Are Adverse Childhood Experiences Associated with Depression in Early Adolescence? An Ecological Analysis Approach Using GEAS Baseline Data 2018 in Indonesia

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ABSTRACT

BACKGROUND: Child and adolescent violence and harassment have frequently happened in Indonesia in the past 5 years. Adverse childhood experiences (ACEs) at an early age involve traumatic events, which can cause long-term negative effects on mental health and well-being.

AIM: This cross-sectional study aimed to examine the correlation between ACEs and depressive symptoms among early adolescents in Indonesia.

METHODS: Using Indonesia’s Global Early Adolescent Study (GEAS), data analysis included 4684 early adolescents with 2207 boys and 2477 girls from three sites: Semarang, Lampung, and Bali. Depressive symptoms were collected using self-reported questionnaires. Simple and multiple logistic regressions were used to examine how ACEs, individual, family, and peer-level predictors predict depressive symptoms with odds ratio (OR) and 95% confidence interval (CI).

RESULTS: Nearly 80% of adolescents have experienced at least one ACE; the prevalence of experiencing depressive symptoms in boys and girls was closely similar. Adolescents with ACEs were two times more likely to have depressive symptoms (OR: 2.01, 95% CI: 1.70–2.38) compared to those without any ACE. Among the family-level predictors, only wealth was significantly associated with depressive symptoms. All variables in peer-level predictors including communication with peers, peer perception of having sex, and dating through unadjusted until adjusted models significantly predict depressive symptoms, (OR: 1.39, 95% CI: 1.20–1.61), (OR: 1.82, 95% CI: 1.14–2.91), and (OR: 1.18, 95% CI: 1.02–1.36), respectively. After adjusting with individual, family, and peer-level, only sex, wealth, and peer-level variables were associated with depressive symptoms.

CONCLUSION: ACEs strongly predict depression when the analysis was adjusted for social-ecological predictors. Recognition of the significant roles of family and peer-level predictors is important to improve adolescent health and well-being.

Introduction

Child and adolescent violence and harassment frequently happen in Indonesia. Recently, studies and documentaries of child violence reveal many challenging teenage issues including bullying, sexual abuse, sexual harassment, quarreling, suicide, and homicide [1]. The Ministry of Women’s Empowerment and Child Protection data indicated that 47.7% of boys and 18% of girls aged 13–17 years old experienced at least one physical or psychological abuse in 2013 [2]. Research showed that adolescents who experience more than one maltreatment during childhood have an increased risk of poor mental health [3]. It occurs because adolescence is a critical period of rapid growth and development in physical, emotional, sexual, and cognitive aspects [4], [5].

Maltreatment and living in an abusive environment that is harmful to a child’s and adolescent’s development are referred to as adverse childhood experiences (ACEs). ACEs have been explained as potentially traumatic events that last for an extended period and negatively impact health and well-being [6]. ACEs that occur in childhood involve the development of toxic stress resulting in prolonged or excessive activation of the stress response system. Continuous chronic stress can damage the body and brain, especially for children [7], and excessive stress can interfere with the development of brain architecture and increase levels of stress hormones [8], both of which will cause problems that can last into adulthood [9].

Adolescents who experience ACEs before 18 years of age will face long-term effects on their mental health and well-being such as depression [10].
Short- and long-term effects caused by ACEs include developmental delays in the adolescent health both physically and mentally and reinforce why ACEs are now more recognized as a decisive risk factor for adolescent health and well-being [6], [11]. ACEs also predict many poor health outcomes in adult life, including mental disorders, suicidal thoughts, eating disorders, behavior disorders, drug abuse, alcoholism, and poor social development [12], [13]. These will decrease a person's quality of life, which is associated with mental and physical health conditions [14]. In addition, children and adolescents exposed to ACEs have been shown to have an increased risk of depression [15], [16].

Depression is a common mental disorder worldwide in most age groups [17]. Depression is a serious mood disorder that can affect a child's and adolescent's development, including physical, emotional, and social [18]. Depression is characterized by depressed moods most of the day, loss of interest or pleasure, weight loss, insomnia or hypersomnia, fatigue or loss of energy, feelings of guilt or low self-worth, poor concentration, and recurrent thoughts of death [19]. Globally, 4.4% of the population suffer from depression, and cases are still increasing, especially in low-to-middle income countries (LMIC) [17]. Particularly in adolescents, the prevalence is estimated to be between 4 and 5% [20]. In Indonesia, depression cases are about 6.1% in people age >15 years old [21]. Meanwhile, based on the data from the Indonesian Family Life Survey (IFLS) 5 in 2015, the depressive symptoms among adolescents were about 29.2% [22]. Depression is a rare issue in childhood but commonly occurs in adolescence [23]. Depression will severely impact adolescent life in many aspects, such as school, behavior and social disorders, drug abuse, bad reproductive and sexual health, and even suicidal thoughts [24].

Understanding adolescents’ mental health focuses on individual factors and considers environmental factors. Ecological approaches shift the focus from the individual to the environment. The ecological model helps to explain how depressive symptoms are influenced by the microsystem, mesosystem, and macrosystem. Each level of the individual, family, and peer interactions contributes to each other [25], [26]. The ecological framework supports the view that the causes of mental health disorders, including depression in adolescents, are from the individual and environmental factors involved in adolescent life and development, such as family, school, peers, and community [27]. Peers play an important role in adolescent life, and the closest environment next to family is the peer group since adolescents spend most of their time within a peer group [28]. An ecological approach is widely used to understand adolescent mental health comprehensively.

To date, research concerning ACEs and depression varies worldwide but remains scarce in LMICs, whereas various studies showed that ACEs are more frequently happening there than in high-income countries [29]. Abusive childhood experiences powerfully predispose adolescents to poor mental health [30]. Studies that involve early adolescents as respondents showed that the more they have had ACEs, the more depressive symptoms emerge even after a long period [31]. A significant correlation was found between ACEs and adolescents’ poor mental health, particularly depression. To the best of our knowledge, many studies have focused only on a single factor rather than multiple factors that contribute to child and adolescent depression. In addition, studies about early adolescent depression in Indonesia are still limited, particularly research examining mental health issues through the ecological approach. Related research showed during adolescence, relationships with parents and friends are very supportive for their development in the future [32]. Besides family, peers play an important role in adolescents’ lives, as vital sources of support for their mental health [33].

This study investigated the association between ACEs and self-reported depressive symptoms among early adolescents in Indonesia adjusted by other socioecological factors (individual, family, and peers). There were several protective factors identified, including individual, family, and peer levels in this research, that could mitigate early adolescent depression.

**Methods**

**Research design**

This cross-sectional study used the baseline survey of Global Early Adolescent (GEAS) in Indonesia. GEAS-Indonesia was a school-based survey focusing on early adolescents aged 10−14 years, conducted by John Hopkins University (JHU) and a World Health Organization (WHO) partnership with Rutgers and the Center for Reproductive Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada. Using a smartphone-based questionnaire, it measured three cross-cultural components: A 10-module health instrument, a vignettes-based questionnaire, it measured three cross-cultural components: A 10-module health instrument, a vignettes-based measure of gender equality, and assessment of gender norms [34].

**Population and sampling**

GEAS-Indonesia was conducted in three sites: Semarang (Central Java Province), Denpasar (Bali Province) and Bandar Lampung (Lampung Province). The total sample method resulted in 4684 early adolescents aged 10−14 years from the seventh grade of junior high school at eighteen selected schools.
It consisted of 2207 boys and 2477 girls. Based on data quality, some participants were excluded from the multivariable analysis based on survey questions to which they provided no meaningful response (i.e., “Don’t know” or “Refuse” answers). Table 1 shows the exact numbers of respondents used for the multivariable analysis. Most respondents have experienced ACEs, with at least one in the past year (78.2%), and 2421 adolescents (51.7%) strongly indicate depressive symptoms. Most respondents are girls (52.9%), age 12 (72.1%), and from rich families (22.8%).

Covariates were divided into three categories. At the individual level, variables included sex, categorized into boy and girl, age, and freedom of voice were collected through multiple questions about adolescents’ perceived courage to express their opinions. The score for each question was then summarized and categorized into below median for low voice and above the median for higher voice. The same approach was applied for freedom of movement and freedom of decision-making. Access to social media is adolescent time spent in social media at least 2 h a day.

The family level variable is the wealth index measured through a series of questions about household ownership of selected assets, such as television and bicycles, materials of house construction, and types of access to water and sanitation. The responses were then constructed into a composite measure of household cumulative living standards using factor scores generated through principal component analysis. The score was standardized using normal distribution and broke into five percentiles as lowest (very poor), second (poor), middle, fourth (rich), and highest (very rich). Family structure was categorized as a complete set of parents, single parent, and other. Parent-child closeness is adolescents’ perception of closeness with their parents. Parent-child communication was collected through questions about: (1) The things that worry them, (2) changes with their body, and (3) problems with their boyfriend or girlfriend (only applies if they have one). Parent-child awareness represents the child perceiving whether the parent(s) know(s) their school, friends, and where they go. Covariates at the peer level are communication with peers indicating whether adolescents communicate at least one topic of sexual reproductive health, perception of having sex, and dating.

### Variables

Depressive symptoms were measured using a series of self-reported questions. Adolescents were asked whether they were: (1) Worried for no reason, (2) not feeling happy and cannot sleep in the night, (3) feeling sad, and (4) not feeling happy and trying to do self-harm. For each question, they responded with five subscales. The summed score was coded into two categories above and below the mean score. The above mean category indicated a strong indication of depressive symptoms. The independent variable is ACEs which was examined using 13 questions about stressful or traumatic experiences, including violence, neglect, family dysfunction, domestic violence, and family drug abuse. Adolescents were asked to provide their responses in three subscales (often, sometimes, and never) for each question. Often and sometimes, responses were coded as ever experience ACEs. A respondent with experience of at least one ACEs was coded as “Yes” and code “No” was for those who never experienced any ACEs.

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### Statistical analysis

Descriptive analysis was used to present the distribution and prevalence of each predictor as total and cross-tabulation with the dependent variable. Inferential analysis using simple and multiple logistic regression tests examined how different levels of predictors predict and influence the association between ACEs and depressive symptoms. The exclusion criteria removed
“don’t know” and “refuse to answer” responses as well as any missing data in selected variables of this study from the analysis. All tests used a 95% confidence interval (CI) level and the association magnitude was presented in odds ratio (OR). Data were analyzed using STATA software version 15.

Results

The pattern of depression according to predictors at individual, family, and peer-level

Most adolescents reported experiencing at least one ACEs in their lifetime. Higher depression symptoms were more likely to come from those who had ACEs (82.7% vs. 73.3%). Nearly equal number of boys and girls showed depressive symptoms. Social media was an essential part of teenagers’ daily lives, with 90.9% spending at least 2 h/day to access social media. Most adolescents lived in a family with low-middle economic background and both parents (59.6% and 87%, respectively). Perceptions of parent-child closeness, communication, and monitoring were lower among those who reported higher depressive symptoms than those who never had that experience. Relationships with peers are significant factors for adolescents, but only 29.1% of adolescents communicate with their peers about sexual reproductive health. Most adolescents reported having peers who perceive having sex and dating were not essential. However, higher depressive symptoms were more likely to come from adolescents who discussed sexual reproductive health with peers and had peers who perceived having sex and dating as important.

Association between ACEs and depressive symptoms

Table 2 shows the correlation between depression and selected predictors. ACEs were a strong predictor of depressive symptoms among early adolescents. Those who had at least one ACEs in their lifetime were 1.74 times more likely to report depressive symptoms. The magnitude of ACEs correlation increased after adjusting other predictors at the individual, family, and peer level. The unadjusted analysis also signals the significant correlation of several indicators, such as wealth, parent-child closeness, sexual reproductive health communication with peers, and peers’ perception that having sex and dating which are important factors in reporting depressive symptoms. Adolescents from poor and very low-income families (40% lowest quintile of wealth) are more likely to report depressive symptoms than the higher economic status. The role of age, freedom of voice and decision-making, access to social media, family structure, and parent-child communication and monitoring were not significant in predicting depression even after adjustment analysis.

The first adjusted model illustrates how predictors at the individual level correlate with depressive symptoms. The influence of ACEs and type of sex could significantly predict depressive symptoms, while the other individual-level predictors were not significant predictors. After adjustment, the probability of reporting depressive symptoms was 2 times higher among adolescents who had ACEs experience. Boys were more likely to have depressive symptoms than girls (OR: 1.26, 95% CI: 1.11–1.44).

The analysis found an inconsistent correlation between parent-child closeness and depressive symptoms before and after being adjusted with other variables at the family level. In contrast, the role of wealth, family structure, parent-child communication, and parent awareness is similar across the analysis. After being adjusted with all levels in the final model, family structure, parent-child communication, and parent awareness still consistently do not significantly predict depressive symptoms; however, a significant correlation of wealth and depressive symptoms remains. Living in very poor conditions has the highest OR for depressive symptoms (OR: 1.32, 95% CI: 1.07–1.63). Among predictors in the peer level, communication with peers, peers’ perception of having sex and dating could significantly predict depressive symptoms. Results showed consistent OR values whether unadjusted or adjusted with all variables in the final model (OR: 1.39, 95% CI: 1.20–1.61), (OR: 1.82, 95% CI: 1.14, 2.91), and (OR: 1.18, 95% CI: 1.02–1.36), respectively.

Discussion

Most findings in this study align with the present research that consistently showed the experience of stressful life events is significantly associated with an increase in depression [12], [35]. The distinctive contribution of this analysis is that it elaborates the effect of ACEs on depressive symptoms in a nationally representative sample of 10–14 years old early adolescents.

First, we found that nearly 80% of adolescents have experienced at least one ACEs; this number is higher than the ACEs survey in adolescents previously done in Indonesia [2]. In this study, boys and girls tend to have the same prevalence of depressive symptoms, which is different from existing research. One study in India found that boys are more vulnerable to experiencing ACEs than girls, both physically and psychologically [36]. Boys tend to experience more physical violence, but on the other hand, girls face more psychological violence [13]. Another study found boys frequently
Table 2: Unadjusted and adjusted analysis of the predictor’s influence on early adolescent adverse childhood experiences on depressive symptoms

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Unadjusted OR (CI)</th>
<th>Adjusted OR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual level</td>
<td>Family level</td>
</tr>
<tr>
<td>ACEs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.74 [1.52, 2.01]***</td>
<td>2.19 [1.87, 2.58]***</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boy</td>
<td>1.35 [1.20, 1.51]***</td>
<td>1.32 [1.16, 1.50]***</td>
</tr>
<tr>
<td>Girl</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Age</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1.83 [0.16, 20.5]</td>
<td>2.11 [0.19, 23.7]</td>
</tr>
<tr>
<td>12</td>
<td>2.08 [0.19, 23.0]</td>
<td>2.26 [0.20, 25.0]</td>
</tr>
<tr>
<td>13</td>
<td>2.36 [0.21, 26.1]</td>
<td>2.53 [0.23, 28.2]</td>
</tr>
<tr>
<td>14</td>
<td>3.43 [0.30, 39.6]</td>
<td>3.12 [0.27, 36.3]</td>
</tr>
<tr>
<td>Freedom of voice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above median</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Below median</td>
<td>1.05 [0.93, 1.18]</td>
<td>1.02 [0.99, 1.17]</td>
</tr>
<tr>
<td>Freedom of decision making</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Above mean</td>
<td>0.98 [0.87, 1.10]</td>
<td>1.01 [0.88, 1.15]</td>
</tr>
<tr>
<td>Below mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to social media</td>
<td>No</td>
<td>0.99 [0.79, 1.25]</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wealth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very poor</td>
<td>1.29 [1.07, 1.56]**</td>
<td>1.28 [1.06, 1.55]**</td>
</tr>
<tr>
<td>Poor</td>
<td>1.29 [1.06, 1.56]**</td>
<td>1.27 [1.05, 1.56]**</td>
</tr>
<tr>
<td>Middle</td>
<td>1.11 [0.92, 1.33]</td>
<td>1.10 [0.92, 1.33]</td>
</tr>
<tr>
<td>Rich</td>
<td>1.09 [0.90, 1.31]</td>
<td>1.08 [0.90, 1.31]</td>
</tr>
<tr>
<td>Family structure</td>
<td></td>
<td></td>
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<tr>
<td>Both parents</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mom/dad only</td>
<td>1.11 [0.89, 1.38]</td>
<td>1.08 [0.87, 1.35]</td>
</tr>
<tr>
<td>Grandparent/other</td>
<td>1.16 [0.90, 1.50]</td>
<td>0.75 [0.48, 1.19]</td>
</tr>
<tr>
<td>Parent-child closeness</td>
<td>No</td>
<td>1.18 [1.04, 1.34]**</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Parent-child communication</td>
<td>No</td>
<td>1.07 [0.95, 1.21]</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Parent awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.10 [0.98, 1.24]</td>
<td>1.06 [0.94, 1.20]</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Communication with peer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.55 [1.37, 1.76]**</td>
<td>1.44 [1.26, 1.64]**</td>
</tr>
<tr>
<td>Peer perception of having sex</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>2.40 [1.57, 3.65]**</td>
<td>1.87 [1.22, 2.87]**</td>
</tr>
<tr>
<td>Peer perception on dating</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.38 [1.21, 1.57]**</td>
<td>1.23 [1.06, 1.41]**</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.022</td>
<td>0.004</td>
</tr>
<tr>
<td>AIC</td>
<td>5658.2</td>
<td>6233.0</td>
</tr>
<tr>
<td>df m</td>
<td>4158</td>
<td>4502</td>
</tr>
</tbody>
</table>

Exponentiated coefficients; 95% confidence intervals [CI] in brackets; Likelihood Ratio (LR) from Akaike; df_m=Degree of freedom of the model, Data source: Indonesia GEAS; *p < 0.05, **p < 0.01, ***p < 0.001.

This study explains how the early adolescents who experienced ACEs had 2 times higher odds of having depressive symptoms. Repeated traumatic events in childhood will become toxic stress and thus can interfere with early adolescent growth and development. High levels of stress can disturb brain development and toxic stress will cause trauma to the child. Those very early imprints are challenging development and toxic stress will cause trauma to development. High levels of stress can disturb brain development and toxic stress will cause trauma to the child. Those very early imprints are challenging development and toxic stress will cause trauma to development. High levels of stress can disturb brain development and toxic stress will cause trauma to development. High levels of stress can disturb brain development and toxic stress will cause trauma to development.

Only poverty was consistently and significantly associated with depressive symptoms at the family level. Poverty is a strong risk factor that makes adolescent depression worsen [41]. The poor economic conditions can make that adolescents show more depressive symptoms, so a hard economic situation is related to the higher chance of adolescents experiencing ACEs. Children living in poverty tend to get inappropriate treatment, violence, and even experience periods of hunger and starvation. Moreover, poverty is mainly linked with difficulties experienced in childhood; therefore, poverty itself can be confirmed as one of the ACEs because of its persistent and vast effect on development and health outcomes [42].

All of the predictors on the peer level are significantly related to depressive symptoms. These findings highlighted that the peer level could significantly affect the early adolescent depressive symptoms beneficially. It clearly explained that peers represent an
essential part of adolescent life since most adolescent’s time is spent with their peers, especially with the opposite sex [43]. In contrast, findings from another study showed the opposite effect, where adolescents who made communication with their peers about reproductive health have a higher probability of showing depressive symptoms. It might happen because the peer group in which an adolescent communicates may lack proper knowledge about reproductive health. Therefore, the misinformed adolescent experiences unnecessary worry about the unknown. It confirms how crucial it is to prepare a peer to peer communication approach about reproductive health as early as possible based on accurate information. Adolescents can have a significant influence and are more comfortable learning from their peer group. Moreover, the reproductive health material should include positive mental health promotions for well-being and encouragement of positive relationships [44].

Although ACEs have a strong influence on the occurrence of depressive symptoms; however, they are related to each other. This interaction can be observed from differences in OR of ACEs before and after adjusted by the individual, family, and peer-level factors. Initially, ACEs were correlated to depressive symptoms; they are a strong predictor of depressive symptoms. There was no significant change in direction through adjustment in the individual level up to the final model, but the OR increased. This finding shows that the role in each level toward depressive symptoms is complex and intense. The social-ecological model can explain that depressive symptoms are significantly influenced by the microsystem, mesosystem, and macrosystem. Research has shown that each level, whether in individual, family, or peer interactions, contributes to each other in complex interactions [45], [46].

**Strength and Limitations of the Study**

This study is a pioneer study that discusses depressive symptoms in early adolescence in Indonesia with a large number of respondents. However, the cross-sectional design of this analysis cannot demonstrate any cause-effect correlation. Second, recall data can be biased because adolescents tend to misrepresent memories of past events. Third, identification of the depressive symptoms was not based on clinical review measurements and has not been clinically validated.

**Conclusions**

ACEs strongly predict depression and adjusted with social-ecological predictors increasing the odds of depressive symptoms. Significant roles of family and peer-level predictor inform mental health practitioners that addressing these variables are essential to improve adolescent health and well-being. These studies can help guide prevention and intervention programs to promote adolescent resilience through family and peer support.

**Acknowledgments**

We want to thank all the women and men who participated in the GEAS-Indonesia survey, as well as the funder that supported the entire study.

**Ethical Approval and Consent to Participate**

The GEAS-Indonesia study was approved by the Institutional Review Board at Bloomberg School of Public Health, Johns Hopkins University, Maryland-United State of America and Faculty of Medicine, Public Health and Nursing of Universitas Gadjah Mada, Daerah Istimewa Yogyakarta-Indonesia.

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PMid:27884508

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PMid:24826831


PMid:22305766


PMid:29529418


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