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**Adolescent conduct problems and later risk of induced abortion:
A population-based longitudinal study**

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Adolescent conduct problems and later risk of induced abortion: A population-based longitudinal study

Abstract

Objective: To examine the relationship between level of conduct problems (CP) at age 15 and the risk of abortion during the teenage years and throughout the women's twenties

Design: Longitudinal study

Setting: The "Young in Norway longitudinal Study" was used.

Population: Nationally representative sample (N 769) of Norwegian girls aged 12-15 years in 1992, followed up till 2005

Methods: Conduct problems (CP) approaching DSM-III-R criteria for conduct disorder, sociodemographic factors, family factors and a number of individual factors (e.g. use of alcohol and depression) was measured at age 15. Logistic regression analysis was used to model whether the probability of having an abortion in the age span 15-19 and the age span 20-27 years depends on CP at age 15, with a number of control variables.

Main outcome measure: Induced abortion

Results: CP at age 15 was associated with a later risk for abortions. The most CP-disturbed 5% of the sample had an OR of 5.8 (95 % ci 1.9-18.3) of teenage abortions, after controlling for socio-demographic and family variables. Risk behaviours related to alcohol, school problems, and deviant peers mediated part of the CP-associated risk. However, after controlling for such variables, CP still was a risk factor (OR 3.9; 1.0-16.0). In the age period 20-27 years CP measured at age 15 continued to be a risk factor, with an OR of 5.1 (1.7-15.0) for the most CP disturbed group after control for confounders and mediating risk factors. Impulsivity mediates a minor part of the association between early CP and abortion.

Conclusions: Girls with conduct problems in early adolescence are at risk for induced abortion throughout the teenage years and until their mid twenties. More targeted and intensive abortion preventive programmes aimed at girls with CP may be warranted.

Keywords: Abortion, pregnancy, conduct problems, woman, adolescence

Introduction

Women in Norway have had the right to abortion on demand for more than three decades. Based on the current rates, around 470 abortions will be performed per 1000 women, if they are followed up until the age of 50 years ¹. Surprisingly, little is known about risk factors for abortion in the Nordic welfare state context. However, during the past decade, official policy has tried increasingly to aim preventive measures against unwanted pregnancy and abortion towards groups at high risk. To reach this aim, more knowledge is required. Most teenage pregnancies are aborted, and early motherhood has not been a central issue in Norway ².

The epidemiological evidence on induced abortion is limited. Several studies have examined the relationships with demographic and socioeconomic variables like age, marital status, and social class ³, and there are some studies of self-reported motives for taking an abortion. ⁴ We have limited knowledge about the psychological and behavioural factors that place young women at increased risk of unwanted pregnancy and abortion. A couple of recent studies show, however, that conduct-disordered girls have a three- to five-fold increased risk of teenage pregnancy ^{5 6}. In addition, conduct problems (CP), also at sub-clinical levels, were established early as a risk factor for a range of adverse psychosocial consequences, including alcohol dependence ⁷, medical problems, and poor overall health ⁵. We follow up this literature in this article, examining to what extent CP increases the risk of induced abortion.

A couple of studies comparing births and abortions in adolescence have revealed that abortion is associated with higher educational attainment of the woman's mother ⁸ and with high educational aspirations of the adolescent ^{9 10}. Thus, abortion in young women seems to be an ambiguous phenomenon: One may hypothesize that it is associated with factors such as CP. However, the decision to abort may be more prevalent in females with more resources than those usually available to females with high rates of CP.

One should note a number of limitations within the research. First, most studies are non-representative, with subjects drawn from clinical populations. Second, the measurement of CP typically involves the use of categorical measures of conduct disorder, an approach that does not permit an assessment of the effects of symptom severity. Third, few studies have examined the role of socio-economic adversity and family dysfunction as confounders between CP and later outcomes. Woodward & Fergusson (1999) found an association between early CP and risk of teenage pregnancy. However, this association disappeared after controlling for a disadvantaged family background and a number of individual risk factors.

Whereas CP are related to aggression and other delinquent acts, symptoms of depression relate to internalizing feelings, such as sadness and loss of energy¹¹. Given these disparities, it is perplexing that comorbid CP and depressive disorders occur at a high rate¹². Further, females with depressive symptoms in adolescence have an elevated risk of early pregnancy¹³. Thus, when investigating the relationship between CP and abortion, it is also necessary to consider the level of depression.

This paper reports the results of a longitudinal study of the relationship between early onset CP and later probability of pregnancy and abortion in a population-based sample of girls who were followed from their mid-teens to age 27 years. More specifically, we

1. investigate the extent to which CP measured at age 15 are associated with induced abortion up to age 27;
2. examine whether these associations can be explained by confounding socio-economic factors and measures of parenting and family functioning;
3. identify possible intervening factors that may explain an association between CP and later abortion; such factors include school problems, number of sexual partners, use of substances, and deviant peer affiliations.

4. investigate whether predictors of abortions differ from predictors of pregnancy (both childbirths and abortions).

Methods

This study is based on *Young in Norway longitudinal study*, which has been described in greater detail elsewhere¹⁴. In 1992 (T1), a sample of Norwegian adolescents completed a questionnaire at school. All schools in the country were included in the register from which the schools were selected. The sample was stratified according to geographical region and school size, which, in Norway, is closely related to the degree of urbanization. All the students at each school were included in the study. (In Norway, 98.5% of the cohorts aged between 12 and 16 years attend compulsory public lower secondary schools.)

Pupils were required to give written consent based on descriptions of the project formulated according to the standards drawn up by the Norwegian Data Inspectorate. Written consent was also obtained from parents. The initial response rate was 97.0%. The sample was followed up in 1994 (T2), 1999 (T3), and 2005 (T4).

Pupils who still attended their original school at T2 completed the questionnaire at school according to the procedure used for the initial survey (T1). Only pupils who completed the questionnaires at school at T2 (N = 3476) were followed up at T3 and T4. Because the study had originally been planned as a two-wave study, new informed consent was obtained. Those consenting at T2 (N = 3142, 90.4%) received questionnaires by mail at T3 and T4. The response rate was 82% at T4. In the present study, because we wished to predict the abortion experience based on teenage characteristics, only girls in the age group 12–15 years at T1 (N = 769) were included. Their level of CP was assessed at T2, when their age was 15.0 years (SD, 0.6), and at T4, the end of the follow up, when their mean age was 26.6 years (SD, 0.6).

Abortion. The participants were asked “Have you ever taken (induced) abortion?” (No/Yes, and number of times). These reports showed that 16.3% of the girls (N = 125) had undertaken 143 abortions over the follow-up period. To cross-validate the data, the study estimates were compared with abortion statistics for Norway ¹. The observed rate of abortion in the cohort (186 abortions per 1000) was 74% of the rate expected based on population figures (250 per 1000), suggesting some selective attrition or underreporting of abortion.

Childbirth: They were asked: “Do you have own children?” (No/ Yes, and number of children). The variable “pregnancy” was constructed by summing all abortions and all childbirths.

Conduct problems (CP): Fifteen items approaching DSM-III-R criteria for conduct disorder were used to measure CP during the 12 months preceding T2 (for a review of the items, see ¹⁵.) These items range from behaviours that are unlikely to be problematic when very low in frequency (“Had a violent quarrel with a teacher”) to behaviours that are serious even when infrequent (“Theft of more than NOK 1000 (about GBP 90)”. Consequently, the cut-off for an indication of CP was set differently for different items. The CP index is the number of problems reported (Cronbach’s alpha, 0.85). The CP index ranged from 0 to 14 (mean, 1.85; SD, 2.31). In the analyses, a four-category version is used (see Table 1).

Socio-economic background: Parental socio-economic status (SES) was measured. We also asked about level of parental education. A separate question was asked about whether the mother or father was on social welfare or was unemployed (scored dichotomously).

Parental relationships and family characteristics: An instrument of parental monitoring was used, which comprised questions relating to perceived parental norms and parental knowledge of the adolescent’s actions ¹⁶. Based on an instrument developed by

Sarason et al., perceived parental support was measured in situations relating to educational choices, feeling down, or having done something illegal.¹⁸ Information about parental divorce was collected and possible parental alcohol problems were assessed by the question about each parent, “Would you say that your father (mother) has had alcohol problems?”

Deviant peers: The respondents were asked to think about their two best friends and rate whether neither, one, or both was a regular smoker, got drunk at least once a week, had ever used cannabis. *School performance:* Questions were posed about school grades in the three major subjects Norwegian, English, and Mathematics. *Depression:* Kandel and Davies’s six-item¹⁹ measure of depressed mood was used. *Impulsivity* was measured by seven items.²⁰

Smoking and alcohol: The participants were asked about daily cigarette smoking and about the number of alcohol intoxication episodes during the previous 12 months.

We use logistic regression analysis, and model whether the probability of having an abortion in the age span 15 – 19 years, and in the age span 20 – 27 years, depends on CP at age 15, with a number of control variables. We test whether the relationship between CP and abortion is different in the two age intervals, using the seemingly unrelated estimation approach implemented in Stata.²¹

Results

Table 1 shows the sample classified into four groups according to the level of CP reported at age 15 years. These groups ranged from those whose CP scores placed them in the least-disturbed 60% of the sample to those in the most-disturbed 5% of the sample. An increasing level of CP was accompanied by a corresponding increase in the risk of subsequent abortion in both the teenage years and throughout the women’s twenties.

The association reported in Table 1 may be related to confounding factors that may correlate with both CP and later abortion. Table 2 shows that CP were correlated with a

number of family factors such as parental divorce, father's alcohol problems, level of parental support, and level of parental monitoring. In Table 3, the relationship between CP and later abortion was adjusted for the effects of these potentially confounding factors. Only small differences from the bivariate results in Table 1 were observed. In the youngest age group, the association between CP and later abortion is largely unchanged. In the age span 21-27 years, we note a small decrease, from OR 5.7 (95 % ci 2.7-12.4) to OR 4.8 (2.0-11.5) in the most disturbed group. There is no significant difference between early (15 to 20 years) and later (21 to 27) abortion with regard to the predictive power of CP ($\chi^2 = 2.54$, $df = 3$, $p = 0.4681$).

The results so far suggest a possible causal relationship between CP at age 15 years and later abortion. A number of behavioural factors may mediate the relationship between CP and later abortion. This issue is explored in Table 4, which reports the association between early CP and a number of factors including delinquent peers, depression, alcohol intoxication episodes. The table shows strong associations between all of these measures and the level of CP. For example, the most CP-disturbed group had a five times higher risk of a high depression scores. Only 0.9% of the least CP-disturbed group reported having been drunken 10 or more times during the preceding year compared with 57.1% in the most-disturbed group. The data were analysed by new regression models to control for these factors. The results are presented in Table 5. After adjusting for both confounding and possibly mediating factors, the association between CP at age 15 and later teenage abortions remained significant at the more serious levels (group 3 and 4) of CP. The association between CP at age 15 and abortion during the women's twenties remained significant at all levels. Previous research has identified impulsivity as a defining characteristic in conduct disorder.²² A new regression analysis was performed, with abortion in the time span 20 -27 years as dependant variable, where impulsivity measured at T3 was included in the model reported in Table 5.

Impulsivity was associated with later abortion ($p < .005$), and the OR in the most disturbed group fell from 5.1 (95 % ci 1.7-15.0) to 4.3 (1.4-12.8).

Discussion

The main finding of the study was that girls with early CP are an at-risk group for induced abortion well into their 20s. Girls in the most-disturbed 5% of the sample had rates of abortion that were more than five times higher than the rate in the least-disturbed 60% of the cohort. Models of pregnancies (childbirths and abortions) revealed weaker associations to CP.

Previous studies have suggested that such associations may arise through two pathways^{5 6}. First, girls with early CP may come from disadvantaged family backgrounds. In addition, these girls may be involved in risky behaviours. In our study, only a minor part of the association between CP and abortion was explained by family factors common to both phenomena. Risk behaviours related to alcohol, school problems, and deviant peers also seem to mediate a minor part of the CP-associated risk. However, in contrast to previous research^{6 13}, our data show that the risk of abortion remained high in girls with CP even after controlling for these factors, suggesting that more complex mechanisms mediate the relationship between CP and abortion. We note also that the predictive strength of adolescent CP remained at the same level in the 21 to 27 age interval as among the adolescent girls.

This study has a number of advantages over previous research in this area: First, even though there are some studies of the association between CP and early pregnancy, few have linked the abortion experience to early CP. Further, the bulk of studies in this area have used dichotomous and categorical measures of conduct disorder^{23 24} but have ignored the possible consequences of CP at sub-clinical levels. In the present study, CP at age 15 years were assessed using four ordered groups classified according to increasing severity of CP. We

found a significant association with increased risk for abortion for CP at very low and clearly sub-clinical levels. Importantly, we were able to address possible causal processes better than in cross-sectional studies, and in particular those based on selected and clinical samples, because our prospective, longitudinal study included a wide range of possible confounding factors. We also acknowledge some limitations. The sample and the number of abortions analysed were quite small. A larger sample would be desirable. Further, the comparisons with register data indicated some selective attrition or underreporting of abortion.

We were surprised that CP at all levels continued to have an effect on the abortion risk over the entire 11-year span. However, this finding echoes a number of studies revealing both so-called homotypic and heterotypic continuities in antisocial behaviours²⁵. Some of the core problems related to early adolescent aggression, vandalism, and rule breaking may persist throughout the teenage and early adult years (homotypic pattern), although such tendencies may also be expressed in new ways later in life (heterotypic pattern). Early studies typically did not investigate this heterotypic pattern and concluded that outcomes are better for girls with CP than for boys²⁷⁻²⁹. Later studies suggested that adult outcomes of CP in girls may not be so benign when a broader spectrum of outcomes are taken into consideration²⁴. For example, using data from the population-based ECA study, Lee Robins reported that expanding the outcome beyond externalizing problems shows that girls appear to do at least as poorly as boys³⁰.

Recent theorizing suggests that outcomes of CP in females more often become apparent as interpersonal issues and are confined within their relationships³¹. Studies indicate that early CP are associated with later unstable and violent relationships for females³². Further, adolescents with CP are overexposed to antisocial attitudes from parents, family instability, and harsh and inconsistent discipline³³. Although many experience early sexual abuse, this is more common in females than in males with high levels of CP³⁴. Further, such

experiences may have a strong impact on later risk-taking sexual behaviour in females ³⁵.

Thus, female CP is linked to a pathway of unstable partner relationships, and sometimes partner violence. Increased risk of abortion may be a consequence of such life stressors and strains.

Our results also suggest that the impact of socioeconomic background factors on abortion was small. As noted above, at least one previous study has found high socioeconomic background to be positively associated with the choice of abortion rather than delivery among teenagers ⁸. If a high socio-economic background decreases the risk of teenage—and perhaps, more generally, unwanted—pregnancies, but increases the probability of abortion for those who nevertheless become pregnant, the overall relationship between socioeconomic background and abortion may be close to zero, as we found in our study.

What, precisely, are the mechanisms that put girls with CP at risk of later abortion? Our data revealed that girls with CP also took part in a wide variety of potential risk behaviours, such as alcohol intoxication, and more sexual partners at a much earlier age than other girls. These risk behaviours were associated with later abortion risk (in bivariate models), but after controlling for these variables, a considerable association remained for the CP measure. Impulsivity and low self-control has been suggested as core characteristics in conduct disorder³⁶, and longitudinal studies from e.g. Scandinavian countries³⁷ have provided evidence that impulsivity is an important predictor for later norm-breaking behaviour. Control for level of impulsivity reduced the association between CP and abortion, but still a robust association remained. Thus, future studies are needed to elucidate the nature of this relationship. There has been increasing awareness that genetic influences have a role in conduct problems³⁸. However, the path from genes to behaviour is complex, and involving environmental stresses and individual differences in liability³⁸. One possibility is

that such, partially genetic, predispositions increase engagement in risky or non-planned sexual behaviour. This interpretation is supported by our finding that the relationship between CP and abortion does not weaken over time. Studies indicating that persons with conduct disorder remain at elevated risk for a variety of problems, even after the conduct disorder symptoms have remitted ²³, may also point in this direction.

Conclusion

Girls with CP are at a high risk for abortion, indicating that preventive programmes targeted at this group may be needed. A small body of evidence suggests that programmes for girls with CP should target multiple aspects of risk (e.g., family, peers, school), and that those including the family ^{39,40}, are most promising. In the Nordic welfare state context, the right to abortion has been framed as part of the fight for gender equality ⁴¹. However, there is no contradiction between more effective preventive programmes and at the same time defending the woman's right to make the final decision as to whether an abortion should be carried out.

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Conflicts of interest: None

Table 1. Abortion in the age groups 15 - 19 years and 20 - 27 years by level of conduct problems at age 15. Percentages and odds ratios with 95% confidence intervals.

| Conduct problems at age 15 years | | | | | |
|----------------------------------|-------------------------|-------------------|-------------------|-------------------------|----------|
| | 1 (low) 0-1 problems | 2 2-3 problems | 3 4-6 problems | 4 (high) 7+ problems | <i>p</i> |
| Abortion 15-19 years (%) | 3.1 | 5.5 | 11.9 | 14.3 | < 0.0001 |
| Odds ratios | 1.00 | 1.8 (0.8-4.1) | 4.1 (1.9-9.3) | 5.1 (1.9-14.1) | |
| Abortion 20 - 27 years (%) | 6.5 | 13.3 | 17.8 | 28.6 | < 0.0001 |
| Odds ratios | 1.0 | 2.2 (1.2-3.8) | 3.1 (1.7-5.8) | 5.7 (2.7-12.4) | |
| N | 445 | 181 | 101 | 42 | |

Table 2. Associations between level of conduct problems at age 15 years and measures of family functioning. In per cent.

| Conduct problems at age 15 | | | | | |
|----------------------------|-------------------------|-------------------|-------------------|-------------------------|----------|
| | 1 (low) 0–1 problems | 2 2–3 problems | 3 4–6 problems | 4 (high) 7+ problems | <i>p</i> |
| Parental divorce | 22.9 | 32.6 | 40.6 | 35.7 | 0.001 |
| Father's alcohol problems | 7.6 | 11.6 | 15.8 | 16.7 | 0.029 |
| Poor parental support | 18.7 | 32.6 | 45.5 | 57.1 | 0.0001 |
| Poor parental monitoring | 7.4 | 19.3 | 36.6 | 50.0 | 0.0001 |

Table 3. Abortion in the age groups 15-19 and 20 – 27, by level of conduct problems at age 15, after adjusting for covariates. Odds ratios with 95% confidence intervals.

| | 1 (low) 0–1 problems | 2 2–3 problems | 3 4–6 problems | 4 (high) 7+ problems |
|------------------------|-------------------------|-------------------|-------------------|-------------------------|
| Abortion 15-19 years | 1.0 | 1.9 (0.8-4.4) | 4.5 (1.8-11.1) | 5.8 (1.9-18.3) |
| Abortion 20 - 27 years | 1.0 | 2.0 (1.1-3.7) | 2.7 (1.3-5.4) | 4.8 (2.0-11.5) |
| N | 445 | 181 | 101 | 42 |

Covariate factors are parental divorce, father’s alcohol problems, level of parental support, and level of parental monitoring.

Table 4. Associations between level of conduct problems at age 15 years and school performance, depression, substance use, sexual activity, and delinquent peer affiliations. In per cent.

| Conduct problems at age 15 | | | | | |
|--------------------------------|-------------------------|-------------------|-------------------|-------------------------|----------|
| | 1 (low) 0–1 problems | 2 2–3 problems | 3 4–6 problems | 4 (high) 7+ problems | <i>p</i> |
| Delinquent peers | 9.9 | 27.1 | 50.5 | 71.4 | 0.0001 |
| Poor school marks | 10.8 | 17.1 | 27.7 | 35.7 | 0.0001 |
| Depressive mood | 8.1 | 17.7 | 26.7 | 40.5 | 0.0001 |
| Daily smoking | 3.8 | 14.4 | 32.7 | 57.1 | 0.0001 |
| Alcohol intox 10 + times | 0.9 | 8.3 | 20.8 | 57.1 | 0.0001 |
| Sexual intercourse < 16 years | 7.6 | 13.3 | 21.8 | 57.1 | 0.0001 |
| 1 + sexual partner at 16 years | 1.6 | 7.7 | 11.9 | 35.7 | 0.0001 |

Table 5. Abortion in the age groups 15-19 years and 20-27 years by level of conduct problems at age 15, after adjusting for covariates and possible intervening factors.

Odds ratios with 95% confidence intervals.

| | 1 (low) 0–1 problems | 2 2–3 problems | 3 4–6 problems | 4 (high) 7+ problems |
|-----------------------------------|-------------------------|-------------------|-------------------|-------------------------|
| Abortion 15-19 years ¹ | 1.0 | 1.9 (0.8-4.4) | 4.1 (1.5-11.1) | 3.9 (1.0-16.0) |
| Abortion 20-27 years ² | 1.0 | 1.9 (1.1-3.6) | 2.4 (1.1-5.0) | 5.1 (1.7-15.0) |
| N | 445 | 181 | 101 | 42 |

¹ Covariate factors are parental divorce; father’s alcohol problems; level of parental support; level of parental monitoring; school marks at T2; depression scores at T2 ; daily smoking at T2; alcohol intoxication at T2; cannabis use at T2, intercourse debut < age 16, more than one sexual partner before the age of 16 years.

² Covariate factors are parental divorce; father’s alcohol problems; level of parental support; level of parental monitoring; school marks at T2; depression scores at T2 and T3 ; daily smoking at T2 and T3; alcohol intoxication at T2 and alcohol problems at T3; cannabis use at T2 and T3, intercourse debut < age 16, more than one sexual partner before the age of 16 years, and cohabitation status at T3.

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