The impact of early life stress on risk of tobacco smoking initiation by adolescents

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HIGHLIGHTS

• Stress in childhood is a predictor of adult alcohol and drug addiction.
• We use stress in 3 and 7 year olds to gauge teen risk of drinking and smoking.
• Our study uses standard quality measures of outcome and exposure.
• Early life stress in girls doubles the risk of smoking imitation in adolescence.
• Our results may help find the type of early life stress that predicts drug use onset.

ARTICLE INFO

ABSTRACT

Aims: Our study aimed to examine the association between early life stress and early initiation of alcohol and tobacco use.

Design: This prospective cohort study of women and children belongs to the Ukrainian component of the European Longitudinal Study of Pregnancy and Childhood.

Setting: Dniprodzerzhynsk, a city of some 250,000 inhabitants in south central Ukraine.

Participants: All 4398 women who visited antenatal clinics between December 25, 1992 and July 23, 1994, planned to continue their pregnancy, and were permanent residents of the city were invited to participate. Of the 4398 invitees, 2148 agreed and 1020 of the mother–child pairs were available for complete follow-up until the children were 16 years old.

Measurements: When study children reached ages 3 and 7, their mothers completed questionnaires about their children's exposure to and impact from a standard list of recent stressful life events. From the data on event prevalence and severity, we assigned each child to low, medium, or high early life stress. When the children became age 16, they completed questionnaires about their history of smoking and drinking.

Findings: In multivariate analysis that controlled for current level of family income, current family type, current school type, year of child's birth, lifetime smoking and current drinking by mother, and education of mother and father, girls with high stress at age 3 had 2.2 times (95% confidence interval: 1.23–4.08) higher odds than girls with low stress to start smoking early.

Conclusions: Our study may be the first to use a longitudinal study design to examine early life stress as a risk factor for early smoking initiation in adolescence.

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1. Introduction

Most studies to identify risk factors for adolescent tobacco and alcohol use focus on concurrent variables, including social environment, parent and peer influence, availability and accessibility of cigarettes and alcohol, and social reinforcement for use of these drugs (Simantov, Schoen, & Klein, 2000). While some research finds that initiation and

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experimentation in late childhood predict tobacco and alcohol use (Jackson, 1997), other evidence describes developmental pathways to teenage smoking and drinking that emerge even earlier (Masten, Faden, Zucker, & Spear, 2008). A life course approach uses modeling to uncover the temporal relation between early life exposures and later life outcomes and possible causal pathways including mediating, modifying, and confounding factors (Kuh, Ben-Shlomo, Lynch, Hallqvist, & Power, 2003).

Stress in childhood is a predictor of adult psychopathology, including alcohol and drug addiction. Stressors exert their effect both as mediators of inherited genetic risk for disorders and also as independent risk factors (Anda et al., 2002; Eaves, Prom, & Silberg, 2010). Early life stress (ELS) has been associated with several adverse effects in adults, including abnormalities in electrical brain activity (McFarlane et al., 2005), personality dimensions (Roy, 2002), substance abuse and depression (Anda et al., 2002), and other risk behaviors and diseases (Enoch, 2011; Felitti et al., 1998). The relation between severe stress, such as child abuse and maltreatment, and adult substance abuse and psychopathology is even more prominent (Maniglio, 2011; Simpson & Miller, 2002).

Compared with alcohol use, few reports identify stressful life events (SLE) as risk factors for tobacco smoking. McFarlane et al. confirmed a retrospective measure of ELS as a predictor of nicotine dependency in adult smokers (McFarlane et al., 2005). Other retrospective studies have reported an association between adult smoking and different stressors: emotional, physical, and sexual abuse; witnessing violence between parents; divorce of parents; and growing up with a substance-abusing, mentally ill, or incarcerated household member (Anda et al., 1999; Chung et al., 2010; Dube, Cook, & Edwards, 2010; Ford et al., 2011; Mingione, Heffner, Blom, & Anthenelli, 2012; Ramiro, Madrid, & Brown, 2010; Sacco et al., 2007; Simantov et al., 2000; van Loon, Tijhuis, Surtees, & Ormel, 2005). However, we are unaware of any published prospective or retrospective studies of ELS as a risk factor for early smoking initiation in adolescence.

Our prospective cohort study uses data about stressful events in 3 and 7 year old children to examine the risk of early initiation of alcohol and tobacco use among adolescent boys and girls in a large, middle-income country.

2. Methods

2.1. Study setting and population

The present analysis uses data from the Ukrainian component (described previously (Hryhorczuk et al., 2009)) of the European Longitudinal Study of Pregnancy and Childhood, a prospective cohort study of women and their children to identify environmental features affecting children's health and development (Golding, Pembrey, & Jones, 2001). In Dniprodzerzhynsk, a city of some 250,000 inhabitants in south central Ukraine, we invited all pregnant women who between December 25, 1992 and July 23, 1994 visited antenatal clinics, planned to continue their pregnancy, and were permanent residents of the city. All antenatal clinics in the city were visited by the study team (Little, Monaghan, Gladen, Shkyryak-Nyzhnyk, & Wilcox, 1999). Of the 4398 women who met these study eligibility criteria, 2148 (49%) women agreed to participate. No information was recorded about reasons why some pregnant women were unwilling to participate. With a very high abortion rate then, some women might have been unsure about their intention to keep the pregnancy (Little et al., 1999). Furthermore, the study personnel had limited resources to track participants for long periods and to record attempts to locate drop-outs. Therefore, only 1020 (47%) of the enrolled 2148 woman–child pairs were available for complete follow-up until the study children were 16 years old. (In case of twin births, both children were eligible to participate.) Informed consent was obtained from the children's parents, and assent was obtained from every child at ages 7 and 16. The study received Institutional

Review Board ethical approval from the University of Illinois in Chicago and the Ukraine Institute of Pediatrics, Obstetrics and Gynecology in Kyiv at each stage of data collection.

2.2. Data collection

Data about outcomes, exposures, and potential confounders were obtained from participants' self-completed questionnaires distributed by local primary health care facility staff. Mothers provided answers about their smoking and drinking, their marital status and attitude to pregnancy in the baseline questionnaire. The year of child birth was recorded during the delivery (delivery questionnaire). Mothers answered questions about their children's exposure to and impact from SLE at ages 3 and 7 (see Appendix). Education of mother and father was also recorded when the child was 7. When study children became age 16, they answered questions about their history of smoking tobacco and drinking alcohol. At the same time mothers gave answers to the questions about their smoking and drinking. A US four dollar voucher for mobile phone use was given to the adolescents to participate in the study. No financial incentives were given to the mothers or the young children at any stage of data collection.

2.3. Outcome measures

For this paper, we used two study outcomes—age at initiation of smoking and of drinking—which were determined from answers to questions asked of the 16 year old study children. The questions were, "When (if ever) did you FIRST do each of the following things (smoke your first cigarette)?" and "When (if ever) did you FIRST do each of the following things? (drink beer (at least one glass), drink cocktail (at least one glass), drink wine (at least one glass), drink spirits (at least one glass))?". These questions came from the European Survey Project on Alcohol and Other Drugs (ESPAD) questionnaire (Hibell et al., 2007), whose test–retest reproducibility and high internal consistency have been shown previously (Hibell et al., 2000; Molinaro, Siciliano, Curzio, Denoth, & Mariani, 2012). For smoking, children were divided a priori into those who started smoking at or before age 13 and those who started after age 13 or never. For drinking, children were divided into those who started drinking at or before age 12 and those who started after age 12 or never. These two ages came from estimates of the average age of smoking and drinking onset in Eastern Europe (Andreeva, Krasovsky, & Semenova, 2007; Oh et al., 2010).

2.4. Exposure measures

When the study children reached ages 3 and 7, their mothers reported whether they had had any SLE in the past 1.5–2 years. The SLE list (see Appendix) included 15 events for 3 year olds and 18 events for 7 year olds. For each event a child had, such as being hospitalized, the mother rated the event's impact by describing the child as being "very upset", "quite upset", "a bit upset", or "not upset". The exposure measures came from the Avon Longitudinal Study of Parents and Children (http://www.bristol.ac.uk/alspac/sci-com/quests/ accessed on July, 20; 2012). Using these data on SLE prevalence and severity, we calculated an "ELS score" of 0–60 points for 3 year olds and of 0–72 points for 7 year olds. We assigned the children's ELS scores to three equal groups representing low, medium, and high stress. For children aged 3 the groups were 0–2, 3–6, and 7–60 points, while for children aged 7 the groups were 0–3, 4–7, and 8–72 points. We used the method used by the Avon Longitudinal Study of Parents and Children to score mothers' ratings of event severity: 1 for not upset, 2 for a bit upset, 3 for quite upset, and 4 for very upset (Enoch, Steer, Newman, Gibson, & Goldman, 2010). For example, if a child had three of 15 possible events and was "very upset" each time, this child received an ELS score of 12 (3 times 4) points. Because the ELS score anticipated transforming ordinal data to interval data, which is not always appropriate, we approached