). This suggests that every student with a deceased mother has about a 1.5 chance of experiencing ACEs.

DISCUSSION

Multiple important findings emerged from this study. First, our findings, which are consistent with a large number of studies, demonstrate that the tendency to develop BPD increases with an increase in self-reported histories of both neglect and abuse. A study from Hungary found that 86% of patients with BPD had experienced emotional neglect, including parental disinterest, parental under-involvement, and physical neglect by caretakers.

Moreover, the prevalence of prolonged separations from caretakers was 80% in the BPD group. In terms of abuse, 88% of patients with BPD reported a childhood

history of emotional abuse, 65% reported physical abuse, and 56% reported sexual abuse [33]. In agreement with the above, our results indicated that 61.4% of students with BPD had experienced childhood abuse. Physical and emotional abuse, neglect, and family violence were among the ACEs reported by participants in this study.

Furthermore, another study indicated that neglectful childhood experiences may raise blood levels of triglycerides, free fatty acids, glucose, and insulin, which raises the likelihood of poor glucose regulation and has long-lasting consequences on markers of physical health three decades later, including body mass index, waist circumference, and glycosylated hemoglobin [34].

Prevalence of BPD

In this study, we found that 41.2% of university students exhibit BPD; this rate is lower than that reported by a study from Pakistan, which showed that the prevalence of BPD in university students was 62%. Another systemic review, which included 26,343 participants, found that the prevalence of BPD in university students ranged from 0.5% to 32.1% [2]. A previous study concluded that social and emotional burdens and educational competition with peers and siblings can explain the high prevalence of personality disorders [5].

Our study revealed that a significantly high number of participants from the at-risk BPD group had divorced or separated parents. In agreement with this, Guzder *et al.* reported that individuals with BPD experienced parental divorce and separation more frequently than those without BPD [35]. Another study found that parental divorce history indicated worse mental outcomes [36]. Additionally, a previous study suggested that due to the lack of parental direction, children of divorced parents are more likely to struggle in their early adult years [37]. In one study, only 21% of patients with BPD came from families who had not lost a parent due to death, divorce, or serious illness, as opposed to 57% of patients with BPD who had [38].

In the current study, smoking was more prevalent in the at-risk BPD group than in the non-risk group; this could be due to the impulsiveness associated with BPD, aggravated by anhedonia, which is also a feature of BPD [39]. Valadka *et al.* found that the primary motivations for smoking were cravings, habit, and boredom. Furthermore, significant emotional instability

is a risk factor for BPD, and emotionally unstable individuals are also more likely to experiment with smoking [40].

In our study, the at-risk BPD group was more likely to be diagnosed with mental disorders compared to those in the non-risk BPD group. It is known that in terms of comorbidity, BPD is strongly associated with a lifetime of depressive episodes and anxiety disorders. Schizotypal, narcissistic, and dependent personality disorders were reported to be substantially related to BPD [16]. These factors can contribute to impairment in emotional and psychosocial functioning.

Another finding of the current study was that as a student gets older, the probability of developing BPD decreases. These results are supported by previous studies that reported that BPD first manifests in adolescence and can be distinguished reliably from normal adolescent development. The course of BPD from adolescence to late life is characterized by a symptomatic switch from affective dysregulation, impulsivity, and suicidality to maladaptive interpersonal functioning and enduring functional impairments, with subsequent remission and relapse. Dimensional models of BPD appear more age-neutral and more useful across the entire life span [41]. Several other studies have proposed that characteristics of BPD are obvious till adulthood [42, 43]. It is expected that the high prevalence of BPD in a particular age group could be related to environmental burden, social circumstances, psychological pressure, or genetic propensity [42, 43].

Prevalence of ACE

We found that 43.6% of the participating university students were at risk of experiencing ACEs. The most commonly reported ACE was emotional abuse.

Our analysis revealed that a significantly high proportion of participants who belonged to the at-risk ACE group tended to be smokers. A study conducted in Nebraska in 2011 reported a high incidence of environmental ACEs (defined as exposure to household mental illness, household substance abuse, witnessing abuse, divorce, or incarceration of a household member) among Nebraskans and their link to an increased risk of smoking [44]. Another study conducted in the US in 2011 found that adverse childhood experiences were strongly related to smoking status. It was also reported that an increase in the score for ACEs was positively associated with a

graded increase in the prevalence ratios for present and past smoking [45]. Another study corroborated the association of ACEs that comprise the Household Dysfunction dimension with smoking [46].

In addition, we found that students with at least one family member diagnosed with a mental disorder had a higher risk of experiencing ACEs. This finding is in line with a previous study, which found that 71% of those exposed to trauma with physical abuse reported having either a parent or a sibling with a psychiatric disorder [47].

Porter *et al.* [13] conducted a meta-analysis examining the link between childhood adversity and borderline personality disorder (BPD). The analysis found that individuals with BPD are 13.91 times more likely to report childhood difficulties compared to non-clinical controls, with emotional abuse and neglect showing the strongest associations. The study's strength lies in its comprehensive review of 97 studies, including case-control, epidemiological, and prospective cohort designs. However, smaller retrospective cohort and epidemiological study sample sizes suggest potential methodological biases. In relation to our research, both studies demonstrate a strong correlation between early adversity and the risk of developing BPD, particularly emphasizing the severe effects of emotional abuse and neglect. Key differences between the studies include their scope and methodology. While Porter *et al.*'s meta-analysis synthesizes data from 97 studies with varied approaches, our study is centered on a sample of university students, using direct observation of risk factors and associations. Additionally, there are variations in sample sizes and population focus.

Schäfer *et al.* [48] examined the connection between borderline personality disorder (BPD) behaviors, the severity of childhood trauma, attachment styles, and social support. Using a graph-theoretical approach on a large global sample (n=1692), they identified emotional abuse as the central factor linking other forms of adverse childhood experiences (ACEs) with BPD symptoms. Identity disturbance emerged as the most prominent feature in the BPD network. The study's strength lies in its thorough methodology, accounting for multiple factors and their interactions. However, the cross-sectional design limits the ability to draw causal conclusions. In comparison, our study also highlights the critical role of childhood trauma in BPD development, although differences exist in methodology, sample demographics, and analytical

approaches. While Schäfer's study offers a broad, integrative view through network analysis, our research provides specific prevalence rates and contextual insights within a defined student population.

Our study focused on exploring the link between childhood trauma and BPD in Saudi Arabia, identifying a strong association. It also sheds light on the high prevalence of neglect and abuse among adolescents with BPD, emphasizing the need for tailored mental health interventions in the region. This includes the development of specialized mental health services and educational initiatives to address childhood trauma and its role in BPD within the community. Applying these findings can improve early intervention strategies, enhance support services, and inform policy development, leading to better mental health outcomes.

Our results further revealed that participants who were divorced from their partners had a higher risk of having experienced ACEs. This result is in line with findings from another study, which showed that three of the seven childhood traumas were associated with a greater probability of marital dissolution (i.e., currently separated or currently or previously divorced). Specifically, compared to people who remained married, people who had experienced a marital disruption were more likely to report that they had experienced physical abuse, rape, serious physical attack, or assault during their childhood. The only childhood trauma that was related to both marital disruption and marital satisfaction was rape. Individuals who reported that they had been forced to have sexual intercourse during childhood had a greater probability of experiencing marital disruption and reported lower marital satisfaction than individuals with no such history [49].

We also found that students with deceased mothers were 1.5-fold more likely to experience an ACE than those with mothers who were alive; probably this is because mothers are protective of their children and play a significant role in child attachment development, and the absence of a mother would leave the child vulnerable to experience ACEs.

Ding *et al.* [50] conducted a cross-sectional study to investigate how Adverse Childhood Experiences (ACEs) influence adult diet quality, as measured by the Healthy Eating Index-2010 (HEI-10). They found that individuals with a history of ACEs were 1.22 times more likely to have lower HEI-10 scores (95% CI: 1.17,

1.27). Additionally, a dose-response relationship was observed, with those experiencing four or more ACEs having 1.34 times higher odds of poorer HEI-10 scores (95% CI: 1.27, 1.42). The study provides compelling evidence that ACEs are associated with lower diet quality in adulthood, independent of race, sex, or income, though its cross-sectional design limits conclusions regarding causality.

Jackson and Vaughn's [51] research identified a link between ACEs and food insecurity in young adults. Individuals who had experienced four or more ACEs were 3.4 times more likely to face food insecurity compared to those without ACEs. This suggests that ACEs can have a long-lasting effect on nutritional outcomes by significantly increasing the risk of food insecurity.

A notable limitation of our study is the lack of a detailed analysis of nutritional outcomes related to adverse childhood experiences (ACEs). Although prior research has demonstrated a strong connection between ACEs and various health risks, including food insecurity, our study does not thoroughly examine how ACEs impact long-term nutritional status. This gap restricts our understanding of the full extent of ACEs' influence on health, underscoring the need for future research to investigate this relationship in greater depth.

LIMITATIONS

The present study has several limitations. First, this study deals with the sensitive topic of abuse; it is possible that participants found it difficult to answer questions exploring abuse and neglect in their private lives. This may have led to underreporting and a resulting underestimation of actual abuse. This is a general limitation seen in most studies on this topic. We tried to overcome this limitation by asking the participants to complete the questionnaire without revealing their identity. Childhood trauma remains largely hidden and unreported because of fear and stigma and the societal acceptance of this type of violence. This may be a particular problem for students who are often concerned about the implications of showing signs of "weakness" or "admitting" to mental health problems.

Second, the sample size was not large compared to the total number of students enrolled at the university. We believe that one of the reasons for the lack of response is that our data collection period was in June,

which marks the start of summer break. Students typically check their university email infrequently at that time due to the completion of the lecture and assessment periods; students may also have to attend to a higher volume of personal emails, which would leave them insufficient time to check their university email. This may explain the lower number of responses from the students.

Lastly, one of our study's limitations is a need for more detailed data on nutritional status among people with ACEs and BPD. Our study needed to collect specific information about participants' dietary intake, nutritional inadequacies, and their possible links to mental health outcomes. This gap is critical because dietary status may influence both physical and mental health outcomes, and knowing this link may give more thorough insights into the overall effects of ACEs and BPD.

Despite the above common limitations of such studies, the major strength of this study is that it is the first study to examine the prevalence of child abuse and BPD symptoms in Saudi Arabia. This study provides data about and allows for a discussion on child abuse and BPD symptoms and risk factors in this country.

CONCLUSION AND RECOMMENDATIONS

In this study, including university students, we show that approximately 61.4% of those with BPD had experienced abuse (mostly emotional abuse) during their childhood. We found that the prevalence of BPD was 41.2% among the university students. The prevalence of ACEs was also very high among the participants, at 43.6%. Further in-depth surveys are needed to assess the root causes of the higher frequency of BPD and ACEs among university students.

This study has implications as it is the only study directed towards the University students of Saudi Arabia. We propose that counseling services should be mandatory on every university campus. This would help in regularly evaluating and assessing the mental well-being of the students.

Early childhood education initiatives, such as Head Start, a United States Department of Health and Human Services program, play a crucial role in mitigating the effects of ACEs. By creating a secure, supportive atmosphere, these programs foster cognitive, emotional, and social growth. Children who

participate in such programs demonstrate greater academic achievement, improved social skills, and fewer behavioral issues. Therefore, it is recommended that access to high-quality early childhood education programs, particularly in underprivileged areas, be increased to provide a safe and nurturing environment for children who have experienced ACEs [52].

Empowering parents with the skills and information they need to create a supportive home environment is a key strategy in minimizing the impact of ACEs. Parenting programs that teach constructive discipline, stress management, and effective communication can significantly enhance parents' abilities and minimize the possibility of perpetuating trauma. As a result, community-based parenting support programs are recommended to provide parents with the tools they need to create a supportive and loving home environment, highlighting their crucial role in the well-being of their children [53].

Nutritional therapies play a significant role in addressing the physical health components of ACEs. Programs like the Supplemental Nutrition Assistance Program and school lunch programs ensure that children receive adequate nutrition, which is crucial for their overall development and well-being. Therefore, it is recommended that financing and access to nutritional assistance services for ACE-affected families be increased, and nutrition instruction should be included in the school curriculum to support healthy Dietary Behavior for life [54].

Access to mental health intervention is not just beneficial but essential for children who have had ACEs. The early identification and therapy of mental health issues can prevent the emergence of more severe problems later in life. School-based mental health programs, such as counseling and therapy, can offer children the assistance they require in a familiar and accessible setting. Therefore, it is crucial to increase access to school-based mental health services and teach instructors how to spot indicators of trauma and send children to appropriate options, underlining the urgency of these services [55].

In conclusion, treating the effects of ACEs involves a multifaceted strategy that includes early education, parenting support, dietary aid, mental health services, and trauma-informed care. Implementing these strategies can help to encourage resilience and increase the well-being of children who have been through adversity.

Future research should include extensive nutritional evaluations in those with ACEs and BPD. This can involve assessments of dietary intake, nutritional inadequacies, and their possible links to mental health outcomes. However, conducting such evaluations may pose challenges in terms of participant compliance, resource availability, and data analysis. By bridging this gap, future research can better understand the intricate interplay between nutrition, ACEs, and BPD, ultimately leading to more effective and comprehensive interventions.

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