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Association between Adverse Childhood Experiences and Physical Activity among Private and Public University Students of Karachi

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Article Details

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ABSTRACT

The cross-sectional study examined the association of Adverse Childhood Experiences with physical activity levels among public and private university students in Karachi, Pakistan. Data was collected from N=500 participants (249=public, 251=private) aged mostly between 18-30 years, surveyed using the Adverse Childhood Experiences Questionnaire (ACE-Q) and the International Physical Activity Questionnaire (IPAQ). Statistical tests, including descriptive, inferential, chi-square, and logistic regression, were applied. Results showed significant disparities in ACE profiles among both sectors. Public university students reportedly have higher rates of violence-related ACE, including physical abuse (33.7% vs. 4.4%, $p<0.01$) and household violence (37.3% vs. 31.9%, $p<0.05$), while private university students showed greater family dysfunction, including parental separation and divorce (27.1% vs. 9.6%, $p<0.01$) and emotional neglect (58.6% vs. 49.0%). The most prevalent ACE was emotional neglect among both sectors. Physical activity level results were also different. Low PA (0–599 MET min/week) was reported by 91.2% of private university students as compared to 68.3% among public university students. High PA was not observed among either group, while moderate PA was slightly higher in the public sector (31.3% vs. 8.8%). Logistic regression models assessing the associations between ACE and PA showed statistically unstable results. The research highlights the socioeconomic status of Karachi, which is evident in contrasting ACE patterns and PA differences. Despite violence being more prevalent at public universities, students tend to have moderate PA levels. University students in private institutions tend to exhibit greater levels of seclusion and familial instability. Culturally tailored interventions that address specific vulnerabilities in sectors are recommended, such as preventing violence at public universities and promoting family support and PA promotion at private universities. Limitations include cross-sectional design, self-report bias, and unstable regression outputs.

INTRODUCTION

The exposure to Adverse Childhood Experiences (ACEs), especially considering their social and public health impact exacerbating pre existing concerns, is a serious issue neglecting essential societal needs. ACEs refer to a wide array of stressful and traumatizing events that occur during one's formative years (Felitti et al., 1998; CDC, 2024). These experiences profoundly impact a child's development and include all forms of abuse, neglect, and household dysfunction, with consequences spanning to adulthood (Majid et al., 2023; Webster, 2021). While secure and supportive environments play a pivotal role in child wellbeing (Al Shail et al., 2012), a substantial number of children worldwide face such detrimental experiences each year (Al Shail et al., 2012; Sethi et al., 2013).

A more comprehensive understanding has become available due to the growing number of studies examining the association between ACEs and the engagement in Health Risk Behaviors (HRBs), where the term is defined by actions deemed detrimental to one's health (Michie et al., 2016). A higher burden of ACEs has been linked to HRB engagement, such as increased substance abuse, heightened risk-taking in intimate relationships, and suicidal thoughts (Swedo et al., 2024; Majid et al., 2023; Morgan, 2017). Critically, these behaviors further enhance the risks for developing chronic physical and mental health concerns like cardiovascular issues, illnesses of the respiratory system, and several forms of cancer (Chang et al., 2019; WHO, 2020; Rehm & Shield, 2019; Prochaska & Young-Wolff, 2017).

Physical activity, as a fundamental health behavior, helps to reduce the risk of many chronic diseases and promotes overall well-being. Maintaining physical and psychological stability requires its regular involvement (Warburton & Bredin, 2017). Conversely, negative life experiences such as ACEs have been found to lead to decreased psychological stability and increased mental health problems (Forster et al, 2018), which can indirectly impact an individual's motivation and ability to exercise.

The global recognition of ACEs and their health implications, including their potential impact on physical activity, is hindered by a significant research gap in certain areas. The association between ACEs and physical activity levels among university students in Pakistan, where child abuse is a concern (Sahito et al, 2023), is of great importance. Additionally, there are no comparative studies between public and private university student populations that delve into this correlation. This study seeks to address the critical research gap by investigating the ongoing impact of ACEs on physical activity among university students in Pakistan, with specific

context-specific data. The conclusions drawn will be essential for policymakers and healthcare organizations to design and execute evidence-based, culturally sensitive measures, such as sports activities and health education campaigns, to promote healthier living and foster a more resilient student population.

PROBLEM STATEMENT

Many university students in Karachi have Adverse Childhood Experiences (ACEs), which are a significant factor in many adverse childhood outcomes that occur throughout their lives. This research investigates the essential association between traumatic experiences such as physical and emotional abuse, sexual violence, domestic violence in households, substance abuse/incarceration (including drug use), parental separation/divorce, neglectful behavior (emotional or physical), bullying, and community/collective violence and decreased participation in physical activity. Exercise is essential for good health and can protect one from the long-term effects of trauma. Having conducted correlation and regression analyses, it is now necessary to conduct a systematic analysis of how these 13 factors occur. ACE factors are responsible for the significant harm caused to the overall health and academic performance of university students in Karachi, particularly those who participate in public or private sector exercise programs.

RESEARCH QUESTION

What is the association between Adverse Childhood Experiences (ACEs) and physical activity levels (Low, Moderate and High) among public and private sector university students in Karachi?

HYPOTHESIS

Null Hypothesis (H0): There is an insignificant association between Adverse Childhood Experiences (ACEs) and physical activity levels (Low, Moderate and High) among public and private sector university students in Karachi.

Alternative Hypothesis (H1): There is a significant association between Adverse Childhood Experiences (ACEs) and physical activity levels (low, moderate, and high) among public and private sector university students in Karachi.

OBJECTIVES OF THE RESEARCH

1) determine the prevalence of Adverse Childhood Experiences (ACEs) and their individual factors among university students in Karachi

2) Compare the association of different ACE factors and the cumulative ACE score with physical activity levels.

3) Quantify the predictive effect of ACEs on physical exercise using correlation and regression analyses.

4) assess the odds ratios for low physical activity associated with specific ACEs and increasing ACE scores.

SIGNIFICANCE/IMPACT/BENEFITS OF RESEARCH

This research is significant for Karachi's public health, educational system, and social welfare sectors, as it aims to establish an organized relationship between 13 specific Adverse Childhood Experience (ACE) factors and physical activity levels among university students. The results will provide a basis for empirically determined policies and evidence-based preventive measures, providing public health authorities with information on common ACEs and their association with physical activity, which will enable campaigns that are trauma-informed. The data can aid universities in creating personalized health care programs that promote physical activity as a means of coping, and social welfare initiatives may be utilized to mitigate the long-lasting impacts caused by childhood challenges.

LITERATURE REVIEW

ADVERSE CHILDHOOD EXPERIENCES: PREVALENCE, IMPACT, AND LONG-TERM CONSEQUENCES

The World Health Organization (2022) reports that Adverse Childhood Experiences (ACEs) pose a significant global public health problem, with profound consequences for individual well-being. Traumatic experiences in the home, which are complex and interdependent risks that affect healthy development (Felitti et al, 2019). Studies have consistently shown that higher ACE scores are associated with an increased risk of various health and disability diagnoses in later life. ACEs are highly stressful and have negative consequences for the individual in their later years (Anda et al, 2020).

Some form of abuse is committed by 1.5 to 500 million children worldwide every year, resulting in over 3 million child maltreatment cases in the U.S. Surprisingly, the rate of sexual abuse is 1 in 4 females and 1 in 7 males. Physical neglect (64.1%) is the most frequently reported form of maltreatment, followed by physical abuse (16%) and emotional neglect (6.6%) (US Department of Health & Human Services, 2022). The proportion of children affected by violence in South Asia is 64%. Instances of child maltreatment include home, school, work, and community (UNICEF, 2021). One way to comprehend ACEs is by considering their main categories.

CHILD MALTREATMENT

The term child maltreatment or abuse refers to harmful actions or failures of a parent or caregiver, which can result in death, physical harm, sexual assault on an innocent person, mistreatment, victimization by other adults (WHO 2022), or neglect posing disproportionate risks. This affects a child's psychological, emotional, and social development; disrupts security and trust in children who are developing complex trauma responses over their lifetime (van der Kolk, 2018).

The UNODC (2021) has identified child trafficking as a type of maltreatment that involves physical or emotional harm, sexual abuse, or unjust consequences impacting disadvantaged children's lives. Abuse is more common in children under three years of age, with physical abuse prevalent in boys and sexual abuse in girls (U.S. Department of Health & Human Services, 2023). Early mistreatment can cause severe impacts on brain development, resulting in changes to stress response systems and cognitive abilities (Teicher & Samson, 2016).

Socioeconomic factors such as economic hardship, low parental education, and underprivileged status increase the likelihood of maltreatment (Font & Maguire-Jack, 2020). Physical abuse is more common among individuals with disadvantaged backgrounds and larger family sizes (Sidebotham et al., 2022). However, systematic intervention addressing education, family support, and poverty is crucial for support.

PHYSICAL ABUSE

Physical abuse encompasses all actions that result in physical harm, ranging from minor injuries to severe and life-threatening injuries (WHO, 2022). It involves the inability to prevent violence, such as beating, throwing objects or burning (UNICEF, 2020). Suicidal thoughts are often triggered by physical abuse, which is common among both genders (Afifi et al., 2017). Compared to physical wounds, psychological and emotional injuries tend to be more permanent (van der Kolk, 2015).

Sahito et al. (2023) report that severe physical abuse is a common form of discipline in Pakistan. According to the Rights of Children in Pakistan (2021), nearly 80% of children in this country are subjected to physical assault by household members, including teachers and parents. Physical abuse by caregivers is estimated to affect 300 million children aged 2-4 worldwide, according to WHO's (2020).

Human Rights Watch (2022) reports that 50,000 children are severely injured each year in Pakistan, while 8 million minors are trafficked because of abuse/neglect. The consequences are severe. Inadequate education, cultural norms, and abusive parenting contribute to the

perpetuation of violence (Sahito et al., 2023). Chronic pain, neurological damage, developmental delays, and increased mental health issues such as anxiety, depression, or PTSD are all associated with physical abuse (Teicher & Samson, 2016). Violence has a detrimental effect on stress response systems, which can lead to an increase in adult health issues such as metabolic disorders and cardiovascular disease (Danese & McEwen, 2012). Due to the cumulative effects of chronic stress, it can cause various physical health problems for adults (McEwen, 2017).

CHILD SEXUAL ABUSE (CSA) AND CONTACT SEXUAL ABUSE

Inappropriate sexual contact or non-contact behaviors like exposure are classified as CSA by the WHO (2022). Facing vulnerability is exploited by it, usually for the benefit of the abuser (Finkelhor, 2018). "Contact Sexual Abuse" refers to physical contact forms like penetrating or touching someone.

The UNICEF (2020) has documented over 120 million child sexual abuse (CSA) events worldwide, with 89% of them involving female victims. In different settings, CSA takes place, and disclosure is complicated due to the involvement of close ones or acquaintances (Stoltenborgh et al., 2015). In Pakistan, the Sahil Organization (2024) reported a total of 2,846 individuals. Last year, there was an average of eight CSA cases per day. In early 2024, there were 862 cases reported. In addition, there were reports of 668 abductions and 48 pornography cases (Sahil 2024).

The reason for Pakistan's severe underreporting is attributed to cultural factors, fear of shame, and unclear laws (Khan et al., 2021). The impact is significant, lasting beyond the initial phase and continuing into adulthood (Norman et al., 2012). The economic aspect of CSA involves the use of force to gain financial advantages for children (ECPAT International, 2023). In terms of psychology, it is linked to self-destructive behavior, fear, distress, and cognitive development, which are contributing factors to PTSD (D'Andrea et al., 2012). Victims feel terror, guilt, and isolation (Herman, 2015),which suggests that complex PTSD, dissociative disorders, and emotional dysregulation are potential long-term effects.

The impact of CSA on physical health is not limited to minor injuries (Irish et al., 2010). Longer-term effects include chronic health problems, substance abuse, and relationship difficulties (Felitti et al., 2019). Dysregulation of the HPA axis by chronic stress from CSA affects immune function, making people more susceptible to physical illness (Danese & McEwen, 2012).

HOUSEHOLD DYSFUNCTION

Children experience unstable environments due to household dysfunction, which includes substance abuse, mental illness, imprisonment, and domestic violence.

ALCOHOL OR DRUG ABUSER IN HOUSEHOLD

Children experience unstable environments due to household dysfunction, which includes substance abuse, mental illness, imprisonment, and domestic violence.

Drug and alcohol abuse by parents leads to disordered living situations in families. Material use is more likely to occur in adolescents aged 18-25 (Merrick et al., 2017). Substance abuse parents can cause neglect and insecurity in children (Peleg-Oren & Teichman, 2019).

According to Khan (2016), 2 million individuals aged 15-25 are among the 9 million people who struggle with substance abuse in Pakistan. According to WHO's report (2021), tobacco is a prevalent drug on the global market. Drug addiction is classified as a substance use disorder that causes emotional and physical abnormalities (APA, 2022). UNODC (2022) reports that Pakistan has a drug addiction population of 7.6 million, with an annual growth rate of 40,000 individuals. Among contributing factors are nuclear families, large family sizes, low education (Hussain et al, 2020), institutional/interpersonal factors (Sarfraz et al., 2021), peer pressure, and easy access (Rehman et al., 2023).

Anda and Colleagues (2016) found that early adult substance use is associated with environmental stressors (ACEs) in the later stages of development. ACEs are associated with drug/alcohol abuse, which is linked to health-risk behaviors, poor neurological health, and reduced living standards (Hughes et al., 2021). Diase & McEwen (2012) suggest that childhood trauma can lead to an imbalance of cortisol and chronic hyperarousal.

The neuropsychiatric condition of drug addiction is on the rise globally, resulting in health problems and rising criminal activity (Volkow et al., 2016). Heroin, hashish, and alcohol abuse is common in Pakistan (Pakistan Narcotics Control Board, 2023). The consequences of substance abuse are severe (Degenhardt et al., 2018). Drug trafficking in Pakistan is fueled by the increased cultivation of poppy, which can result in an increase of 50,000 acres per year (UNODC, 2023). The misuse of emotional distress, family conflicts, and peer pressure (Khan et al., 2022) is evident. Biderman and associates (2020) report that children who are victims of substance abuse are more likely to develop substance use disorders themselves.

INCARCERATED HOUSEHOLD MEMBER

Child development is greatly affected by the significant ACE of parental incarceration. According to Murray and associates (2022), it is connected to psychological distress, behavioral problems,

academic struggles and involvement in future criminal justice cases. As a result, many children experience shame, stigma, loss, and abandonment (Dallaire et al., 2021), which can lead to attachment issues and anxiety. The combination of financial and emotional strain can exacerbate vulnerabilities (Turney & Goodsell, 2018). Stress and maladaptation are a result of the emotional burden that caregivers endure during routine tasks (Arditti, 2022). Inclusion can lead to social withdrawal and school issues (Haskins & Turney, 2021).

Being in a household with an incarcerated family member is incredibly critical and can cause significant harm to all ages. A number of detrimental consequences, including increased psychological distress, behavioral problems with children, academic challenges, and a greater chance of involvement in juvenile justice (Murray & Farrington, 2008), are also associated with parental imprisonment. The presence of shame, stigma, loss, and abandonment among children of incarcerated parents can result in anxiety, depression, or difficulties developing secure attachments (Dallaire, 2007). Parental imprisonment can lead to financial and emotional turmoil, which can also increase family vulnerability and make life more difficult for the child (Geller et al., 2012). Stress and maladjustment can be exacerbated by family routines, the absence of parents, and the emotional strain on those who still have to look after them (Wildeman & Turney, 2014).

HOUSEHOLD MEMBER WAS MENTALLY DEPRESSED OR ILL

Living with a mentally ill household member creates an unpredictable, emotionally strained environment. Children face inconsistent caregiving and increased household stress (Goodman et al., 2011). Parental mental illness impairs consistent emotional support, leading to insecure attachment, behavioral problems, and increased risk of their own mental health issues (Reupert et al., 2023). Children may prematurely take on caregiving roles, causing stress and blurred boundaries (Aldridge & Becker, 2003). Stigma isolates families, preventing support (Corrigan & Miller, 2004). Chronic stress has an impact on the brain development of children, particularly in relation to emotional regulation (Lupien et al., 2009).

DOMESTIC VIOLENCE

Domestic violence is a traumatic ACE. Witnessing violence without any direct physical harm can result in severe psychological and developmental effects (Kitzmann et al., 2003). The symptoms of anxiety, depression, and aggression in children, as well as emotional dysregulation,are significant (Evans et al., 2008). Inheritance patterns of violence may be established in individuals who internalize blame or acquire aggression (Bandura, 1978; Jaffe et

al., 1990). Chronic stress can disrupt safety and negatively impact brain development, leading to an increase in future trauma vulnerability (Perry, 2001; Teicher et al., 2003). However, relationship difficulties, an increased risk of violence, and physical/mental health issues are among the long-term effects observed in most studies (Felitti et al., 1998; Whitfield & coll.). Academics and social interactions are influenced by hypervigilance, which is caused by fear and unpredictability (Graham-Bermann & Levendosky, 1998).

MALTREATMENT: EMOTIONAL ABUSE AND EMOTIONAL NEGLECT

Emotional abuse and emotional neglect are two types of maltreatment that can cause significant harm to a child's mental and physical health, leaving behind visible but harmful scars.

EMOTIONAL ABUSE

Grievances such as criticism, humiliation, threats, or rejection undermine the self-esteem of a child (Glaser 2002). Despite being difficult to detect with invisible marks, they can be emotionally devastating. According to Iwaniec et al. (2007), victims experience issues with low self-esteem, anxiety, depression, eating disorders, substance abuse, and relationship difficulties. They experience difficulties with identity, self-regulation, and trust, resulting in inadequacy and distorted self-perception (Sachs-Ericsson et al., 2010). The constant falsification of reality and belief in perceptions leads to chronic self-doubt (Spinazzola et al., 2014).

EMOTIONAL NEGLECT

There appears to be no emotional involvement (Hildyard & Wolfe, 2002). arises from caregivers' inability to There appears to be no emotional involvement (Hildyard & Wolfe, 2002).

Emotional neglect leads to attachment issues, which can result in anxiety, depression, and neurological problems (Teicher & Samson, 2016). Depression, anxiety, and lifelong alcohol dependence are among the risk factors (Maguire et al., 2015). Those who have experienced emotional abuse tend to exhibit oppositional defiant disorder, panic attacks, major depression, and dysthymia more frequently (Norman et al., 2012). The correlation between hyperactivity and child labor history with neglect is noted (Lansford et al., 2002). Evaluators: While responsive parenting can alleviate PTSD symptoms, emotional dysregulation and internalizing/externalizing behaviors are also linked to parent-child interaction (Scheeringa & Zeanah, 2001). However, some studies have shown that responsiveness to parental influence can reduce the impact.

Among mothers with substance abuse, impaired parenting was found to result in emotional neglect due to intergenerational trauma (Suchman et al, 2006). However, the long-

term consequences of this include problems with emotional expression, alexithymia, low self-esteem, chronic emptiness, and difficulties in forming secure adult attachments (Grossmann et al, 2005).

PHYSICAL NEGLECT

Physical neglect refers to the lack of physical needs such as food, clothing, shelter, medical care, supervision and protection (Dubowitz et al., 2022). Developmental delays, physical health issues, and increased vulnerability to accidents/exploitation are induced (Hildyard & Wolfe, 2002). The effects of chronic stress on children include malnutrition, stunted growth, infections, and impaired cognitive development (Walker et al., 2007). The long-term effects of this condition include chronic health problems, academic difficulties such as malnutrition or hypertension, social isolation, and a greater risk of substance use and criminal activity (Gilbert et al., 2009). Abnormal care undermines security and trust, leading to the erosion of adult relationships and self-esteem (Baer & Martinez, 2006).

PARENTAL SEPARATION & DIVORCE

If there is significant conflict or instability, parental separation/divorce can be a major ACE (Amato, 2001). Loss, grief, anxiety and confusion are common feelings experienced by children when their family breaks up (Lansford, 2009). Stress is elevated by disruptions in routines, living arrangements, and parent contact (Hetherington & Kelly, 2002). High levels of conflict between parents are particularly detrimental, contributing to behavioral problems, academic struggles, depression and anxiety (Cummings & Davies, 2010). The long-term consequences include problems with relationships, lower educational levels, and more mental health problems (Chase-Lansdale et al., 1995). By fostering stable environments through supportive co-parenting, negative effects can be lessened (Emery, 2012).

BULLYING

The prevalence of bullying is a common ACE in schools, communities, and online platforms, as stated by (Olweus, 1993). It entails frequent aggression, deliberate harm, and an imbalance of power. The prevalence of behavioral issues, hyperactivity, conduct problems, and suicidal thoughts among victims is higher (Arseneault et al., 2010). Evidence suggests that there are indications of neurological health issues (Teicher et al., 2016), worsening health (Takizawa et al., 2014), lower quality of life (Frisén et al., 2007), and higher psychological disorders/suicide attempts in adulthood (Copeland et al., 2013).

ACEs are believed to have an inflammation-dependent effect on long-term health in individuals who experienced bullying as children (Copeland et al., 2014). Multiple occurrences of stress-related disruption (Danese et al., 2007), disrupting normalization and inflammation (Miller et al., 2011), increase the risk of cardiovascular disease, metabolic syndrome (Slavich & Irwin, 2014) and autoimmune disorders. In addition, bullying causes anxiety, depression, social isolation, and academic struggles that persist (Hawker & Boulton, 2000). School avoidance and academic decline are caused by constant fear and humiliation.

COMMUNITY VIOLENCE AND COLLECTIVE VIOLENCE

The exposure to violent behavior outside of the home, whether at a community level or through collective acts, is one of its major ACEs, and it can have profound effects on children.

COMMUNITY VIOLENCE EXPOSURE

Community violence exposure (CVE) is the process by which individuals experience violence in their neighborhoods, as stated by (Buka et al., 2001). Adolescents' internalizing behaviors are linked to CVE (Fowler et al., 2009). According to Swoopen and colleagues (2011), community adversity is associated with somatic symptoms such as headaches and chronic pain. Physical symptoms such as sweating, abdominal pain, weakness, chest pain (resistance to respiration), reduced appetite, and sleep difficulties are associated with perceived stress and CVE in urban young adults (Wilson et al., 2019). Consistent threat triggers hypervigilance and chronic stress, which have consequences for mental/physical health (Gapen et al., 2011).

Indicators of adverse behavioral and health outcomes are certain ACEs, such as CVE (Felitti et al., 1998), and strong associations with mental/physical health conditions (Anda et al., 2006). Adolescent males' substance misuse, particularly tobacco, is closely linked to abuse, domestic violence, and community assault (Dube et al., 2003). Neurological health problems and chronic conditions such as pulmonary problems, cancer, and heart disease, or vulnerability to the

adaptive changes (ACE). Danese & McEwen (2012) found that ACEs have an important role to play in development, acting on the brain, hormonal, and immune systems. The impact of neurological disorders on global health is expected to reach $16 trillion by 2030 due to community violence (Patel et al., 2016).

COLLECTIVE VIOLENCE

The term collective violence is used to describe large-scale group violence (WHO, 2002). Betancourt and colleagues (2013) found that children who are subjected to collective violence undergo profound trauma, displacement and loss. The psychological impact is severe, causing high rates of PTSD, depression, anxiety, and impaired cognitive development (Tol et al., 2013). The exposure of children to atrocities in conflict zones can affect their neurobiological stress responses and result in long-term mental/physical health problems (Bick et al., 2017). Education and services disruptions hinder recovery efforts. In the future, these impacts may shape economic stability and social cohesion (Miller & Rasmussen, 2010). Educational and economic opportunity loss are the result of constant threat and social breakdown, which can lead to hopelessness (Panter-Brick et al., 2011).

PHYSICAL ACTIVITY AND ADVERSE CHILDHOOD EXPERIENCES

According to Caspersen and colleagues (1985), physical activity refers to any bodily motion that necessitates energy. The benefits of regular exercise are numerous, including a decrease in the risk of chronic disease, enhancement of cardiovascular health, enhanced mood, cognition, and immune function (Warburton et al., 2006). ACEs have a significant impact on participants' participation in physical activity.

The correlation between physical activity and ACE exposure is found to be opposite. In both childhood and adulthood, there is a correlation between higher ACE scores and decreased physical activity (Mersky et al., 2016). This link arises from psychological, physiological and environmental factors.

The impact on mental health is a fundamental mechanism. ACEs are associated with an increased risk of depression, anxiety, and PTSD (Chapman et al., 2004). Fatigue, anhedonia, low motivation and social withdrawal are associated with these conditions which act as barriers to physical activity (Stubbs et al., 2017). The presence of emotional neglect or bullying can result in social anxiety and discourage individuals from participating in group activities (Vancampfort et al., 2017). Child sexual abuse survivors may face challenges with body image because of not engaging in physical activities during training (Mason & Richardson, 2010).

Chronic ACEs can also hinder physical activity. In trauma survivors, the dysregulation of the HPA axis leads to chronic fatigue, pain, and inflammation, which makes exertion difficult (Pacak & Palkovits, 2001). Fatigue may be reduced by exposure to domestic or community violence, which can deplete energy reserves and hinder active play (Farrell et al., 2017). Physical exercise can be impeded by the effects of physical abuse or neglect, such as developmental disabilities and chronic pain (Norman et al., 2012).

Environmental factors are crucial. In families with substance abusers, incarcerated relatives or mentally ill parents, children often lack stable routines and supervision; absence of safe places to exercise (Mammen & Faulkner, 2013). The absence of parents/divorce can interfere with recreational opportunities (Amato, 2001). Community or collective violence can lead to unsafe neighborhoods for outdoor activities (Carver et al, 2008).

Conversely, physical activity is a potent protective and therapeutic agent for ACE survivors. Stress-relief exercises can decrease the severity of depression, anxiety, and PTSD symptoms, improve emotional regulation, and promote a positive self-image (Schuch et al., 2016). It provides trauma survivors with the power to gain control and mastery (Caddick & Smith, 2014). Community, social connections, and coping skills are fostered through structured activities like team sports in order to combat isolation (Eime et al., 2013).

Adverse Childhood Experiences (ACEs) represent a pervasive public health crisis with far-reaching consequences across the lifespan. Various forms of child maltreatment (physical, sexual, emotional abuse; physical, emotional neglect), household dysfunctions (parental substance abuse, mental illness, incarceration, domestic violence), and external stressors (bullying, community/collective violence) inflict profound psychological, emotional, and physical damage. The global prevalence of these experiences highlights the urgent need for comprehensive prevention and intervention. Documented links between ACEs and negative health outcomes—including chronic diseases, mental health disorders, substance abuse, neurological impairments, and reduced physical activity—underscore the critical importance of addressing early life adversities. Understanding ACEs and their mechanisms allows for more effective policies and programs fostering safe, nurturing environments for children, mitigating trauma's burden, and promoting healthier, more resilient populations. Integrating physical activity interventions, as both a buffer and recovery tool, is crucial for supporting survivors and fostering well-being.

METHODOLOGY

Through an analytical cross-sectional research design, this study examined how adverse childhood events affected health risk behaviors among university students in Karachi. One public and one private university's students were gathered over a period of roughly twelve months. To obtain sufficient statistical power, the minimum sample size needed was 123, which was determined by prevalence estimates from previous studies. By considering an anticipated 20% non-response rate and aiming for a 95% confidence interval with at least a 5% margin of error using Epi Info software, the target sample was increased to 150. Ultimately, the study found that there were 249 responses from the public university and 251 from private universities. During peak hours, such as lunchtime or after school, non-probability convenience sampling was used to recruit participants by contacting students in heavily congested common areas like libraries, cafeterias, and lecture halls. A summary of the study's objectives and procedures was provided to potential participants, with a focus on participation being voluntary and the confidentiality of all responses. The inclusion criteria included all students aged 18 to 30 who voluntarily agreed to participate. All other participants were considered equal. On the other hand, any student who did not want to take psychiatric medication or was considered psychologically unfit was excluded.

DATA COLLECTION PROCEDURE

Data collection was conducted using two paper questionnaires, namely the Adverse Childhood Experiences Questionnaire (ACE-Q) and the International Physical Activity Questionaire (IPAQ), that evaluated the effects of childhood challenges on physical activity levels. At a public and private university in Karachi, surveys were conducted within classrooms for 3-5 minutes each. The next stage was to obtain the necessary institutional approvals and informed consent from each participant. Upon collection, all completed questionnaires were enclosed in envelopes and secured.

MATERIALS

ADULT CHILDHOOD EXPERIENCE (ACE) QUESTIONNAIRE

The ACE Questionnaire, which was developed by Felitti and colleagues (1998), provides information on adverse childhood experiences. Various forms of childhood trauma, such as neglect, abuse, and dysfunctional behavior, are evaluated using this 10-item assessment. A sum of points assigned to each item's responses is used to determine an overall ACE score, which can be anywhere from 0 to 10. A higher ACE score implies a greater probability of experiencing various adult physical and behavioral health problems.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

The International Physical Activity Questionnaire (IPAQ) short form was developed as a result of collaborating scientific methods started in Geneva in 1998. Although not credited to any single author, it was developed by key researchers such as Craig and Marshall. The first scoring system was introduced in August 2003, and it was later modified in April 2004. The total Metabolic Equivalent of Task (MET)-minutes per week is calculated using the following scoring system: 3.3 for walking, 4.0 for moderate, and 8.0 for vigorous. Levels of activity are subsequently classified as Low (≤600 MET-min/week), Moderate (≥600 MET-min/week), or High (≥3000 MET-min/week). Specific criteria for vigorous activity are based on MET-min/week.

DATA ANALYSIS PROCEDURE

SPSS was utilized to analyze the data. Deficiencies in descriptive statistics were used to describe the total sample and demographic variables, such as university type, age, gender, and education level, among various public/private universities. Inferential analyses were conducted using Pearson's chi-square tests for categorical variables and independent t-tests for continuous variables, with significance set at $p < 0.05$. The associations between Adverse Childhood Experiences (ACEs) and risky health behaviors were tested using independent t-tests. Furthermore, the comparative relationship between ACEs and physical activity levels was established using Multinomial Regression Analysis.

ETHICAL CONSIDERATIONS & ERC APPROVAL

The study was conducted in accordance with ethical guidelines, and the Sohail University ERC granted its approval. Additionally, All individuals received detailed information about the research purpose and procedures and consented to it with informed consent before participating. ACEs required participants to complete retrospective self-reports. Participants were authorized to withdraw at any time. During the research, confidentiality and privacy were strictly enforced.

RESULTS

Data for the research were acquired from a private and public university in Karachi by providing participants with survey questionnaires. Participants in this research were undergraduate and postgraduate students pursuing degrees in different programs. About 500 participants participated in the research. The table below shows the demographic information of the sample population.

TABLE 1: DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS (N=500) FROM PRIVATE AND PUBLIC UNIVERSITIES

Characteristic	Category	N	%
Age (years)	18–19	40	8
	20–23	299	59.8
	24–26	84	16.8
	27–30	77	15.4
Gender	Male	229	45.8
	Female	271	54.2
Education Level	Undergraduate	411	82.2
	Postgraduate	89	17.8
University Sector	Public	249	49.8
	Private	251	50.2

Table 1 shows that most of the individuals are in the 20-23 age group, while females (54.2%) participated more in the survey compared to males (45.8%). About 82.2% of the students are undergraduates, while the rest are pursuing their postgraduate degrees. About 50.2% are from private universities, while 49.8% are from public universities.

TABLE 2: PREVALENCE OF PHYSICAL ACTIVITY AND ACES AMONG PUBLIC AND PRIVATE STUDENTS.

Variable	Public (n = 249)	Private (n = 251)
Physical Activity Category		
Low (0–599 MET min/week)	68.3%	91.2%
Moderate (600–2999 MET min/week)	31.3%	8.8%
High (≥3000 MET min/week)	0.4%	0%
Adverse Childhood Experiences (ACEs)		
Physical abuse	33.70%	4.40%
Emotional abuse	27.30%	2.40%
Contact sexual abuse.	20.10%	19.90%
Alcohol/drug abuser in household	4.80%	11.20%
Parental separation or divorce	9.60%	27.10%
Physical neglect	6.00%	8.00%
Emotional neglect	49.00%	58.60%

Household members treated violently.	37.30%	31.90%
Chronically depressed, mentally ill, institutionalized or suicidal	17.70%	27.10%
Incarcerated household member	4.40%	6.00%
Bullying	43.40%	36.70%
Community violence	45.80%	40.20%
Collective violence	8.00%	0.40%

Table 2 shows the prevalence of physical activity levels (Low, Moderate, High based on met min/week) and specific Adverse Childhood Experiences (ACEs) experienced by students from public and private universities in Karachi. It compares the distribution of health-related variables between sectors within each university.

TABLE 3: ADJUSTED ODDS RATIOS FOR PHYSICAL ACTIVITY LEVELS BY ADVERSE CHILDHOOD EXPERIENCES AMONG PUBLIC AND PRIVATE UNIVERSITY STUDENTS

University Type	Physical Activity Category	Predictor	B	Std. Error	Wald	Sig.	Exp(B)	95% CI lower	95% CI Upper
Public	Low (0 - 599 MET min/week)	Physical abuse	9.05	32.262	0.079	0.779	8518.929	2.94E-24	2.47E+31
		Emotional abuse	-3.539	73.616	0.002	0.962	0.029	6.32E-65	1.33E+61
		Contact sexual abuse.	-6.75	68.687	0.01	0.922	0.001	4.00E-62	3.43E+55
		Alcohol/drug abuser in household	-15.176	0.896	286.813	0	2.57E-07	4.43E-08	1.49E-06
		Parental separation or divorce	-3.319	85.256	0.002	0.969	0.036	9.75E-75	1.34E+71

	Physical neglect	-0.423	130.079	0	0.997	0.655	1.24E-111	3.46E+110
	Emotional neglect	5.047	71.052	0.005	0.943	155.597	5.15E-59	4.70E+62
	Household members treated violently.	-7.407	35.026	0.045	0.833	0.001	9.32E-34	3.95E+26
	Chronically depressed, mentally ill, institutionalized or suicidal	4.875	70.159	0.005	0.945	130.993	2.50E-58	6.87E+61
	Incarcerated household member	-4.175	208.128	0	0.984	0.015	1.07E-179	2.22E+175
	Bullying	-0.875	57.798	0	0.988	0.417	2.65E-50	6.57E+48
	Community violence	6.625	28.989	0.052	0.819	753.607	1.59E-22	3.57E+27
	Collective violence	-8.163	53.005	0.024	0.878	0	2.17E-49	3.74E+41
Moderate (600 - 2999 MET	Physical abuse	9.997	32.263	0.096	0.757	21954.571	7.57E-24	6.37E+31
	Emotional abuse	-3.321	73.617	0.002	0.964	0.036	7.85E-65	1.66E+61

min/week)	Contact sexual abuse.	-5.521	68.688	0.006	0.936	0.004	1.36E-61	1.18E+56
	Alcohol/drug abuser in household	-14.369	0	—	—	5.75E-07	5.75E-07	5.75E-07
	Parental separation or divorce	-1.08	85.261	0	0.99	0.339	9.04E-74	1.28E+72
	Physical neglect	1.412	130.083	0	0.991	4.103	7.70E-111	2.19E+111
	Emotional neglect	5.467	71.053	0.006	0.939	236.657	7.84E-59	7.15E+62
	Household members treated violently.	-6.555	35.027	0.035	0.852	0.001	2.18E-33	9.29E+26
	Chronically depressed, mentally ill, institutionalized or suicidal	4.68	70.16	0.004	0.947	107.757	2.05E-58	5.66E+61
	Incarcerated household member	5.648	222.156	0.001	0.98	283.652	2.26E-187	3.57E+191

		Bullying	-0.049	57.798	0	0.999	0.952	6.04E-50	1.50E+49
		Community violence	7.158	28.989	0.061	0.805	1284.169	2.71E-22	6.09E+27
		Collective violence	-7.21	53.009	0.018	0.892	0.001	5.59E-49	9.78E+41
Private	Low (0 - 599 MET min/week)	Physical abuse	-14.84	1385.436	0	0.991	3.59E-07	0	
		Emotional abuse	-1.251	1761.443	0	0.999	0.286	0	
		Contact sexual abuse.	-2.182	1.302	2.81	0.094	0.113	0.009	1.447
		Alcohol/drug abuser in household	-1.144	1.799	0.404	0.525	0.319	0.009	10.827
		Parental separation or divorce	-13.964	319.308	0.002	0.965	8.62E-07	1.38E-278	5.39E+265
		Physical neglect	-13.786	569.814	0.001	0.981	1.03E-06	0	
		Emotional neglect	-2.414	0.822	8.63	0.003	0.089	0.018	0.448
		Household members treated violently.	-14.696	280.031	0.003	0.958	4.15E-07	1.80E-245	9.56E+231
		Chronically depressed,	-1.732	1.412	1.506	0.22	0.177	0.011	2.814

mentally ill, institutionalized or suicidal							
Incarcerated household member	-14.778	763.181	0	0.985	3.82E-07	0	
Bullying	-3.025	0.814	13.82	0	0.049	0.01	0.239
Community violence	-1.832	0.792	5.346	0.021	0.16	0.034	0.756
Collective violence	2.702	0		—	14.91	14.91	14.91

Table 3 presents the adjusted odds ratios (Exp (B)) obtained from logistic regression analyses that analyze connections between specific Adverse Childhood Experiences and physical activity levels vs. moderate participation from students enrolled in both public and private universities in Karachi. It encompasses the coefficients (B), standard errors, Wald statistics, significance levels (Sig.), and 95% confidence intervals for the odds ratios.

TABLE 4: COMPARISON OF ACE VARIABLES AMONG THE PUBLIC AND PRIVATE UNIVERSITIES.

Category	**Public**		**Private**	
	Chi-Square	**Sig.**	**Chi-Square**	**Sig.**
Physical abuse	9.87	0.007	1.896	0.169
Emotional abuse	0.255	0.88	0	1
Contact sexual abuse.	7.172	0.028	3.659	0.056
Alcohol/drug abuser in household	1.916	0.384	0.402	0.526
Parental separation or divorce	7.189	0.027	9.23	0.002
Physical neglect	3.781	0.151	3.508	0.061
Emotional neglect	1.648	0.439	11.865	0.001

Household members treated violently.	6.366	0.041	17.669	0
Chronically depressed, mentally ill, institutionalized or suicidal	0.174	0.917	1.791	0.181
Incarcerated household member	3.912	0.141	2.706	0.1
Bullying	5.811	0.055	20.762	0
Community violence	3.657	0.161	6.474	0.011
Collective violence	2.83	0.243	.	.

Table 4 shows chi-square tests and associated significance levels to compare the frequency of Adverse Childhood Experiences (ACEs) among students from public and private universities. It indicates which ACEs had statistically significant differences in prevalence between the two university sectors.

DISCUSSION

This study examines the adverse childhood experiences (ACEs) among university students in Karachi and highlights several important findings that contribute to our comprehension of childhood adversity in urban Pakistan. The results demonstrate a significant burden of ACEs in this age group. The prevalence of emotional neglect as the most frequent ACE in both university sectors (Public: 49.0%; Private: 58.6%; Table 2) was consistent with recent studies in South Asia (Maqsood et al., 2020; Siddiqui et al., 2021). The prevalence of this phenomenon highlights a crucial yet often overlooked aspect of childhood difficulties in Pakistan's cultural context, where emotional expression may be restricted and emotional validation may not be sought within family structures (Khalid & Khalid, 2022).

The findings indicate marked differences in the ACE characteristics of public and private university students (Table 2, Table 4), likely reflecting the significant socioeconomic stratification in Karachi (Gazdar & Mallah, 2021). Compared to public universities, the rates of exposure to physical abuse and direct interpersonal violence were significantly higher (33.7% vs. 4.4%; χ^2=9.87, p=0.007), emotional abuse (27.3% vs. 2.4%; χ^2=0.255, p=0.88). Additionally, household members treated with violence (37.3% vs. 31.9%; χ^2=6.366, p=0.041), collective violence (8.0% vs. 0.4%; χ^2=2.83, p=0.243) in comparison to other groups. Studies indicating higher rates of violence in concentrated poverty and community environments align with this pattern (Ali et al., 2022). On the other hand, private university students had a much higher incidence of ACEs linked to family dysfunction such as parental separation or divorce (27.1%, χ^2=9.23, p=0.002 vs. 9.6%, χ^2=7.189, p=0.027 for public), alcohol/drug abuse prevalence among

private vs. public (11.2%; χ^2=0.402, p=0.526 vs. 4.8%; χ^2=1.916, p=0.384). The statistical significance of the descriptive difference between private and institutionalized individuals is significant, with a positive outcome for both groups. For chronically depressed, mentally ill institutionalized or suicidal household members, prevalence was private vs. public (27.1%, χ^2=1.791, p=0.181 vs. 17.7%, χ^2=0.174, p=0.917). Contact sexual abuse prevalence was concerning similar among both sectors, public vs. private (20.1%; χ^2=3.659, p=0.056 vs. 19.9%; χ^2=7.172, p=0.028).

It is important to note the marked difference in physical activity (PA) between students enrolled in public universities and those studying in private universities (Table 2). The absence of exercise (Low PA: 0-599) was evident. Overall, MET min/week was high, but it was significantly higher among private university students (91.2%) than in public universities (68%). Conversely, moderate physical activity (600–2999 MET min/week) was significantly higher among public university students (31.3%) than among private university pupils (8.8%). Both groups had a low prevalence of high levels of exercise ≥3000 MET min/week, with public and private not being observed. These findings provide support for the concerning regional patterns of sedentary behavior among young people from South Asia (Javed et al., 2022).

These disparities are likely a reflection of significant differences in daily living environments and socioeconomic conditions (Khan et al., 2021; Baig et al., 2020). Despite coming from lower income backgrounds and possibly having no access to private vehicles, public university students are naturally engaging in more physical activities during their daily routines. It is likely that private university students, who come from more privileged backgrounds and are typically higher class, use motorized transportation more frequently and participate in sedentary leisure activities. Neither sector has high levels of activity, which is an important public health concern regarding the fitness of our cardiovascular system.

A logistic regression analysis was conducted to investigate the connections between certain ACEs and PA levels (Table 3). Table 3 reveals results that are statistically unstable and cannot be reliably interpreted. Although regression outputs are unstable, known neurobiological pathways account for potential ACE-PA linkages. Chronic stress through ACEs can disrupt the HPA axis, leading to fatigue or anhedonia that impairs exercise motivation (Danese & McEwen, 2012). Due to emotional neglect, adolescents often exhibit negative self-schemas (Sachs-Ericsson et al., 2010) and experience a decrease in their perceived competence for PA. Hyper vigilance can make public fitness spaces unsafe for students who are violent (Gapen et al, 2011), while motor

retardation is strongly associated with depression, which is a common ACE outcome (Stubbs et al., 2017). According to Schuch and colleagues (2016), PA promotion is essential for the population as it can regulate cortisol, enhance self-efficacy, and provide social mastery experiences through physical activity.

The patterns of adversity in Karachi are characterized by the presence of two distinct categories, public and private, with direct violence and family dysfunction being more prevalent (Gazdar, 2021). Public university students' profiles are shaped by the struggles they encounter in resource-limited, high-stress environments with higher rates of community and interpersonal violence. Private university students' profiles, which exhibit greater family instability and emotional neglect despite material advantages, align with studies on the stresses within upwardly mobile families in rapidly urbanizing contexts where parental pressures and emotionally distant relationships may occur (Zaidi et al., 2020; Naz et al., 2019). It is important to note that the prevalence of high emotional failure in both sectors is consistent with cultural or societal factors beyond socioeconomic status, which may limit emotional support and attainment within families (Siddiqui & Karmaliani, 2023).

CONCLUSION

Critical information about the different profiles of childhood hardship and exercise among university students in Karachi's regulated educational environment is provided by this research. The pervasive and culturally relevant nature of emotional neglect in both the public and private sectors highlights the need for targeted interventions. ACE patterns that differ significantly in socioeconomic context, with public university students experiencing higher rates of direct violence and private university students reporting more family instability, highlight the differences. These patterns are evident across all levels of education. These findings are further contextualized within the context of cultural norms in Pakistan. Gender segregation expectations may restrict female students' access to public sports facilities (Khan et al, 2021), and socioeconomic factors often prioritize academic performance over recreational activities, particularly in mobile private institutions (Zaidi & Mansoor, 2020). Both sectors exhibit a high degree of emotional neglect, which aligns with the collectivist tendencies in family structures to suppress emotional expression. This may reduce both helper and participant involvement in physical activity as coping mechanisms (Khalid & Khalid, 2022). The absence of intense PA may be attributed to the religious beliefs that discourage mixed-gender exercise. . These norms will need to be addressed in future through gender-specific fitness programs and culturally framed

PA messaging that respect family values. The substantial disparity in physical activity, with private university students displaying almost universally low activity levels compared to their more active peers at public universities, is also of great concern for long-term health.

Statistically unreliable results were obtained through logistic regression in the attempt to model specific ACE-PA relationships, making it difficult to draw conclusions about activity levels and individual ace impacts. The methodological result highlights the difficulty of analyzing these interdependent challenges and behaviors. The outcomes reveal a clear pattern of the significant difficulties faced by students, which are influenced by both past hardships and present lifestyle patterns, greatly impacted by the socioeconomic divide in Karachi. The resolution of these challenges necessitates recognizing the unique vulnerabilities of different sectors: public university students prioritize violence prevention and safe community initiatives, while private university seniors focus on strengthening family support systems and managing emotional neglect. To safeguard our health for the future, it is imperative that all students take action to combat sedentary behavior, particularly the alarmingly low levels of moderate and vigorous activity.

LIMITATIONS OF THE RESEARCH

This study has key limitations. The absence of causal inferences about ACEs and physical activity is prevented by its cross-sectional design (Shadish et al., 2002). Reliance on self-reported ACEs may be biased towards recall; the IPAQ may inaccurately reflect physical activity levels in this population (Hardt & Rutter, 2004; Jahangir et al., 2020; Lee et al., 2011), and highlights that the sampling data for Karachi universities is limited to rural Pakistan or other cities. Therefore, it cannot be generalized anywhere else in the world. It might have disregarded moderators of ACE effects since protective factors such as resilience or social support were not considered (Masten, 2014). Despite their usefulness, logistic regression analyses produced statistically unstable results (extreme coefficients and large standard errors) that made certain ACE-PA associations impossible to interpret (Allison, 2022; Hosmer et al., 2013). A dearth of biomarker data hinders understanding of physiological pathways (Danese & McEwen, 2012).

RECOMMENDATIONS

In future studies, it is recommended to focus on longitudinal designs that monitor ACE impacts over time and incorporate protective factors and biomarkers (Felitti et al., 1998; Danese & McEwen, 2012; Masten, 2014). Buoyant analysis and methodological refinement are required: use of validated PA measures for Pakistan; application of robust statistical techniques (e.g., regularization); and ensuring adequate sample sizes (Bull et al., 2020; Tibshirani, 1996). A multi-regional study is necessary (Karmaliani et al., 2022). Work on sector-by-sector approaches to address trauma-sensitive PA promotion and violence prevention in public universities (Harris, 2014), and employ family support and emotional neglect reduction strategies alongside sedentary behavior strategies for private universities (Siegel, 2012; Cooke et al., 2021). Universally, establish campus policies for ACE-aware support services and mandatory PA integration (Anda et al., 2020).

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