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Sleep Paralysis as Predicted by Adverse Childhood Experiences: The Mediating Role of Depression

Research Article

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ABSTRACT

Sleep paralysis is a unique occurrence where individuals awaken during the night but find themselves unable to move. Despite being a fairly common phenomenon, it remains insufficiently researched. Although the exact causes are unclear, several studies have explored potential factors contributing to this phenomenon. This study investigated the relationship between adverse childhood experiences (ACEs) and sleep paralysis (SP) in adults, focusing on the mediating role of depression. A personal information form and Bangla-adapted versions of the Comprehensive Child Maltreatment Scale for Adults, Waterloo Unusual Sleep Experience Questionnaire, and Depression Scale were administered to 100 young adults purposively selected from public universities in Dhaka. Results of correlation coefficients suggested that only adverse childhood experiences (*i.e.*, sexual abuse) are significantly and positively correlated with sleep paralysis. Multiple regression analysis revealed that depression and sexual abuse were significant predictors, jointly explaining 25.1% of the variance in sleep paralysis. Depression alone accounted for 16.1% of the variance, while sexual abuse explained 8.9%. Furthermore, depression partially mediated the relationship between adverse childhood experiences and sleep paralysis, as supported by the Sobel test (p = .02). The outcomes of the present study are anticipated to serve as a valuable tool for mental health professionals and physicians in addressing issues related to sleep deprivation, subjective sleep quality, and sleep hygiene among their clients. This information can aid them in implementing necessary interventions to improve the sleep quality of adults.

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Introduction

Sleep paralysis (SP) is marked by a temporary inability to move that happens just before falling asleep or upon waking, often accompanied by vivid sensory experiences, complex hallucinations, and usually a strong sense of fear (International Classification of Sleep Disorders, 2005). Sleep paralysis is a commonly occurring phenomenon (Jalal et al., 2015), generally harmless but often accompanied by distressing physical and mental sensations that induce panic (Jalal et al., 2015). Experiencing an episode of SP typically triggers an immediate and intense desire to understand the occurrence (Jalal, 2016). Although sleep paralysis primarily happens in young adulthood, it has a lifetime prevalence. According to Sharpless and Barber (2011), around 8% of the general population, 28% of students, and 32% of psychiatric patients experience at least one episode during their lifetime. The episodes are more frequent if SP begins earlier (Ohayon et al., 1999). Sleep paralysis is likely to result from a combination of various factors, as indicated by Denis et al. (2015). Therefore, clinicians and researchers must comprehend the elements that can impact the frequency and severity of these episodes. In this review, we systematically examine existing literature on the connection between adverse childhood experiences and depression with sleep paralysis.

Adverse childhood experiences (ACEs) are commonly described as distressing or traumatic incidents that transpire in the initial 18 years of life, encompassing emotional, physical, or sexual abuse, as well as emotional or physical neglect, and other manifestations of family dysfunction (Anda et al., 2006). Timely identification of a history of ACEs is crucial for developing trauma-informed care to address subsequent health implications and to prevent further adverse health outcomes (Substance Abuse and Mental Health Services Administration, US). Consequently, there is an urgent need to uncover the enduring effects of ACEs.

Emerging research underscores the cumulative effects of ACEs, revealing that individuals with multiple ACEs are more likely to experience sleep disturbances, such as insomnia and nightmares (Hughes et al., 2017). Furthermore, ACEs, particularly emotional and sexual abuse, have been linked to the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, which may predispose individuals to heightened stress sensitivity and disrupted sleep architecture (De Kloet et al., 2005). Sleep disorders, which are a significant health issue affecting an estimated 50 to 70 million Americans, exhibit cumulative effects over time (Colten and Altevogt, 2006). Examining the link between ACEs and adult sleep disorders is particularly noteworthy as certain ACEs, such as sexual and physical abuse, impact adults, leading to sleep-related issues like difficulty maintaining sleep and sleep paralysis (Finkelhor et al., 2013; Spertus and Yehuda, 2003).

Chambers et al. (1998) discovered that individuals with a background of adverse childhood experiences exhibited higher average scores in all measures of subjective sleep disorders compared to those without ACEs. Agargun et al. (2003) observed that the occurrence of traumatic events during childhood was more prevalent among participants who frequently experienced nightmares (55%) in comparison to those who occasionally had nightmares (27%) and those who reported no nightmares (24%). Furthermore, aside from the frequency of nightmares, instances of physical and sexual abuse were found to be significantly linked to difficulties in falling asleep, fear of sleeping, and overall sleep disturbances when compared to individuals who reported no history of abuse (Agargun et al., 2003).

Earlier studies have suggested a higher prevalence of sleep paralysis in individuals with a background of childhood sexual abuse, whether it was repressed (44%), recovered (43%), or continuous (47%), in contrast to those without a history of such abuse (13%) (Abrams et al., 2008McNally et al., 2005). Additionally, Haj-Yahia et al. (2008) found a correlation between physical abuse and self-reported sleep disturbances. Chapman et al. (2013) found statistically significant connections between

difficulties in falling or staying asleep and feeling fatigued after a good night's sleep with eight categories of Adverse Childhood Experiences. These categories include emotional abuse, witnessing domestic violence, household substance abuse, household mental illness, parental separation/divorce, and household member imprisonment. Similarly, Greenfield et al. (2011) found a correlation between three ACE categories and diminished sleep quality when compared to individuals without a history of abuse. In summary, these initial studies provide support for the cross-sectional associations between ACEs and various subjective sleep disorders and disturbances.

Depression is defined as a mental state characterized by a low mood and a reluctance to engage in activities, as outlined by the National Institute of Mental Health (NIMH, 2013). Medically, it is categorized as a mental and behavioral disorder (Sartorius et al., 2004), impacting various aspects of an individual's thoughts, behavior, motivation, emotions, and overall well-being (Zwart et al., 2019). Depression is a well-established mediator of the relationship between trauma and sleep disturbances. It is characterized by disrupted sleep patterns, including delayed sleep onset, frequent awakenings, and reduced sleep efficiency (Tsuno et al., 2005). Sleep disturbances are widely associated with depression (Breslau et al., 1996), often persisting as predominant residual symptoms even among those who respond to antidepressant treatment (Nierenberg et al., 1999). Clinical polysomnographic studies have both predicted and descriptively characterized depression through observed sleep disruptions, such as poor sleep quality with increased awakenings and abnormalities in the rapid eye movement (REM) sleep stage, including a shortened REM sleep latency (Reynolds et al., 1983; Thase et al., 1984).

In epidemiological research, a connection has been observed between depression and heightened occurrences of both insomnia and hypersomnia, as indicated by studies conducted by Breslau et al. (1996). Additionally, other investigations such as those by Hublin et al. (1996) and Ohayon et al. (1997) have reported an association between depression and an increase in excessive daytime sleepiness. Previous studies have suggested a potential association between depression and experiences such as sleep paralysis (SP) (Hishikawa and Shimizu, 1995; Roth et al., 1968a), as well as automatic behavior (AB). Despite reports indicating a lifetime prevalence of sleep paralysis in undergraduate and medical students ranging from 15% to 43% (Cheyne et al., 1999), there has been limited epidemiological research examining the psychiatric connections of these disturbances (Ohayon et al., 1999; Ohayon and Shapiro, 2000).

The cognitive-affective model of trauma highlights how unresolved trauma leads to maladaptive thought patterns and emotional dysregulation, particularly depression, which mediates the relationship between early life adversity and adult psychopathology (Widom et al., 2007). Trauma theory posits that adverse events during critical developmental periods can disrupt normal psychological and neurobiological processes, leading to maladaptive coping mechanisms and heightened vulnerability to mental health conditions (Anda et al., 2006). These disruptions may manifest as hypersensitivity to stress, which has been associated with sleep disturbances like sleep paralysis (Hishikawa and Shimizu, 1995). The biopsychosocial model integrates biological predispositions (e.g., genetic susceptibility to stress or sleep disorders), psychological factors (e.g., depressive symptoms), and social influences (e.g., exposure to childhood trauma) to explain how these elements interact to influence the onset and frequency of sleep paralysis episodes (Denis et al., 2015).

So, Sleep paralysis is not only a clinically significant phenomenon but also one that intersects with cultural, psychological, and physiological domains. Understanding the predictors of sleep paralysis, particularly adverse childhood experiences and depression, offers critical insights into addressing sleep disorders through trauma-informed mental health care. Furthermore, the prevalence of adverse childhood experiences in Bangladesh and their enduring effects on adult

psychological health underscores the relevance of this study in a socio-cultural context. By exploring the mediating role of depression, this research provides an evidence-based foundation for targeted interventions to improve mental well-being and sleep quality.

The Rationale of the Study

Sleep paralysis is a widespread occurrence, with expressions for this phenomenon found in more than 100 cultures (Sharpless and Doghramji, 2015). According to a comprehensive review of lifetime prevalence rates in the general population, the estimated prevalence of sleep paralysis is around 8%, although individual study estimates vary widely from 2 to 60% (Sharpless and Barber, 2011). Some researchers have investigated the impact of adverse childhood experiences on specific sleep disorders, such as sleep paralysis (Abrams et al., 2008; McNally and Clancy, 2005). Additionally, other studies have explored the connection between ACEs and adult sleep paralysis (Chapman et al., 2013; Poon and Knight, 2011). Those who report Adverse Childhood Experiences (ACEs) demonstrate a higher prevalence of suicide attempts and depression (Hoertel et al., 2015). Additionally, they exhibit poorer outcomes in the treatment of depression (Nanni et al., 2012). Notably, sleep disturbance is a symptom of Major Depressive Disorder (MDD), and ACEs are linked to a twofold risk of experiencing sleep disturbances (Chapman et al., 2011). Moreover, prospective studies have indicated that ACEs expose individuals to lower sleep quality and an increased incidence of self-reported insomnia symptoms (Kajeepeta et al., 2015). Notably, there is a lack of research examining the direct influence of adverse childhood experiences on sleep paralysis, with a focus on depression as a mediating factor. To address this gap in the existing literature, the present study aims to explore the relationship between adverse childhood experiences arising from physical, sexual, emotional, or psychological abuse, neglect, and depression in influencing sleep paralysis.

Research Objective (RO)

The study aims to explore the complex relationship between adverse childhood experiences (ACEs), depression, and sleep paralysis (SP) in young adults. The specific objectives are:

RO₁: To examine the impact of adverse childhood experiences on sleep paralysis.

RO₂: To investigate the mediating role of depression, which influences the relationship between adverse childhood experiences and sleep paralysis.

***RO₃*:** To determine the individual and combined contribution of adverse childhood experiences and depression to sleep paralysis.

Research Hypotheses and their Justifications

The hypotheses and their justification have been discussed below:

***H₁*:** Adverse childhood experiences lead to a high level of sleep paralysis (Chapman et al., 2013; McNally and Clancy 2005; Murray et al., 2007).

***H₂*:** Depression leads to a high level of sleep paralysis (Breslau et al., 1996; Nierenberg et al., 1999).

***H₃*:**Adverse childhood experiences and depression individually and jointly explain sleep paralysis (Chambers and Belicki, 1998; Murray et al., 2007).

***H₄*:** Depression mediates the relationship between adverse childhood experiences and sleep paralysis (Koren et al., 2002).

Materials and Methods

Sample and Sampling Technique

The targeted inhabitants of the study are students over 18 years studying at the tertiary level from different public universities, from honors 1st year to honors 4th year, including MS, and above. The number of respondents considered in our sample size was 100, who were purposively and conveniently selected from different public universities of Dhaka city. Thus, all selected participants (those who had at least one episode of sleep paralysis) were taken in this study to be representative.

Design of the Study

The current research was carried out using a cross-sectional survey design, which is a type of non-experimental design. In this design, data is collected by asking questions to a sample of respondents at a single point in time.

Measuring Instruments and Outcome Measures

The following questionnaires have been used to gather and assess primary data from the participants.

Personal Information Form

The researcher created a Personal Information Form (PIF) specifically to collect personal data from the respondents. The queries included in this part were respondents' age, gender, weight, height, blood group, BMI, educational status, SES, sleep position, and sleep duration.

To measure the selected constructs following research instruments were used in the present study. These scales have been adapted and modified into Bangla by Zaman and Yeasin (2022) following the ITC (International Test Commission, 2010) guidelines for use in Bangladeshi settings.

Waterloo Unusual Sleep Experience Questionnaire (WUSEQ)

The WUSEQ, originally developed by Cheyne (2002), assesses the phenomenology of sleep paralysis (SP). It was adapted and validated for use in Bangladeshi settings by Zaman and Yeasin (2022). The tool comprises 17 items that measure distress, physical sensations, and cognitive perceptions during SP episodes, using a combination of 4-point and 5-point Likert scales. These included questions such as, "Do you ever feel as though you are being smothered?" The current version also evaluates various experiences, including sensed presence, hallucinations (visual and auditory), movement of bedcovers, pressure on the chest or other body parts, difficulty breathing, pain, choking, smothering, motor movements (such as getting up, walking around, flipping light switches), sensations of floating, out-of-body experiences, falling, feelings like being in an elevator, flying, spinning, autoscopy, tingling, shaking, feeling cold, and smelling odors. Additionally, it assesses five emotions experienced during SP: fear, anger, sadness, bliss, and erotic feelings.

On this scale, fifteen of these 17 items (item no. 1 to item no. 15) were organized on a 4-point Likert scale from 1, "Never," to 4, "Always." Two of these 17 items (item no.16 and item no.17) were organized on a 5-point Likert scale from 1, "Not at all," to 5, "A lot." The highest possible score of the first 15 items of the WUSEQ scale was 60, and the lowest possible score was 15. And sixteen and seventeen no. The item's highest possible score was 10, and the lowest possible score was 2. A higher score indicated higher sleep paralysis, and a lower score indicated a lower level of sleep paralysis. The Cronbach's alpha for the Bangla-adapted WUSEQ was reported as 0.88, indicating strong internal consistency. Content validity was established through expert reviews, while construct validity was confirmed via correlations with related psychological measures (e.g., depression scales).

We removed irrelevant questions from the survey; if a participant answered "no" to a prompt, no further questions were asked. The checklist format simplified the process of completing the self-administered WUSEQ. Additionally, we made minor revisions to the original questionnaire to fix grammatical errors and standardize the Likert scales.

Comprehensive Child Maltreatment Scale for Adults (CCMS)

The Bangla adaptation of the "CCMS for Adults," created by Higgins and McCabe in 2001, is a 22-item self-report tool that assesses adults' perceptions of potentially abusive and neglectful behaviors experienced during their childhood. This adaptation was explored by Ferdous, Roy, and Islam in 2020. Participants assess how often they think they have experienced various forms of abuse, including psychological maltreatment, physical abuse, witnessing family violence, neglect, and sexual abuse. Each category, such as psychological maltreatment, physical abuse, and

neglect, includes three items rated on a 5-point scale (*0 = never or almost never to 4 = very frequently*).

The sexual abuse subscale includes 11 items, each rated on a 6-point scale (0 = never, 1 = once, 2 = twice, 3 = 3-6 times, 4 = 7-20 times, 5 = more than 20 times). Participants answered each item three times regarding their (a) mother, (b) father, and (c) another adult or adolescent who was at least 5 years older than them, for the four subscales: psychological maltreatment, physical abuse, neglect, and sexual abuse. Witnessing family violence includes two items, each rated on a 5-point scale (0 = never or almost never to 4 = very frequently). These items ask for a general assessment of observed family violence, such as psychological maltreatment or physical abuse. The scores from all five subscales can be added together to obtain a total score.

The reliability coefficients for each subscale of the adapted version were as follows: psychological maltreatment .797, physical abuse .795, witnessing family violence .892, neglect .847, and sexual abuse .837. The Cronbach's alpha for the overall CCMS for adults was .844. These alpha coefficients for the adapted version were considered sufficiently significant, ranging from .795 to .892 (George and Mallery, 2003). The correlations between scores from the two administrations for each sub-scale were as follows: psychological maltreatment at .938, physical abuse at .962, witnessing family violence at .844, neglect at .873, and sexual abuse at .927. Additionally, the test-retest reliability correlation for the overall CCMS was .958, demonstrating that the adapted Bangla version of the CCMS for adults is highly reliable. The instrument's validity was confirmed through content and convergent validity, and the adapted Bangla version showed satisfactory validity. Content validation for the adapted scale demonstrated that the translated items, instructions, response formats, and scoring are appropriate compared to the original scale. Additionally, significant positive correlations among the subscales supported the convergent validity.

Depression Scale (DS)

To assess the level of depression in young adults, the Bangla Depression Scale developed by Uddin and Rahman (2005) was utilized. This scale, also used in therapeutic sessions and research, comprises 30 positively stated items with printed instructions. Responses are given on a 5-point rating scale: 1 for "not at all applicable," 2 for "not applicable," 3 for "uncertain," 4 for "a bit applicable," and 5 for "totally applicable." The total score on the scale, which measures depression, ranges from 30 to 150. A higher score signifies greater depression, while a lower score indicates less depression. Participants were categorized into four levels of severity based on their scores: minimal (30-100), mild (101-114), moderate (115-125), and severe (126-150).

The depression scale demonstrated strong reliability with a split-half reliability coefficient of .760 and a test-retest reliability coefficient of .599. Concurrent validity estimates showed positive correlations with depression ratings by psychiatrists (r = .377) and self-reports by patients (r = .558), with statistical significance ($p < .01$). The scale's discriminability was confirmed with an F-value of 85.386 ($p < .01$), indicating high concurrent validity. Additionally, the scale was positively correlated with the depression sub-scale of the Hospital Anxiety and Depression Scale (HADS) (Pearson correlation, r = .716, $\alpha = .01$), which supports its construct validity.

Procedure

Before gathering the proposed data, the researcher sent formal letters to the relevant authorities requesting permission to conduct the study, detailing the study's purpose and promising to maintain confidentiality. After building rapport with the participants, the researcher explained the study's objectives and reassured them about the confidentiality of their responses. Participants were given both written and verbal instructions to clarify how to complete the questionnaires. Respondents were permitted to ask questions if they needed clarification about any part of the scale. To gather information about experiences of sleep paralysis (SP), participants were given the following written

prompt: 'Some people experience an inability to move their arms or legs or speak while falling asleep or waking up, even though they wish to. Have you ever experienced this?' Participants who had never experienced SP were instructed to stop filling out the questionnaire, while those who had were asked to proceed. Participants were made aware that they could withdraw from the study at any time. They filled out the Bangla version of the questionnaires in a comfortable environment, with no time constraints. It took approximately 30 minutes to complete all the questionnaires. After completion, the data sheets were meticulously reviewed for any missing responses. Once the task was finished, participants were thanked for their cooperation. Ethical considerations were given high priority, ensuring that participants' personal information was kept confidential.

Data Processing and Analysis

Descriptive and inferential statistics were employed for the present exploration by using SPSS version 25.

Results

To test the research hypotheses, the data obtained from the surveys were analyzed by applying descriptive and inferential statistics was carried out. Results, according to the hypothesis, were shown in the following Tables and Figures consecutively.

Table 1. Mean and Standard Deviation of the Continuous Data as Descriptive Statistics.

Variables	**Mean**	**Std. Deviation**
Adverse Childhood Experiences Dimension	**17.83**	**13.72**
Psychological Maltreatment	7.39	5.99
Physical Abuse	4.50	5.25
Witnessing Family Violence	2.03	1.52
Neglect	1.67	2.36
Sexual Abuse	2.24	2.95
Sleep Paralysis Dimension	**28.46**	**6.03**
Feel Pressure	2.07	0.55
Feel Smothered	1.70	0.65
Hear Unusual Sounds	1.30	0.54
Feel You Might Die	1.78	0.76
Feel Numbness	1.90	0.67
Feel As If you Left Your Body	1.37	0.64
See Your Own Body	1.21	0.47
Smell Unusual Odors	1.20	0.47
Feel Strangled	1.78	0.62
Feel As If You Were Spinning	1.44	0.64
Sense that You Were Touched	1.54	0.74
Unable To Open Eyes	2.03	0.77
Unable To Speak	2.40	0.69
Feel A Presence	1.85	0.62
Experience Erotic Feelings	1.82	0.68
Worry That Something Is Wrong With Your Body	1.67	0.72
Afraid Of Going Crazy	1.40	0.73
Depression	**87.56**	**22.93**

As shown in Table 1, the mean scores of adverse childhood experiences and their dimensions (*i.e*., psychological maltreatment, physical abuse, witnessing family violence, neglect, and sexual abuse) were 7.39, 4.50, 2.03, 1.67, and 2.24, respectively. Further, in case of sleep paralysis the mean scores [*i.e*. feel pressure, feel smothered, hear unusual sounds, feel you might die, feel numbness, feel as if you left your body, see your own body, smell unusual odors, feel strangled, feel as if you were spinning, sense that you were touched, unable to open eyes, unable to speak, feel a presence, experience erotic feelings, worry that something is wrong with your body, afraid of going crazy] were 2.07, 1.70, 1.30, 1.78, 1.90, 1.37, 1.21, 1.20, 1.78, 1.44, 1.54, 2.03, 2.40, 1.85, 1.82, 1.67, 1.40, and depression was 87.56 respectively.

Table 2. Descriptive Statistics of the Demographical Variables.

	Variable	**Mean**	**SD**	**Total Mean Score**	***F/t***
Gender	Male	29.21	7.11	1.52	1.19* *t*
	Female	27.77	4.79		
Age	18-21years	29..08	6.05	1.94	.44 *F*
	22-25 years	28.55	5.96		
	26-30 years	27.33	6.42		
Weight	41-50 Kg	26.96	5.21	2.38	.629 *F*
	51-60 Kg	29.42	5.56		
	61-70 Kg	28.86	7.57		
	71-80 Kg	27.92	4.82		
	81-90 Kg	27.50	6.36		
Blood Group	A+(ve)	27.82	5.71	4.12	1.327 *F*
	A-(ve)	–	–		
	B+(ve)	29.73	6.21		
	B-(ve)	–	–		
	AB+(ve)	30.23	7.16		
	AB-(ve)	–	–		
	O+(ve)	–	–		
	O-(ve)	27.00	5.50		
		25.00	0.00		
BMI	Under Weight	26.00	5.37	2.12	.936 *F*
	Normal Weight	28.79	6.24		
	Over Weight	28.55	5.63		
Educational Status	Honors 1st year	29.07	6.90	3.55	.159 *F*
	Honors 2nd year	28.62	4.75		
	Honors 3rd year	29.21	5.84		
	Honors 4th year	27.82	5.42		
	MS	28.27	6.72		

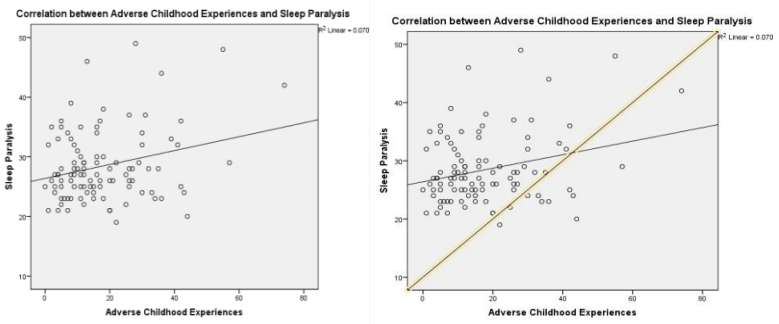
	Variable	Mean	SD	Total Mean Score	*F/t*
Socioeconomic Status	Lower Class	29.25	4.53	2.11	.727 *F*
	Middle Class	28.28	6.21		
	Upper Class	35.00	–		
Sleep Position	Supine	28.77	6.45	2.25	1.111 *F*
	Prone	30.33	7.69		
	Side	27.78	5.24		
Sleep Duration	Less than 6 hours	29.57	5.59	1.73	1.006 *F*
	7-8 hours	27.98	6.42		
	More than 9 hours	27.00	4.72		

Note**: Values within parentheses indicate a value of significance, $p<.05$*, $p<.01$**, $p<.001$*

***Note:** t referred to the t value, and F referred to the F ratio*

Table 2 summarizes the descriptive statistics for key demographic variables related to sleep paralysis (SP). The mean represents the average SP score for each subgroup (e.g., males and females), calculated by dividing the total score for a subgroup by the number of participants in that group. This provides a detailed comparison of SP prevalence across demographic categories such as gender, age, weight, and socioeconomic status (SES). The findings pointed to the total mean score of selected demographic variables (*i.e.*, gender, age, weight, blood group, BMI, educational status, SES, sleep position, and sleep duration) were 1.52, 1.94, 2.38, 4.12, 2.12, 3.55, 2.11, 2.25, and 1.73, respectively.

The total mean score aggregates these averages across all subgroups within a variable. Additionally, statistical analyses, including *t*-tests and F-ratios, were employed to evaluate the significance of differences across subgroups, providing insights into which demographic variables most strongly correlate with SP. Findings further suggested that there were no significant differences between demographic factors, except [*i.e.*, gender ($t = 1.19$, $p<.01$)], with sleep paralysis observed respectively.



In Figure 1, the relationship between adverse childhood experiences and sleep paralysis is approximately linear, indicating a positive correlation *(r* = .265; *p*

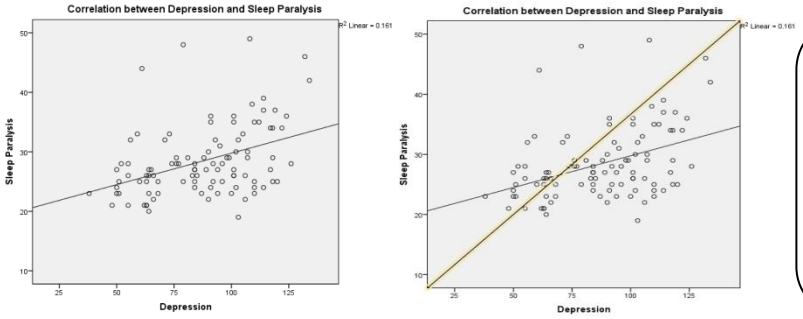
Figure 1. Correlation between adverse childhood experiences and sleep paralysis.

Table 3. Correlation Matrix among Adverse Childhood Experiences and Sleep Paralysis.

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Adverse Childhood Experiences	*1*	-	-	-		-	-	-
1. Psychological Maltreatment	*.869***	*1*	-	-	-	-		-
2. Physical Abuse	*.852***	*.641***	*1*	-	-	-		-
3. Witnessing Family Violence	*.637***	*.596***	*.459***	*1*	-	-		-
4. Neglect	*.710***	*.492***	*.499***	*.363***	*1*	-		-
5. Sexual Abuse	*.468***	*.165*	*.244**	*.126*	*.426***	*1*		
Sleep Paralysis	*.265**.*	*.136*	*.226**	*.135*	*.152*	*.360***		*1*

Note: *** Correlation is significant at the .01 level (2-tailed); *Correlation is significant at the .05 level (2-tailed).*

Table 3 represents adverse childhood experiences (r = .265; p <.01), which were significantly and positively correlated to sleep paralysis. The findings also revealed that physical abuse (r = .226; p <.05) and sexual abuse (r = .360; p <.01) were positively and significantly correlated with sleep paralysis.



In Figure 2, the association between adverse childhood experiences and sleep paralysis is approximately linear, indicating a positive correlation (r = .402; p <.01)

Figure 2. Correlation between depression and sleep paralysis.

Table 4. Correlation Matrix between Depression and Sleep Paralysis.

Variables		
Depression	1	
Sleep Paralysis	.402**	1

Note*. ** indicates .001 level of significance* ***Predictors****: Depression;* ***Dependent Variable:*** *SP*

Table 4 represents depression (r = .402; p <.01), which was significantly and positively correlated to sleep paralysis.

Table 5. Simple Linear Regression of Adverse Childhood on Sleep Paralysis.

Predictors	***Un Standardized Beta***	***β***	***t***	***p***	***R^2***	***R^2 Change***	***F Change***	***ANOVA for Model Fit***
Constant	26.036		24.768	.000				
Adverse Childhood Experiences								
1. Psychological Maltreatment	-.022	-.022	-.153	.879				
2. Physical Abuse	.201	.175	1.352	.180				
3. Neglect	.231	.059	.491	.624	.157	.157	3.511**	3.511**
4. Witnessing Family Violence	-.247	-.097	-.792	.430				
5. Sexual Abuse	.724	.355	3.371	.001				

Note. *** indicates .001 level of significance;* ***Predictors****: ACEs1. PM; 2. PA; 3. NL; 4. WFV & 5. SA;* ***Dependent Variable:*** *SP*

Values of standardized β reported (table 5) (*i.e*., sexual abuse) considered the strongest predictor of sleep paralysis, alone explained 15.7% of the variance. The unstandardized beta (.724) of sexual abuse suggested that as sexual abuse increases by one unit, sleep paralysis increases by .724 units. Standardized beta (.355) indicates that as sexual abuse increases by one standard deviation, sleep paralysis increases by a .355 standard deviation. This interpretation is true only if the effects of other predictors are held constant. Finally, the values of ANOVA indicated that all the predictors are good and fit the models significantly. Adverse childhood experiences, namely sexual abuse, predict sleep paralysis.

Table 6. Simple Linear Regression of Depression on Sleep Paralysis.

Predictors	***Un Standardized Beta***	***β***	***t***	***p***	***R^2***	***R^2 Change***	***F Change***	***ANOVA for Model Fit***
Constant	19.205		8.719	.000	.161	.161	18.857**	18.857**
Depression	.106	.402	4.343	.000				

Note. *** indicates .001 level of significance;* ***Predictors****: Depression*

It can be seen from Table 6 that the predictor's depression is a significantly stronger predictor of sleep paralysis, which alone explained 16.1% of the variance. Unstandardized beta (.106) of depression

suggested that as depression increases by one unit, sleep paralysis increases by .106 units. Standardized beta (.402) indicates that as depression increases by one standard deviation, sleep paralysis increases by a .402 standard deviation. This interpretation is true only if the effects of other predictors are held constant. Finally, the values of ANOVA indicated that all the predictors are good and fit the models significantly. So, it might be said that depression predicts sleep paralysis in adults.

Table 7. Stepwise Multiple Regression of Adverse Childhood Experiences, Depression on Sleep Paralysis.

Predictors	***Un Standardized Beta***	***β***	***t***	***p***	***R^2***	***R^2 Change***	***F Change***	***ANOVA for Model Fit***
Constant	19.205		8.719	.000	.161	.161	18.857**	18.857**
Depression	.106	.402	4.343	.000				
Constant	18.950		9.049	.000				
Depression	.093	.353	3.959	.000				
Sexual Abuse	.618	.303	3.397	.001	.251	.089	11.541**	16.213**

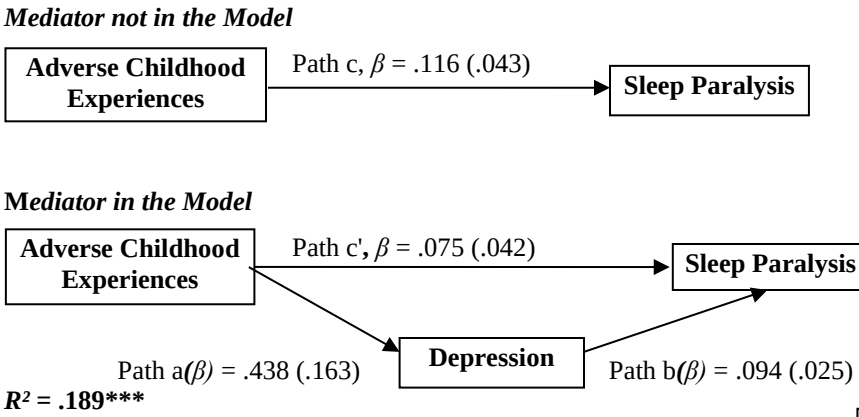
Note*. ** indicates a .001 level of significance*

Predictors*: ACEs1. PM; 2. PA; 3. NL; 4. WFV & 5. SA;* ***Dependent Variable:*** *SP*

Findings reported in Table 7 revealed that there were two significant (*i.e*., depression and sexual abuse) predictors, which jointly explained 25.1% of the variance in sleep paralysis, and the strongest predictor of sleep paralysis was depression, which alone explained 16.1% of the variance. The unstandardized beta (.618) of sexual abuse suggested that as sexual abuse increases by one unit, sleep paralysis increases by .618 units. Standardized beta (.303) indicates that as sexual abuse increases by one standard deviation, sleep paralysis increases by a .303 standard deviation. Sexual abuse was the second strongest predictor, which alone explained 8.9% of the variance in sleep paralysis. Finally, the values of ANOVA indicated that all the predictors are good and fit the models significantly. Adverse childhood experiences (*i.e.*, sexual abuse) and depression jointly explain sleep paralysis.

Mediation Analysis

The mediation analysis in this study examines the role of depression as a mediator in the relationship between adverse childhood experiences (ACEs) and sleep paralysis (SP). Mediation was tested using regression models to estimate the direct, indirect, and total effects of ACEs on SP, with depression as the mediator. The Sobel test was used to evaluate the significance of the indirect effect (Path a × Path b). The indirect effect quantifies how much of the ACE-SP relationship is mediated by depression. Figures 3–8 illustrate these relationships, showing how each ACE component (e.g., sexual abuse, neglect) interacts with depression and SP.



From Figure 3 it can be said that βvalue of path cis .116 and path c' is .075 which is smaller than path c. So, it may be concluded that depression mediates the relationship between adverse childhood experiences and sleep paralysis.

Figure 3 . Mediating effect of depression in the relationship between adverse childhood experiences and sleep paralysis.

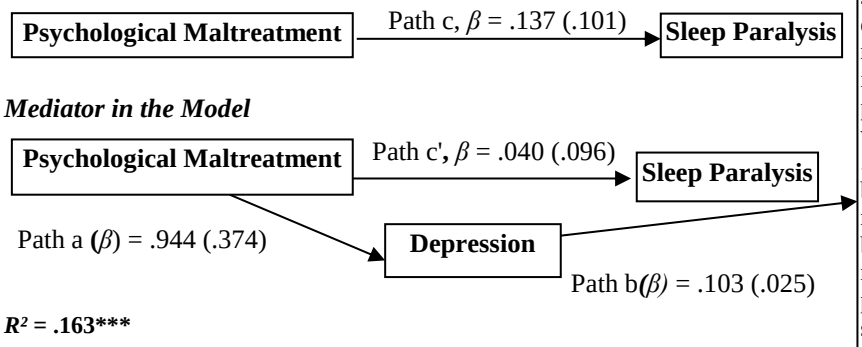
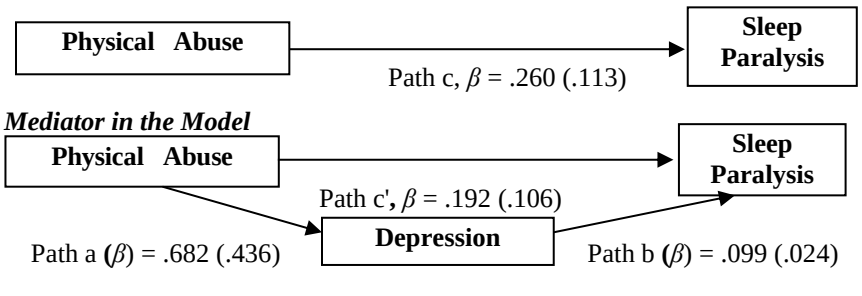


Figure 4 shows that Psychological Maltreatment has no significant independent effect on sleep paralysis [path c, β = .137 (.101)]. It can be seen from that when depression was included in regression analysis, the independent effect of psychological maltreatment was reduced to path c ´, β = .040 (.096). Therefore, it may be concluded that depression mediates the relationship between psychological maltreatmentand sleep paralysis. Again, figure 4 also shows that psychological maltreatment and depression can significantly explain 16.3% of the variance in sleep paralysis.

Figure 4. Mediating effect of depression in the relationship between psychological maltreatment and sleep paralysis.



From Figure 5 it can be said that the β value of path cis .260 (.113) and path c' is .192(.106) which is smaller than path c. So, it may be concluded that depression mediates the relationship between physical abuse and sleep paralysis.

Figure 5. The mediating effect of depression on the relationship between physical abuse and sleep paralysis.

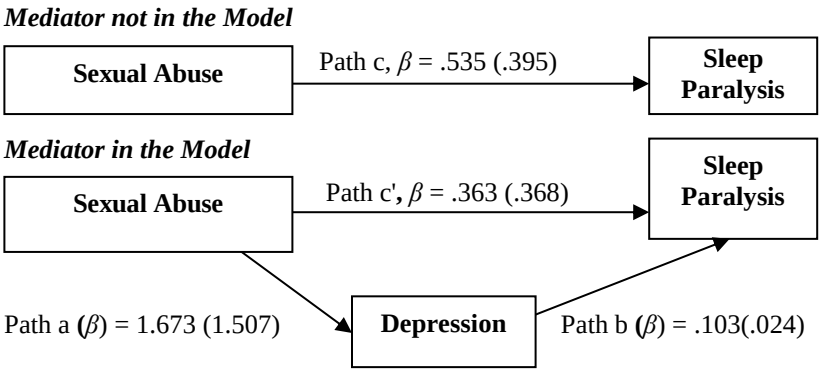


Figure 8 indicates that sexual Abuse has no significant independent effect on sleep paralysis [path c, β = .735 (.192)]**.** It can be seen from Figure 8 that when depression was included in regression analysis, the independent effect of sexual abuse increases to path c ′, β = .618(.182) Therefore, it may be concluded that depression mediates the relationship between sexual abuse and sleep paralysis. Again, this figure also shows that sexual abuse and depression can significantly explain 25.1% of the variance in sleep paralysis.

Figure 6. Finding the mediating effect of depression in the relationship between witnessing family violence and sleep paralysis.

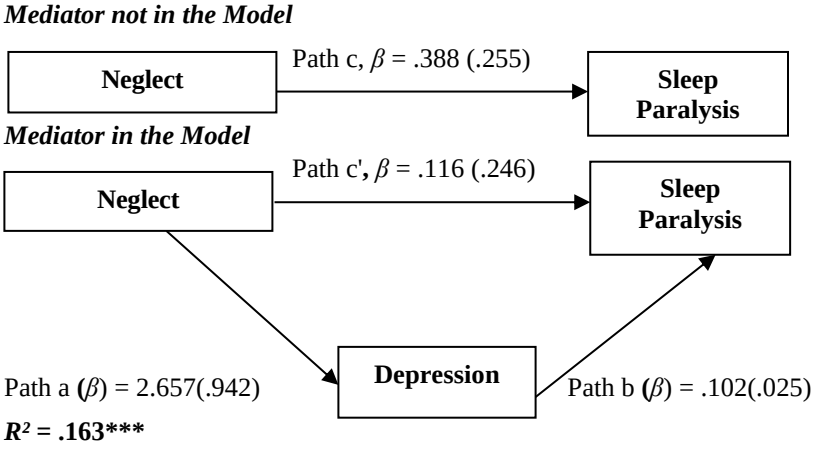


Figure 7 indicates that neglect has a significant independent effect on Sleep Paralysis [path c, β = .388 (.255)]**.** Findings also reported in Figure 7 when depression was included in regression analysis, the independent effect of neglect increases to path c ′, β = .116 (.246) Therefore, it may be concluded that depression mediates the relationship between neglect and sleep paralysis. Again, this figure also shows that neglect and depression can significantly explain 16.3% of the variance in sleep paralysis.

Figure 7. Finding the mediating effect of repression in the relationship between neglect and sleep paralysis.

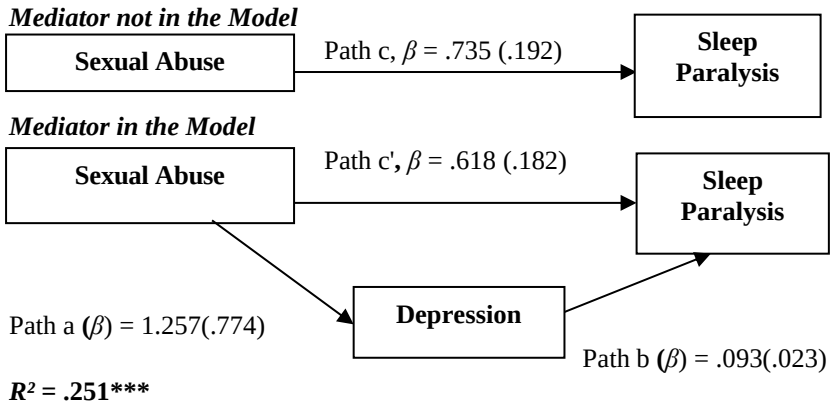


Figure 8 indicates that sexual Abuse has no significant independent effect on sleep paralysis [path c, β = .735 (.192)]. It can be seen from Figure 8 that when depression was included in regression analysis, the independent effect of sexual abuse increases to path c ′, β = .618(.182) Therefore, it may be concluded that depression mediates the relationship between sexual abuse and sleep paralysis. Again, this figure also shows that sexual abuse and depression can significantly explain 25.1% of the variance in sleep paralysis.

Figure 8. Finding the mediating effect of depression in the relationship between sexual abuse and sleep paralysis.

Alignment with Regression Results

The coefficients reported in Figures 3–8 align with the regression results presented in Tables 5–7:

Table 5 identifies sexual abuse as the strongest ACE predictor of SP, which is reflected in Figure 8, where Path a (β = 1.257) and Path b (β = 0.093) confirm the mediating effect of depression. Table 7 demonstrates that depression is the strongest overall predictor of SP (β = 0.353), further supporting the mediation findings.

Summary of Findings

The mediation analysis shows that depression partially mediates the effects of ACEs on SP. While ACEs have a direct impact on SP, the inclusion of depression as a mediator highlights its significant role in explaining this relationship. This underscores the importance of addressing depression in individuals with a history of childhood trauma to mitigate SP risk.

Discussion

In the last section, the research processes have been elaborately discussed in line with the research hypothesis. The present study aims to explore the key relationship between adverse childhood experiences and depression-related demographic variables with the sleep paralysis of young adults. Research indicates that ACEs can disrupt stress-response systems, leading to emotional dysregulation and increased vulnerability to sleep disturbances (Denis et al., 2015). We also expanded on the implications of sexual abuse as a key predictor of SP, which is consistent with studies showing its significant psychological impact (Finkelhor et al., 2013). Significant findings are summarized through the following explanations in the same order in which they were hypothesized.

The results presented in Table 3 and Figure 1 indicated that there was a significant positive relationship between adverse childhood experiences and sleep paralysis, which confirmed the hypothesis. Results presented in Table 5 also indicated that adverse childhood experiences predict sleep paralysis, which explained 15.7% of the variance. The outcomes were in line with the conclusions of numerous researchers (Murray et al., 2007; Colten & Altevogt, 2006), who identified a noteworthy correlation between instances of sexual abuse and occurrences of sleep paralysis. Finkelhor et al. (2013) also observed that adverse childhood experiences, encompassing both sexual and physical abuse, exert a lasting influence on adults, contributing to the occurrence of sleep paralysis. It can be inferred that as the frequency of adverse childhood experiences rises, the likelihood of experiencing sleep paralysis also increases.

The results presented in Table 4, Table 6, and Figure 2 confirmed the second hypothesis. The results were consistent with many invigorators' research findings (Widom et al., 2007; Nierenberg et al., 1999; Breslau et al., 1996), where they found a significant positive association between depression and sleep paralysis.

To explain the third hypothesis results presented in Table 7 indicate that adverse childhood experiences and depression individually and jointly explained sleep paralysis. This finding is also consistent with the previous study conducted by Vallati et al. (2020), where they found that increased levels of emotional or sexual maltreatment were found to be significantly linked to more severe depression, and individuals were more likely to encounter various sleep disorders, including sleep paralysis.

To prove the fourth hypothesis, the outcome in Figure 3-7 indicates that depression mediates the relationship between adverse childhood experiences and sleep paralysis, where sexual abuse is the strongest predictor, which jointly mediates (sexual abuse and depression) 25.1% of the variance in sleep paralysis. Finally, depression mediates adverse childhood experiences and sleep paralysis. These findings align with previous research that suggested that females who experienced childhood abuse demonstrated heightened stress responses in both the pituitary-adrenal and autonomic systems when compared to those without such a history. This effect was notably pronounced among women currently experiencing symptoms of depression and anxiety (Heim, 2000). Hishikawa and Shimizu (1995) discovered that encountering depression is associated with an increased likelihood of experiencing sleep paralysis.

Limitations

The present study has some avoidable limitations. ***Firstly,*** as a cross-sectional study rather than a longitudinal one, it cannot establish the temporal relationships between adverse childhood experiences, depression, and sleep paralysis in young adults. ***Secondly***, the data are solely derived from subjective questionnaires. ***Thirdly***, the sample was taken from only public universities in Dhaka city, not covering all of Bangladesh.

Recommendation for Future Research

The findings of this study underscore the need for further exploration of the relationship between adverse childhood experiences, depression, and sleep paralysis. Future research should focus on establishing causal pathways through longitudinal designs. Additionally, investigating mediators like anxiety or PTSD and protective factors such as resilience and social support could provide a more nuanced understanding. Expanding research to diverse cultural contexts and exploring physiological mechanisms like HPA axis dysregulation and sleep architecture disruptions would be valuable. These efforts could inform effective trauma-focused interventions to improve mental health and sleep quality.

Conclusions

The present study advances our understanding of the process through which adverse childhood experiences and depression affect the sleep paralysis of young adults. The present findings would help the researchers, doctors, psychologists, psychiatrists, educational counselors, and social

workers to understand the factors behind sleep paralysis. Based on the present study, it may be recommended that, to save our young generation from sleep disturbance and sleep paralysis, several remedies should be adopted.

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Conflict of Interests

The authors of this research work declared no conflict of interest.

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