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ORIGINAL ARTICLE

Suicide risk in adolescents with fetal alcohol spectrum disorders

Mary J. O'Connor[1] | **Larissa C. Portnoff**[2] | **Michael Lebsack-Coleman**[3] | **Katrina M. Dipple**[4]

[1]Department of Psychiatry and Biobehavioral Sciences, Semel Institute for Neuroscience and Human Behavior, University of California at Los Angeles, Los Angeles, California

[2]Department of Psychology, Teachers College, Columbia University, New York City, New York

[3]Department of Applied Social Psychology, Claremont Graduate University, Claremont, California

[4]Department of Genetics, University of Washington, Seattle Children's Hospital, Seattle, Washington

Correspondence
Mary J. O'Connor, Semel Institute for Neuroscience and Human Behavior, University of California at Los Angeles, 47-249A, Box 951759, Los Angeles, CA 90024.
Email: moconnor@mednet.ucla.edu

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Background: The teratogenic effects of prenatal alcohol exposure (PAE) have been extensively documented over the course of 45 years of research and psychiatric problems are pervasive in this population. In adults with PAE, suicidal risk is high but less is known about the suicidal risk in adolescents with fetal alcohol spectrum disorders (FASD). This study describes the prevalence of suicidal ideation and serious suicide attempts in a sample of 54 adolescents between the ages of 13 and 18 years with FASD.

Methods: Adolescents were diagnosed with FASD using the *Updated Clinical Guidelines for Diagnosing Fetal Alcohol Spectrum Disorders. The Children's Interview for Psychiatric Syndromes* was used to identify those adolescents who experienced suicidal ideation and/or who had made a serious suicide attempt in the last 12 months.

Results: The prevalence of suicidal behaviors in this sample was high with 35.2% of teens reporting incidences of suicidal ideation and 13.0% reporting at least one serious suicide attempt in the past year. This finding is in contrast to the 17.2% and 2.4% for ideation and serious attempts, respectively, reported in the general U.S. adolescent population. Alarmingly, 29.2% of males with FASD reported a serious suicide attempt which was 19½ times higher than national norms for males. No females reported attempts. Number of home placements and the presence of a depressive disorder contributed to study outcomes.

Conclusions: Findings demonstrate the significant risk for suicidality in this population, particularly adolescent males, and the need to assess and treat this life threatening behavior.

KEYWORDS

FASD, fetal alcohol Spectrum disorders, PAE, prenatal alcohol exposure, suicide risk

1 | INTRODUCTION

Suicide is a leading cause of death in youth ages 13–18 years in the United States (Anderson & Smith, 2003). According to the Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Surveillance Survey (YRBSS), 17.2% of teens nationwide had considered attempting suicide, 7.4% of youth had attempted suicide, and 2.4% required medical attention following their attempts during the 12 months before the survey (Kann et al., 2018). Demographic considerations include higher suicidal ideation and increased number of serious suicide attempts among females.

Since the identification of fetal alcohol syndrome (FAS) over 45 years ago, mounting evidence about the impact of maternal alcohol consumption during pregnancy has prompted increased attention to the link between prenatal alcohol exposure (PAE) and a continuum of developmental disabilities known as fetal alcohol spectrum disorders (FASD). The entire continuum of effects is conservatively estimated to represent up to 5% of youth in the United States (May et al., 2018). Cross-sectional and longitudinal studies suggest that individuals with FASD are at a greatly increased risk for adverse long-term outcomes, including psychiatric problems (O'Connor, 2014). For example, a seminal study on the developmental outcomes of adolescents and adults with PAE, found that 94% had mental health problems (Streissguth, Barr, Kogan, & Bookstein, 1996). Alarmingly, the psychiatric problems of this population are underscored by the degree of suicidal risk with which they present in adulthood with 43% reporting suicidal ideation and 23% reporting a history of suicide attempts (Streissguth et al., 1996). Moreover, although previous investigation estimated that the vast majority of individuals with FASD have IQs of 70 or above and are of comparatively greater risk for maladaptive outcomes than more severely affected individuals with intellectual disabilities, nothing has been reported on the risk for suicidal ideation or behavior in these higher functioning adolescents with FASD (Streissguth et al., 1996).

In the current study, we examined the prevalence of suicidal ideations and serious suicide attempts in higher functioning adolescents with FASD and compared these rates to those from a recent large national survey on high risk behaviors in adolescence (YRBSS, Kann et al., 2018). Adolescent characteristics were examined including adolescent sex, age, race/ethnicity, number of home placements, IQ, and FASD subclassification, as well as caregiver marital status and years of education (a proxy for socioeconomic status). Also of interest was the contribution of a diagnosis of a depressive disorder in this sample. Adolescents were part of a larger intervention study designed to reduce the negative behavioral consequences associated with FASD.

2 | METHODS

2.1 | Institutional review board and informed consent

The University of California at Los Angeles (UCLA) Institutional Review Board (IRB) approved all procedures according to the US Federal Policy for the Protection of Human Subjects. A certificate of confidentiality was obtained from the National Institute of Alcohol Abuse and Alcoholism (NIAAA). Parents and adolescents gave their informed consent prior to study inclusion. Research staff was trained in suicide risk assessment and emergency procedures to insure participant safety in the event a participant was deemed at imminent risk of suicide. All participants were informed of the necessary safeguards in place if they were determined to be in imminent danger of self-harm.

2.2 | Recruitment and eligibility criteria

Recruitment methods consisted of community-posted flyers, contact with local health care providers, YMCAs, school administrators, community mental health centers, and parent groups. In order to meet eligibility criteria, participants had to: (a) be between 13 and 18 years of age; (b) have a composite IQ of ≥70; (c) be English speaking; (d) be living with at least one custodial parent or guardian for 6 months or more; and (e) have a history of PAE. Adolescents were not enrolled if they had a past diagnosis of intellectual disability, psychotic disorder, or pervasive developmental disorder.

2.3 | Participants

Recruitment efforts yielded a total of 83 participants who agreed to be screened for eligibility. Following screening, 54 adolescents between the ages of 13 and 18 years met eligibility requirements. Failure to meet these requirements was due to: (a) no reliable documentation of PAE ($n = 6$); (b) a previous diagnosis of intellectual disability ($n = 1$) or pervasive developmental disorder ($n = 1$); (c) did not meet age requirements ($n = 7$); or (d) failure to keep appointment ($n = 14$). Fifty-six percent of participants were females and 44% were males, averaging 15.69 ($SD = 1.74$) years of age (Table 1). Approximately 56% of the sample identified themselves as White, non-Hispanic, 7.4% as Black/African American, 33.3% as Hispanic, and 3.7% as Native American or Asian. The participants' average IQ was 91.11 ($SD = 12.99$). Approximately 80% of sample caregivers were married or living with a partner. In all, 70% of adolescents were adopted, 24% were in foster or family guardian care, and 6% were living with their biological mother.

2.4 | Procedures

Testing was completed at the UCLA. The study geneticist, who was blinded regarding the adolescents' prenatal alcohol history and neurobehavioral performance, administered the physical examination after reaching reliability with the senior study clinician ($k = 100\%$) who had extensive

TABLE 1 Descriptive statistics

Variable	Total sample ($n = 54$)
Sex (%)	
Males	44.4
Females	55.6
Age in years (M, *SD*)	15.69 (1.74)
Race/ethnicity (%)	
White, non-Hispanic	55.6
Black/African American	07.4
Hispanic	33.3
Asian/native American	03.7
Composite IQ (M, *SD*)[a]	91.11 (12.99)
Primary caregiver marital status (%)	
Married/living with partner	79.5
Single/never married/divorced	20.5
Primary caregiver years education (M, *SD*)	16.37 (3.36)
Number of placements (M, *SD*)	2.62 (1.61)
FASD subclassification	
FAS	17.0
pFAS	68.0
ARND	15.0

[a] Kaufman brief intelligence test—second edition composite.

experience in the use of the diagnostic system. Following the physical, adolescents completed a neurocognitive test battery and questionnaires concerning other behavioral characteristics. Neurocognitive and behavioral testing was completed by a postdoctoral fellow trained to reliability in clinical assessment.

2.5 | FASD diagnosis

Every adolescent was assessed for the presence of the diagnostic features of FASD using the modified Institute of Medicine (IOM) criteria according to the updated guidelines proposed in *Clinical Guidelines for Diagnosing Fetal Alcohol Spectrum Disorders* (Hoyme et al. (2016)). This system examines the expression of four key diagnostic features of FAS: (a) growth retardation; (b) the FAS facial phenotype, including short palpebral fissures, flat philtrum, and flat upper vermillion border; (c) neurodevelopmental dysfunction; and (d) gestational alcohol exposure. Growth retardation was defined as height and/or weight at or below the 10th percentile on national growth charts at any point in time from birth. With regard to facial features, two of the three seminal facial features of FAS were required to be present. The philtrum and upper lip were scored by comparison with a racially normed lip/philtrum guide with scores of 4 or 5 meeting criteria consistent with PAE. Palpebral fissure length was scored using the Canadian palpebral fissure guidelines (Clarren, Chudley, Wong, Friesen, & Brant, 2010). Neurodevelopmental dysfunction was defined less conservatively than the criterion proposed by Hoyme et al. (2016) and was considered significant if the participant demonstrated functioning more than 1 standard deviation below or above the mean depending on whether or not a lower or higher score indicated higher levels of deficit functioning. Measures used to define these functions included those assessing neurocognitive as well as socioemotional development. Given the relatively higher IQs of our subjects (IQs of >70), we determined that it was unlikely that 1½ standard deviations from the mean, as proposed by Hoyme et al. (2016), would adequately capture subtler deficits that might characterize this group of individuals. Moreover, these criteria are in accordance with the report by Doyle and Mattson (2015) suggesting that for most standardized neurocognitive measures, 1 standard deviation from the mean typically indicates problems in behavior or neurocognitive development. To qualify as having neurodevelopmental dysfunction in the present study, participants had to meet criterion on three or more standardized measures. Alcohol consumption during pregnancy was assessed using the *Health Interview for Women (HIW)* or the *Questionnaire for Foster/Adoptive Parents* (O'Connor, Kogan, & Findlay, 2002; Quattlebaum & O'Connor, 2013).

Diagnostic subclassifications included: FAS; partial fetal alcohol syndrome (pFAS), or alcohol related neurodevelopmental disorder (ARND). Using this classification Scheme 17% of adolescents were diagnosed with FAS; 68% with pFAS; and 15% with ARND (Table 1).

2.5.1 | Measures

Demographic questionnaire

All parents completed a demographic questionnaire that included the adolescent's sex, age, race/ethnicity, number of home placements, and caregiver marital status and years of education (a proxy for socioeconomic status).

Health interview for women

Biological mothers were interviewed in person by trained study staff using the *HIW* (O'Connor et al., 2002), which yields standard measures of the average number of drinks per drinking occasion and the frequencies of those occasions. One drink was considered to be 0.60 oz of absolute alcohol (e.g., one 12-oz can of beer containing 5% absolute alcohol was considered 1 drink). Criteria for alcohol exposure included drinking ≥6 drinks/week for ≥2 weeks and/or ≥ 3 drinks on ≥2 occasions including the time periods prior to and following pregnancy recognition. These criteria are based on findings that 1 drink/day (or ≥ 6 drinks/week) is an adequate measure of exposure for FASD and on large epidemiologic studies that demonstrated adverse fetal effects of heavy episodic drinking of ≥3 drinks per drinking occasion (Hoyme et al., 2016; May et al., 2013).

Questionnaire for foster/adoptive parents

For adopted or foster participants, medical or legal records documenting known exposure or reliable collateral reports by others who had observed the mother drinking during pregnancy were obtained. Such documentation included medical records that indicated the biological mother was intoxicated at delivery, or records indicating that the mother was observed drinking alcohol during pregnancy by a reliable collateral source (i.e., friend, close relative, partner, or spouse), or records that the mother had social, legal, or medical complications associated with alcohol misuse. Because the vast majority of individuals diagnosed with FASD are in foster care or adopted, it is often necessary to employ review of such records as a scientifically accepted method for establishing PAE (Centers for Disease Control and Prevention, 2004). Adolescents with unknown exposure were not included in the study unless they were diagnosed with all of the features of FAS (allowed by the *Clinical Guidelines*, IOM criteria, $n = 2$).

Kaufman brief intelligence test–second edition (K-BIT-2)

The *K-BIT-2* is a brief screening tool used to assess intellectual functioning (Kaufman & Kaufman, 2004). The *K-BIT-2* IQ Composite score is an estimate of general intellectual functioning standardized with a mean of 100 and a standard deviation of 15. The IQ Composite score has high internal consistency across ages 4 through 18 (M = 0.93) with test–retest reliability of 0.88. The correlation between the IQ Composite score and the general ability index of the WISC-IV is 0.84.

2.6 | Suicidal risk

The Children's Interview for Psychiatric Syndromes (*ChIPS*) was used to identify those adolescents who experienced suicidal ideation and/or who had made a suicide attempt (Rooney, Fristad, Weller, & Weller, 1999). The *ChIPS* is a highly-structured diagnostic interview for individuals between the ages of 6 and 18 years that assesses for the presence of 20 Axis 1 disorders. Each adolescent was queried regarding suicidal ideation and attempts during the past 12 months. Specific questions included: Do you ever wish you were dead? Do you ever think life is not worth living? Have you ever had thoughts of suicide [killing yourself]? Have you ever thought about how you would hurt yourself, [If yes] what would you do? Have you ever tried to kill yourself? The participants were allowed to elaborate on their responses. Ideation was defined as any thoughts about killing self or verbalizations of suicide intention. A serious suicide attempt was defined as an instance of deliberate harmful behavior in which there was a conscious or clearly apparent wish to die and that required the assistance of a physician or medical professional following the attempt. The presence of a depressive disorder was scored as either present (1) or absent (0) based on the cumulative self-report cut off score.

2.7 | Data analysis plan

Data analyses were conducted using SPSS Statistical Analysis software (22.0). Simple percentages examining the number of individuals who endorsed suicidal ideation and/or serious attempts were calculated. Participant sex, age, race/ethnicity, composite IQ, FASD subclassification, number of home placements, presence of a depressive disorder, caregiver marital status and education were evaluated using Chi Square and independent *t* tests to assess their contribution to the outcomes. Adolescent age, race/ethnicity, FASD subclassification, as well as caregiver marital status and education, were unrelated to either suicidal ideation or attempts and so were not included in further analyses. Participant sex was differentially related to serious suicide attempts. The number of home placements, composite IQ, and the presence of a depressive disorder were significant and were considered in logistic regression models.

3 | RESULTS

Results revealed that 35.2% of the adolescents endorsed suicidal ideation and 13.0% had made at least one serious suicide attempt in the past 12 months. Although there was no statistically significant difference between males and females reporting suicidal ideation (41.7% males and 31.0% females, Fisher's exact test = 0.40), a statistically significant sex difference was obtained for serious suicide attempts: 29.2% of males and 0% of females reported a serious suicide attempt (Fisher's exact test = 0.002). Analysis of the effects of IQ on serious suicide attempts revealed that male attempters had significantly lower IQs than nonattempters (M = 83.57 [*SD* = 12.18] vs. M = 97.76 [*SD* = 13.60], t (22) = 2.39, $p = 0.026$). The average composite IQ for males overall was 93.63 (*SD* = 14.52) and 89.10 (*SD* = 11.49) for females. In addition, those teens who had a higher number of home placements were more likely to report experiencing suicidal ideations (t [24.43, unequal variances] = 2.13, $p = 0.044$) and serious suicide attempts (t [6.47, unequal variances] = 2.40, $p = 0.050$), compared to teens with fewer placements (*M* = 3.32 (*SD* = 2.06) vs. 2.23 (*SD* = 1.17) for ideation; *M* = 4.57 (*SD* = 2.44) vs. 2.32 (*SD* = 1.24) for suicide attempts). Finally, reports of a depressive disorder related to both suicidal ideation and serious suicide attempts: 36.8% of youth who met criteria for a depressive disorder also reported suicidal ideation (Fisher's exact test = 0.023) and, in the male sample, 42.9% reported a serious suicide attempt (Fisher's exact test = 0.059).

3.1 | Regression models

Logistic regression analyses were conducted to determine the associations among: 1. number of home placements, composite IQ, and depressive disorder on suicidal ideation; and 2. number of home placements, composite IQ, and depressive disorder on serious suicide attempts. Independent variables were entered simultaneously for each regression model. The statistical significance of each model, R^2, adjusted R^2, standardized beta coefficients, and 95% confidence intervals were calculated. Only males reported incidents of serious suicide attempts so were the only ones included in regression Model 2. For both Models 1 and 2, number of home placements and presence of a depressive disorder significantly predicted suicidal ideation and serious suicide attempts. Results are presented in Table 2.

4 | DISCUSSION

Results revealed that 35.2% of teens with an FASD had considered suicide in the last 12 months which is twice the prevalence rate of 17.2% of teens in the large YBRSS national sample (Kann et al., 2018). Thirteen percent of teens with FASD reported making at least one serious suicide attempt requiring medical assistance in contrast to only 2.4% of teens nationally. In other words, adolescents with FASD were almost 5½ times more likely to make a serious suicide attempt compared to other teens of their chronological age. Looking at regional norms for the greater Los Angeles area, 13.15% of typically developing teens living in Los Angeles reported seriously considering suicide and 2.8% had made a serious attempt. These regional norms are comparable to national norms and are relatively lower than results from our sample. However, results were more alarming when sex was

TABLE 2 Prediction of suicidal ideation and serious suicide attempts

	F	*β*	*B* (*SE*)	R^2 (adjusted R^2)	*95% CI*
Suicidal ideation	6.74***			0.29 (0.25)	
Number of placements		0.38**	0.11 (0.04)		(039–0.189)
Composite IQ		−0.10	−0.004 (0.01)		(−0.013–0.005)
Depressive disorder		0.42***	0.51 (0.15)		(0.211–0.811)
Serious suicide attempt	13.10***			0.66 (0.61)	
Number of placements		0.63***	0.16 (0.04)		(0.084–0.236)
Composite IQ		−0.13	.−0.004 (0.01)		(−0.014–0.006)
Depressive disorder		0.54***	0.65 (0.17)		(0.300–1.004)

**$p < 0.01$; ***$p < 0.001$; Suicidal ideation $n = 54$.
Serious suicide attempt $n = 24$.

taken into consideration. In the current sample, 29.2% of males with FASD reported making a serious suicide attempt in contrast to the national statistics on typically-developing males of only 1.5% (Kann et al., 2018). In other words, risk for males with FASD was 19½ times that of typically developing teens. Results of increased risk held up even when regional trends of teens living in the greater Los Angeles area were explored. In Los Angeles, the percentage of typically developing males who reported making a serious suicide attempt was 3.4% (Kann et al., 2018). Compared to typically developing teens living in the same geographical area, males in our sample were 8½ times more likely to make a serious suicide attempt. In contrast, females in our sample were less likely to make a serious suicide attempt compared to national and local norms. Females with FASD reported no serious suicide attempts; whereas national and local norms for typically developing females were 3.1% and 2.0%, respectively.

Although this study was not designed to answer questions regarding the myriad of problems that render youth, particularly males, with FASD more vulnerable to suicide risk, a hint comes from the results from the number of home placements and depressive disorder findings. These findings support the notion that the higher the psychosocial stressors (number of home placements as a proxy for stressors), the more likely sample adolescents were to experience suicidal ideation. Moreover, the presence of a depressive disorder in both males and females increased the risk of suicidal ideation and, in males, serious suicide attempts. Other vulnerabilities for future research would include, but are not limited to individual characteristics that have been extensively described in this population including deficits in decision-making and problem-solving, problems in self-regulation and executive function, social isolation, and other disorders of mood and conduct (Bridge et al., 2012; Kable et al., 2016; O'Connor, 2014). In addition, our results indicate that males with FASD who have lower cognitive functioning, are at a higher risk of serious suicide attempts compared to the national data. These findings emphasize the need for increased monitoring and the development of targeted evidence-based interventions for these individuals. Moreover, there is a need to better understand why females with FASD might possess some protective factors that make them less vulnerable to harming themselves compared to typically developing females.

Findings from this study must be considered in the context of some limitations. Restricting the sample to those individuals with an IQ of 70 or higher limits the generalization of results to those whose functioning falls within the range of intellectual disability. However, research indicates that individuals with FASD without intellectual disability are at greater risk for poor psychosocial adjustment than those with more significant cognitive compromise so it is reasonable to study this population (Streissguth et al., 1996).

Our sample was a mix of adolescents including those from the general population and those from the clinical community so an argument could be made that participants sought study participation because they represented a group with significant mental health problems to begin with. Although this is possible, past research has found that the vast majority of adolescents diagnosed with PAE (up to 94%) have a history of mental health problems including having gone to a mental health practitioner or having been a client in a psychiatric or mental health hospital (O'Connor, 2014; Streissguth et al., 1996). While we acknowledge that our sample was not a standard community sample, we propose that our sample represents the "community" of individuals with PAE typically described in the literature. In addition, the proportion of females in our sample who acknowledged depressive symptoms was consistent with the national norms in the general U.S. female adolescent population. Twenty percent of our female sample reported depressive symptoms consistent with a depressive disorder similar to the 19.5% of females 12–17 years of age who reported a depressive disorder on the National Survey on Drug Use and Health (Mojtabai, Olfson, & Han, 2016). In contrast, the percentage of our male sample reporting clinically significant depressive symptoms was much higher than the national norms, 16.7% versus 5.8%, respectively. These findings, in addition to the high levels of depression seen in typically developing teens, suggest the need for greater surveillance of all teens and especially those teens with FASD. Given the added vulnerability of individuals with FASD, not only to psychiatric illness but to high levels of psychosocial and environmental stress, it is incumbent on health professionals to make early diagnoses and to help provide supportive environments to this high risk population.

Finally, study findings are limited by sampling constraints. This study relied on a convenience sample from the greater Los Angeles area and stratified sampling techniques were not applied. However, when compared to a stratified sample of typically developing teens residing in the greater Los Angeles area, rates in the FASD group remained comparatively higher (Kann et al., 2018). Another possible sampling limitation was that 94% of study participants were adopted or living in foster care rather than with their biological mothers perhaps introducing sampling bias. This possibility is of concern were it not for the fact that the vast majority of children who receive a diagnosis of an FASD are not living with their biological parents due to early removal from the home; adoption from Eastern European countries with high levels of maternal alcohol misuse; and physician reluctance to inquire about past alcohol use during pregnancy because of its associated stigma (National Organization on Fetal Alcohol Syndrome, 2012; Petrenko & Alto, 2017; Streissguth et al., 1996).

Overall, research on the psychiatric disabilities suffered by individuals with PAE throughout the lifespan highlights the need for training of health professionals in the identification of people with FASD and the provision of specific treatments to address the serious consequences of this developmental disability. An example of one such effective approach is the Safe Alternatives for Teens and Youths (SAFETY) that combines a cognitive-dialectical (informed) behavior therapy treatment, a primary component of which involves family involvement designed to promote teen safety (Asarnow, Hughes, Babeva, & Sugar, 2017). The treatment emphasizes strengthening protective supports within the family and building skills in teens and parents that lead to safer behaviors and lower stress reactions. This approach has been shown to effectively reduce suicide attempts in typically developing adolescents presenting with recent self-harm and could be adapted to accommodate the behavioral characteristics of individuals with FASD (Laugeson et al., 2007). Particularly important in this approach is the involvement of parents in treatment which has shown to be effective with children and adolescents with FASD (O'Connor et al., 2012; O'Connor, Quattlebaum, Castaneda, & Dipple, 2016).

In conclusion, the overarching message of this research is that adolescents with FASD are at a much greater risk of developing life threatening ideation and behavior when compared to teens in the general population. In addition, these findings point to differential vulnerabilities within this sample of alcohol-exposed youth suggesting that males are a significantly high risk group. Hopefully, findings from this study will provide impetus for suicide screening for adolescents in general and for youth with FASD in particular. Failure to recognize the broad and unique needs of these individuals or to provide early intervention can lead to multiple treatment failures, consequent worsening of symptoms, and increased potential for life threatening behavior.

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FINANCIAL DISCLOSURE

None.

CONFLICT OF INTEREST

None.

ORCID

Mary J. O'Connor https://orcid.org/0000-0001-6862-6139

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