Adverse Childhood Experiences and Implications of Perceived Stress, Anxiety, and Cortisol Among Women in Pakistan

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Abstract

Background: Adverse Childhood Experiences (ACEs) are linked to poor maternal mental health. By disrupting stress regulation systems, ACEs are hypothesized to impact perceived stress, anxiety, and cortisol. This study explores the associations of ACEs with different manifestations of stress.

Methods: Participants were part of the Bachpan study, a longitudinal birth cohort in rural Pakistan. Data were collected at the 36-month postpartum wave. ACEs were captured retrospectively using an adapted version of the ACE International Questionnaire, and represented in the following ways: as a continuous variable, binary indicator, categoric levels, and subdomains (neglect, home violence, family psychological distress, community violence). Outcomes included: perceived stress (N=889) measured with the Cohen Perceived Stress Scale (PSS), anxiety (N=623) measured with the Generalized Anxiety Disorder-7 scale (GAD-7), and hair-derived cortisol (N=90). Multivariable linear mixed models estimated associations between ACEs and the outcome variables.

Results: All models featured positive associations between ACE items and PSS. Both the continuous total ACE score ($B=0.4$; 95% CI=0.0, 0.8) and the presence of any ACEs ($B=1.0$; 95% CI=-1.0, 0.3) were associated with higher anxiety symptoms on the GAD-7. Home violence ($B=6.7$; 95% CI=2.7, 10.8) and community violence ($B=7.5$; 95% CI=1.4, 13.6) were associated with increased hair cortisol.

Conclusions: All four ACE domains were associated with elevated levels of perceived stress, anxiety, and cortisol, with varying precision and strength of estimates, indicating that the type of ACE has a differential impact. This study disentangled adversity to understand the impact of specific adverse events on hypothalamic pituitary adrenal (HPA) axis functioning and mental health conditions.

Background

The prevalence of Adverse Childhood Experiences (ACEs) is extremely high, with population estimates ranging from 50%-70% (Felitti et al., 1998; Ramiro, 2010). A robust literature links ACEs with compromised physical health, mental health, and overall functioning in adulthood (1-4). Those exposed to ACEs are less likely to obtain high levels of education, leading to financial insecurity, lower socioeconomic status, and a lack of psychosocial resources (4). The compounding nature of adversity is especially impactful in low- and middle-income countries (LMICs), where rates of ACEs are high and other stressors, such as poverty, may lead to and co-occur with ACEs (5, 6). The impact of ACEs on maternal mental health is of particular concern as maternal mental health may function as a mediator between maternal ACEs and child mental health, indicating intergenerational trauma (7). Informed by life course theory's linkage of adult disease risk to psychosocial exposures stemming from childhood, understanding the associations between ACEs and adult health may offer important insights into preventing compounding health issues throughout life (8).

Although the overall literature linking ACEs to mental health is robust, several key questions are not well understood. The first is to what extent examining the unique effects of different types of ACEs is important for elucidating how early experiences impact adult functioning. Much of past work has focused on specific ACEs (e.g., sexual abuse) or the cumulative effect of ACEs, and often, domain-specific (e.g., abuse, neglect, household dysfunction) results have either not been reported or have been ambiguous (9-11). Nonetheless, multiple researchers have pointed to the utility of separating ACEs into distinct domains. For instance, Negri (2020) found that in the United States, experiencing neglect, but not physical abuse, predicted anxiety symptoms in

adolescence and ACEs related to child maltreatment were more predictive of mental health outcomes than ACEs related to household dysfunction (12). In our team's prior work with a cohort of women in Pakistan at 36 months postpartum, we have found that exposure to community violence was much more strongly correlated with maternal depression than other domains such as neglect (13). A key potential driver of different findings is the diversity of social, economic, and cultural contexts in which the ACEs take place. Hence, studies from multiple geographic regions and population groups make important contributions towards better understanding of how different ACEs may differentially impact mental health.

A second area of inquiry focuses on the biological stress-related pathways linking ACEs to various health outcomes. Specifically, there is evidence that ACEs impact stress regulation systems, including the Hypothalamic Pituitary Adrenal (HPA) axis and its end product of cortisol (14-16). ACEs are associated with both hyperactivation and hypoactivation of the HPA axis, leading to elevated or reduced cortisol levels, respectively (17-19). The majority of this research has also been conducted in high income settings. The interplay among ACEs, adult stress and anxiety, and adult stress system functioning is not well understood in LMICs and has not been explored in South Asia specifically (4, 20, 21). HPA axis hormones extracted from hair samples capture chronic stress, which is an important mediator between early life experiences and later mental health (22).

In the current study, we examine how ACEs are associated with multiple dimensions of stress later in life including anxiety, perceived stress, and hair derived cortisol in a sample of mothers living in rural Pakistan. We investigate ACEs, and their specific domains, in a LMIC setting because they have been underexplored in this region. For example, while the majority of past studies on these topics sample well-educated, urban populations, the majority of Pakistani women have spent their life in rural areas, which is tied to unique stressors, such as food insecurity, low education and literacy of women, and transportation barriers, compared to urban settings many past studies are set in (23-26).

Methods

Study Design and Participants

The data in the present analysis come from mothers of the Bachpan cohort, a longitudinal birth cohort of mother-child dyads in rural Pakistan north of the Punjab Province (Sikander et al., 2015). One of the purposes of the Bachpan cohort was to evaluate the impact of a peer-delivered, community-based perinatal depression intervention, embedded within the cohort, on maternal mental health and child development (27). Pregnant women from 40 village clusters were screened for depression and invited to participate in the study. Twenty of the 40 village clusters were randomized to receive the perinatal depression intervention delivered by lay peers and 20 clusters received enhanced usual care. In addition, an equal number of non-depressed pregnant women were recruited and followed in parallel as part of the Bachpan cohort. Women were assessed at baseline (during their third trimester of pregnancy) and at an additional five time points: three, six, 12, 24, and 36 months postpartum. At the 36-month assessment, participants completed questionnaires assessing ACEs, anxiety, and perceived stress. In addition, a subsample of participants at the 12 month interview, were asked to provide hair for cortisol assay. Of the 1,154 women who were included at baseline, 889 participated in the 36 month questionnaire, providing information on ACEs and perceived stress. Due to a delay in administering the anxiety assessment, 623 participants provided information on anxiety. We approached a randomly-selected subsample of 107 women for

hair cortisol collection, and of those, 93 provided valid samples. Finally, 90 mothers provided both hair cortisol and ACEs measurement.

Measures

Adverse childhood experiences. ACEs were assessed at the 36 month data collection period using an adapted 12-item ACE International Questionnaire (WHO, 2018). Sexual abuse questions were removed due to the potential risk of stigmatizing the respondents at their marital homes. To discern the impacts of different ACE subtypes and methods of representation, we created a dichotomized score indicating any exposure to ACEs, a summed score, a categorical variable (0, 1, 2, 3, 4+ ACEs), and indicators for the theorized domains: neglect, family psychological distress, home violence, and community violence (Table 1). The domains are dichotomous, representing exposure to any of the ACEs comprising the domain.

Perceived stress. Perceived stress was measured using the Perceived Stress Scale (PSS). The PSS is a 10 item instrument that measures the degree to which life situations are appraised as stressful in the last month (28). The summed score ranges from 0 to 40 and has demonstrated reliability and validity in South Asia (29, 30).

Anxiety. Anxiety was measured using the seven-item version of the General Anxiety Disorder screening tool (GAD-7). The frequency of symptoms in the last two weeks is assessed on a four point Likert scale. The summed score ranges from 0 to 21, and a cut-off of 10 typically represents a clinically significant level to identify probable cases of generalized anxiety disorder (31). The total summed GAD score and the dichotomized GAD indicator (a score above 10) were both used as outcomes in analyses. This measure has demonstrated reliability and validity in Pakistan (32).

Cortisol. Hair samples were collected using a standard protocol: approximately 200 strands of hair were cut from the posterior vertex. Research suggests that one centimeter of hair reflects hormonal output for the previous month (33). The present analysis utilizes two centimeters of hair, reflecting HPA-axis hormone output for the past two months. Cortisol was extracted and measured by Dresden LabService using standard liquid chromatography mass spectrometry (34, 35). We did not observe any outliers. Levels are reported as pg/mg.

Covariates. Informed by existing literature, several variables were selected for the models to adjust for design characteristics and to identify potential confounders. These included maternal age, natal family's history of mental illness, maternal education (as an indicator of childhood SES), baseline depression, peer-delivered perinatal intervention allocation status, and assessor at 36 months (36).

Statistical Analysis

For this cross-sectional analysis, a series of generalized linear models with an identity link were created to estimate coefficients for the total PSS and GAD scores as well for the maternal hair cortisol concentrations. Prevalence ratios for the dichotomized GAD were generated through log-Poisson models. All models used cluster-robust standard errors to account for clustering at the village cluster level. The PSS and GAD models were adjusted for baseline depression and treatment allocation status, mother's age at baseline and education level, history of natal family mental health, and assessor at 36 months. For each outcome (perceived stress, GAD, and hair cortisol), we examined associations with: 1) the presence of any ACEs (yes/no); 2) the number of endorsed ACEs modeled as a continuous indicator; 3) the number of endorsed ACEs modeled as one categorical variable

with levels (i.e., 0, 1, 2, 3, 4+ ACEs); and 4) dichotomous indicators for each domain of ACEs (neglect, family psychological distress, home violence, and community violence). Stata version 16.1 was used for data analysis (StataCorp, College Station, TX).

Results

Descriptive Statistics

Our analytic sample consisted of 889 women who were interviewed at 36 months postpartum (see table 2 for full demographic information). The majority (66.4%) received at least a fifth grade education and had one to three children (62.5%); the mean age (standard deviation [SD]) at baseline was 26.7 (4.4) years old. About 10% reported growing up in a household with a family member who had a mental health illness. The mean (SD) total score on the PSS-10 stress scale was 12.0 (8.8). Fifty-eight percent of women experienced at least one ACE (Table 3), with a mean (SD; minimum, maximum) total number of ACEs of 1.2 (1.4; 0, 10). Among the 12 specific ACE items, emotional abuse (33.1%), physical abuse (23.5%), and emotional neglect (15.1%) were the most common. The most prevalent ACE domain was home violence (38.3%), followed by neglect (19.9 %), family psychological distress (15.8%), and community violence (6.6%) (Table 3). The distribution of ACEs were similar across the GAD and cortisol sub-samples.

Of the 623 women present at the 36 month wave that were able to complete the GAD-7, the mean (SD) total score was 4.0 (5.4), and 101 of the 623 participants (16.2%) had a score above the clinically significant cut-off of 10, which indicates moderate anxiety and signifies reasonable identification of GAD cases. A subset of 90 women participated in hair cortisol collection. There were no clear differences between the analytic groups (N = 889 for the PSS group, N = 623 for the GAD group, and N = 90 for the cortisol group) on demographic characteristics. The only distinctions were that women in the GAD sample tended to be younger, and the mean number of ACEs was higher in the cortisol subsample.

Perceived Stress

Anxiety

Both the presence of any ACEs and the continuous total ACE score were associated with higher anxiety symptoms on the GAD-7 at 36 months postpartum (Table 4, panel 2, models 1 and 2, continuous score B=0.4; 95% CI=0.04, 0.8 and dichotomous ACE B=1.1; 95% CI=0.1, 2.0). As compared to the perceived stress (PSS), there was less evidence of a dose-response relationship between the discrete count of ACEs and anxiety symptoms (model 3). Of all the domains, the strongest association existed with the history of family psychological distress (B=1.6; 95% CI=0.3, 2.9).

Total ACE score was not related to the dichotomized GAD-7 (score > 10) (panel 3) . However, those with a history of family distress experienced a slightly elevated prevalence of anxiety symptoms on GAD-7 (PR=1.6; 95% CI=1.0, 2.3). Mothers who experienced neglect had a lower prevalence of experiencing clinically significant anxiety symptoms (PR=0.2; 95% CI=0.05,0.8).

Cortisol

The effect estimates among the cortisol subsample were generally in the direction of higher ACEs being correlated with higher cortisol levels (Table 5). Of the specific ACEs domains, home violence ($B=6.7$; 95% CI=2.7, 10.8) and community violence ($B=7.5$; 95% CI=1.4,13.6) were associated with increased hair cortisol.

Discussion

The purpose of this study was to examine the impact of ACEs on perceived stress, anxiety symptoms, and cortisol in a sample of mothers residing in rural Pakistan. Our results revealed that ACEs are associated with increased perceived stress and anxiety later in adult life. These findings contribute to previous work indicating that the number of ACEs an individual experiences predicts their psychological functioning in adulthood (10, 11, 37). When examining perceived stress, we found that most ACE indicators, including the continuous measure of ACEs, the dichotomous indicators for number of ACEs, and specific ACEs domains, predicted the outcome in a similar way, with the exception of neglect. Similarly, for anxiety symptoms, there was a significant association of the total ACE score, but not the individual indicators of number of ACEs or ACEs domains. Together, these results suggest that the cumulative effect of multidimensional early adversity, as captured by a continuous ACE measure, may be more important in predicting adult stress than the individual domains of adversity or individual indicators of ACEs.

In this sample, ACEs were consistently and strongly associated with perceived stress, and somewhat more weakly associated with the continuous version of the anxiety symptom scale, and weakly associated when dichotomized at clinically significant levels. The PSS captures one's appraisal of situations as overwhelming or stressful, beyond the actual content of situations (38, 39). Our findings suggests that those who have ACEs are more likely to feel overwhelmed with any current conflict or instability (4, 40). Furthermore, accumulation of disadvantages (i.e., a higher number of ACEs) increases the likelihood that individuals who had ACEs end up in a stressful environment later in life, potentially explaining the predictive power of ACEs on perceived stress (41).

Complementing the perceived stress measure, the assessment of generalized anxiety symptoms with the GAD-7 captures the experience of chronic worry and physiological dysregulation (e.g., muscle tension, restlessness) that are not explicitly tied to current stressors present in the environment. The focus is more on specific symptoms and less on the appraisal and subjective aspects of those symptoms, which is central to perceived stress (28, 31). Our findings with anxiety symptoms were not as consistent as with perceived stress, as can be seen in the finding that ACEs are associated with the continuous anxiety symptom count but not with anxiety at the dichotomized clinically meaningful level. This is consistent with the idea that ACEs might more strongly impact how adults appraise potentially stressful experiences as opposed to their body's physiological responses to those experiences (42). This could also be due to differences in measurement between a continuous score and a dichotomous cut-off.

Somewhat surprisingly, we also found that those who reported experiencing neglect as children were less likely to report significant anxiety symptoms. This is contrary to previous literature suggesting that neglect is associated with heightened anxiety symptoms, though neglect also behaved strangely with perceived stress (ie: neglect was negatively associated with perceived stress) (43, 44). This result may be traced to mothers who have experienced neglect being less likely to report anxiety symptoms independent of their actual experience of anxiety due to desensitization to deprivation-related experiences that tend to be more frequent, yet individually less severe than threat-related ones (40, 45, 46). While disentangling this finding is beyond the scope of this

paper, desensitization and normalization mechanisms should be further explored. In Southeast Asian and sub-Saharan African studies, early adversity in the form of neglect was linked to emotional difficulties later in life (47). Additionally, neglect was not significantly associated with the continuous GAD-7 score, pointing to different relationships between neglect and clinically significant anxiety versus the continuous GAD-7.

When examining the association between ACEs and hair cortisol, we found that endorsing two ACEs or experiencing home violence were significant predictors of increased hair cortisol. This partially aligned with our hypothesis that early adversity is associated with increased HPA axis hyperactivity, and subsequent increase in cortisol production (14, 48). Interestingly, a study in India analyzed hair cortisol in children and found it to be linked with adversity (49). Other studies have shown that among early life experiences, violence particularly has a potent impact on programming the HPA axis (50). This is preliminary evidence that ACEs have downstream effects of adulthood HPA axis functioning. Future studies would benefit from a larger sample size to more fully investigate the relationship between ACEs exposure and cortisol.

In LMIC, home violence in the form of interpersonal violence is particularly common, which is also reflected in our sample (51, 52). Home violence was the only domain that significantly predicted cortisol, possibly because it is linked to consequences that are emotional in nature: isolation, fear, guilt, low self-esteem (53). Violence experienced at home may be internalized to a greater extent because it is physical, occurring closer to the child with a large presence in the child's life. Domestic violence also increases the risk for other kinds of abuse (54). Young girls living in households with domestic violence are at risk for developing internalizing mental health issues (55). Importantly, we did not control for current interpersonal violence, which might interact with earlier adverse exposures and mediate HPA axis activity. We also did not find associations between the emotion abuse items and cortisol. Threatening, violent behaviors lead to the activated kinds of outcomes we focused on compared to ones that stem from neglectful experiences, which tend to be emotional in nature (56).

This study benefited from a number of strengths. In particular, we investigated the impact of ACEs in many ways: as individual items, categorically, continuously, binary (any/none), and domains (neglect, home violence, family psychological distress, community violence). In particular, few prior studies have examined childhood adversity in the form of neglect (45). Neglect is the most common type of maltreatment, increasing the importance to explore it in research (40, 45). Thus, we broke neglect into its subtypes of emotional and physical. Neglect behaved differently from the other domains, and future studies should examine neglect separately in addition to investigating its impact alongside other types of ACEs. In addition to modeling ACEs in multiple ways, we also studied the outcomes from two angles—perceived stress and anxiety—to discern nuances between the two seemingly similar measures. Although PSS and GAD-7 appear to measure similar things, the results of our study point to their distinctive relationships with ACEs. Additionally, the inclusion of the cortisol subanalysis is another way to approach stress and anxiety, with cortisol representing a biological contrast to behavioral constructs, PSS and GAD-7. Finally, our study was situated in a LMIC context, where ACEs have been understudied yet pose a significant public health burden (57).

These results should be interpreted in the context of several limitations. First, the cortisol exploratory analysis only included 90 women, potentially reducing the validity of the associations among ACEs and cortisol. Additionally, Another limitation is that the ACEs questionnaire involved recall bias due to questions asking about events that occurred years, if not decades ago. However, the ACEs questionnaire was designed to be asked retrospectively (World Health Organization, 2018). All of the measures were self-reported and focused on the

appraisal of experiences rather than the actual objective content, providing another pathway to produce subjective results (42). ACEs have been found to be comorbid with low-income and low-education populations, which predispose people to stressful living environments. We attempted to address this by controlling for maternal education as an indicator of childhood socioeconomic status. However, we did not include current stressful life events and violence exposure.

These results inform our understanding of how ACEs are associated with perceived stress, anxiety, and HPA-axis functioning. ACEs were associated with heightened levels across all three domains of perceived stress, anxiety, and cortisol, with varying precision and strength of estimates. Our study attempts to disentangle adversity into subtypes (neglect, home violence, family psychological distress, community violence) to pinpoint the impact of specific adverse events on HPA axis functioning, and therefore mental health conditions related to stress. Most studies of ACEs have focused on higher-income, well-educated populations, yet toxic stress tends to be embedded in social disadvantage and intergenerational adversity is often comorbid with other forms of maltreatment (7). Future research should center on identifying potential moderators and mediators between ACEs and perceived stress and anxiety in order to create targeted interventions that support mental health among women who have experienced ACEs and reside in LMICs. For instance, social support, emotion regulation skills, and positive self-perceptions are powerful protective factors that buffer women from the harmful effects of ACEs. Interventions targeting girls within community or school setting that harness these protective factors or prevent the consequences of ACEs have the potential to lessen HPA axis hyperactivity, prevent the intergenerational transmission of adversity, and improve mental health outcomes in this population.

Abbreviations

ACEs: Adverse childhood experiences; HPA axis: Hypothalamic pituitary adrenal axis; LMIC: Low- and middle-income countries; PSS: Perceived stress scale; GAD-7: Generalized anxiety disorder scale; SES: Socioeconomic status; SD: Standard deviation

Declarations

Patient and Public Involvement

Patient collaborators were not directly involved in the design, recruitment, or dissemination of this study. However, women in the recruitment populations have expressed a high degree of interest in the issue of maternal mental health.

Ethics Approval and Consent to Participate

The study was approved by institutional review boards at the Human Development Research Foundation, Duke University, and the University of North Carolina at Chapel Hill.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used in the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Role of Funding Source

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Author Contributions

NI, JM, AF, ES conceptualized the analysis. NI and VB analyzed the data and JAG, AF, JM further contributed to the data interpretation. NI drafted manuscript and all authors contributed substantively to revisions and further edits. JM, AH, VB, SS designed the larger study. All authors approved the final version to be submitted for publication, and NI was responsible for final submission.

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Tables

Table 1. ACE International Domain and Question Definitions	
Description	Question
Neglect	
Emotional Neglect	Caregiver did not understand your problems/worries; did not know what you were doing with your free time
Physical Neglect	Caregiver did not give you enough food or sending you to school even it could easily been done; too drunk/intoxicated by drugs to take care of you
Family Psychological Distress	
Alcohol and/or drug abuser in household	Lived with a household member who was a problem drinker, alcoholic, or misused street/prescription drugs
Incarcerated household member	Lived with a household member who ever sent to jail or prison
Someone chronically depressed, mentally ill, institutionalized, or suicidal	Lived with a household member who was depressed, mentally ill, or suicidal
One or no parents, parental separation or divorce	Parents ever separated/divorced, or father/mother/guardian died
Home Violence	
Physical Abuse	You being spanked/ slapped/kicked/ punched/beaten up; or being hit/cut with an object by parents/guardian
Emotional Abuse	You were yelled at/screamed at/sworn at/insulted or humiliated, or were threatened/abandoned, thrown out by parents/guardian
Household member treated violently	Saw or heard a parent/household member being yelled at/screamed at/sworn at/ insulted or humiliated; being slapped/kicked/punched/beaten up; or being hit/cut with an object
Community Violence	
Bullying	Being bullied
Community Violence	See or hear someone being beaten up, stabbed, shot, or being threatened with a knife or gun in real life
Collective Violence	Forced to go and live in other place; experienced disruption of home due to these

Table 2. Demographic Features of Mothers in the Bachpan Cohort Study		
	ACEs and PSS, N = 889	
Descriptor	N/Mean	%/SD
Baseline (3rd Trimester of Pregnancy) Characteristics		
Age	26.7	4.4
Education > 5th grade	590	66.4%
Living with Someone with Mental Health Issue in the Natal Home	96	10.80%
Living Children		
First pregnancy	258	29.0%
1-3 Children	556	62.5%
4+ Children	75	8.4%
Number of Rooms	4.2	1.9
People Per Room	2.4	1.7
Socioeconomic Status Quintiles	2	0.05
Nuclear Family	113	12.7%
Baseline PHQ-9 Total	8.4	6.7
Outcome Variables from 36-month Postnatal Interview		
Total Perceived Stress Score (PSS)	12	8.8
Total Generalized Anxiety Disorder Score (GAD) (N=623)	N/A	N/A
Qualified for GAD-7 Clinically Significant Cutoff (>10) (N=623)	N/A	N/A
*Standard deviation is abbreviated as SD		

Table 3. Maternal ACE Characteristics in Full Sample		
	Sample, N = 889	
Description	N/Mean	%/SD
Neglect		
1. Emotional Neglect	134	15.1%
2. Physical Neglect	49	5.5%
Family Psychological Distress		
3. Household alcohol and/or drug use	24	2.7%
4. Incarcerated household member	16	1.8%
5. Depressed, mentally ill, institutionalized, or suicidal household member	21	2.4%
6. One or no parents, parental separation, or divorce	97	10.9%
Home Violence		
7. Physical Abuse	209	23.5%
8. Emotional Abuse	294	33.1%
9. Household member treated violently	130	14.6%
Community Violence		
10. Bullying	12	1.4%
11. Community Violence	60	6.8%
12. Collective Violence	4	0.5%
Domains		
Neglect	173	19.9%
Family Psychological Distress	143	15.8%
Home Violence	349	38.3%
Community Violence	64	6.6%
Number of ACEs		
0 ACEs	369	41.5%
1 ACE	239	26.8%
2 ACEs	139	15.6%
3 ACEs	82	9.2%
4+ ACEs	61	6.8%
Any ACE Exposure	520	58.5%

Total Number of ACEs	1.2	1.4
*Standard deviation is abbreviated as SD		

Table 4. Maternal ACEs and Perceived Stress and Anxiety at 36 Months Postpartum										
		Panel 1			Panel 2			Panel 3		
		Stress (PSS), N = 889			Anxiety (GAD-7), N = 623			GAD Dichotomized at Cutoff of 10, N = 623		
Model	Predictor	B	95% CI		B	95% CI		PR	95% CI	
1	ACE Total	1.0	0.7	1.3	0.4	0.04	0.8	1.0	0.8	1.1
2	Any ACE	2.4	1.0	3.8	1.1	0.1	2.0	1.1	0.7	1.6
3	0 ACEs	Ref			Ref			Ref		
	1 ACE	2.1	0.3	4.0	0.9	-0.3	2.2	1.2	0.7	2.0
	2 ACEs	1.2	-0.6	3.0	0.9	-0.3	2.2	1.2	0.7	2.1
	3 ACEs	3.1	0.9	5.3	1.7	0.2	3.2	1.2	0.7	2.0
	4+ ACEs	5.5	3.7	7.3	1.2	-0.7	3.2	0.4	0.1	1.5
4	Neglect	1.0	-0.5	2.6	-0.8	-2.3	0.8	0.2	0.05	0.8
5	Family Psychological Distress	3.0	1.3	4.7	1.6	0.3	2.9	1.6	1.0	2.3
6	Home Violence	1.6	0.6	2.7	0.7	-0.2	1.5	1.0	0.7	1.4
7	Community Violence	3.0	1.1	4.9	1.6	-0.6	3.8	0.9	0.4	1.8
<i>Note.</i> Models take into account clustering at the village cluster level using cluster robust standard errors, and models are adjusted for mother age at baseline, education level, natal family history of mental health, baseline depression and treatment status, and assessor.										
Abbreviations: PSS, Perceived Stress Scale; GAD-7, Generalized Anxiety Disorder-7; B, Estimate; PR, Prevalence Ratio; CI, Confidence Interval; ACE, Adverse Childhood Experiences										

Table 5. Maternal ACEs and Cortisol at 36 Months Postpartum, N = 90				
		Hair Cortisol		
Model		B	95% CI	
1	ACE Total	1.8	0.6	3
2	Any ACE	4.9	-0.1	9.9
3	0 ACEs	Ref		
	1 ACE	0.4	-4.8	5.6
	2 ACEs	7.1	1.4	12.9
	3 ACEs	3.8	-4.6	12.3
	4+ ACEs	7.7	-0.07	15.6
4	Neglect	2.4	-2.9	7.7
5	Family Psychological Distress	0.2	-6.2	6.6
6	Home Violence	6.7	2.7	10.8
7	Community Violence	7.5	1.4	13.6
<p><i>Note.</i> Models take into account clustering at the village cluster level using cluster robust standard errors, and models are adjusted for mother age at baseline, education level, natal family history of mental health, baseline depression and treatment status, and assessor.</p> <p>Abbreviations: B, Estimate; CI, Confidence Interval; ACE, Adverse Childhood Experiences</p>				

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [ACEsPerceivedStressAnxietyCortisolTables.docx](#)