

Obstetric care and proneness of offspring to suicide as adults: case-control study

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Abstract

Objective To investigate any long term effects of traumatic birth and obstetric procedures in relation to suicide by violent means in offspring as adults.

Design Prospective case-control study.

Setting Stockholm, Sweden.

Subjects 242 adults who committed suicide by violent means from 1978 to 1995, and who were born in one of seven hospitals in Stockholm during 1945-80, matched with 403 biological siblings born during the same period and at the same group of hospitals.

Main outcome measures Adverse and beneficial perinatal factors expressed as relative risks (odds ratios) and 95% confidence intervals, derived from logistic regression of cases matched with their siblings.

Results For multiple birth trauma the estimated relative risks of offspring subsequently committing suicide by violent means were 4.9 (95% confidence interval 1.8 to 13) for men and 1.04 (0.2 to 4.6) for women. In mothers who received multiple opiate treatment during delivery, the estimated relative risk of offspring subsequently committing suicide was equal for both sexes (0.26, 0.09 to 0.69).

Conclusion Minimising pain and discomfort to the infant during birth seems to be of importance in reducing the risk of committing suicide by violent means as an adult.

Introduction

For decades millions of mothers in developed countries have been subjected to new obstetric procedures, but with limited knowledge of the long term effects from those interventions. It does seem that long term effects are possible as one case-control study showed that suicide as an adolescent was associated with adverse perinatal conditions, and another study showed that suicide by violent means was associated with mechanical birth trauma.^{1 2}

Neither of these studies, however, controlled for confounders. We tested whether traumatic birth could be associated with subsequent suicide by violent means in offspring, using a stringent study design. We also predicted that this association could be reduced by giving sedatives and analgesics to mothers during delivery, as the infants' perception of trauma would be reduced. We based our predictions on the hypothesis (presented to the ethics committee of the Karolinska Institute in advance) that, through a process of imprinting, certain individuals might subconsciously create a traumatic situation during the act of suicide that produces a sensation similar to that experienced during birth.² Since such imprinting processes are facilitated by testosterone, we expected men to be affected more than women.³ We analysed cases matched with siblings by logistic regression. Variables constituting a trauma score were selected by one of us (MB) before any access to birth records.

Subjects and methods

Cases and controls

Cases were included in the study if: (a) they were adults who had committed an unambiguous suicide by violent means—that is, using a firearm, jumping from a height, jumping in front of a train, laceration, hanging, and strangulation; (b) they were born at one of seven hospitals in Stockholm from 1945 to 1980; (c) they had been examined after death at the Department of Forensic Medicine, National Board of Forensic Medicine, Stockholm between January 1978 and June 1995; and (d) they were Swedish citizens at the time of death. Birth records could not be found for 22 (5.7%) of 383 adults who had committed suicide, and two (0.6%) of the adults had not been raised by their biological parents so were excluded from the study, leaving 359 cases for analysis.

Of 436 siblings born during the same period at the same seven hospitals, birth records could not be found for 26 (6.0%), four (1.0%) had not been raised by their biological parents, and three (0.7%) had committed suicide, leaving 403 siblings for comparison with 242 cases of suicide with siblings.

Blinded evaluation

Copies of the birth records of adults who had committed suicide and their siblings were coded, and data were extracted by two experienced midwives. (In Sweden midwives assist most births and keep all birth records.)

Trauma score and opiate treatment

A trauma score was calculated for each subject by adding the number of instances when any of the following birth events occurred that were likely to cause pain to the infant: presentation other than vertex, meconium stained amniotic fluid and membranes, instrumental delivery or internal version, and resuscitation and other complications usually requiring ward care.

The number of times opiates (50-100 mg pethidine hydrochloride or 15-20 mg morphine) were given within 24 hours before birth was recorded.

Confounders

Several potential confounders were taken into account. Categorical variables included: the hospital and year and season of birth; maternal age, socioeconomic level, and civil status; order of birth, duration of labour, birth weight, and administration of nitrous oxide, barbiturates, or chloroform. Indicator variables included: treatment with oxytocin, neonatal asphyxia, and sex. Duration of labour was determined in three ways: the difference between the time of delivery and, when available, time of onset of labour; the difference between the time of delivery and time of admission to the hospital plus two hours; and the difference between



Additional tables can be found on our website

the time of delivery and the time the membranes ruptured. No missing values were substituted, and subjects with missing values were rejected during statistical analysis. The origin of missing data has been attributed to some midwives and was not likely to be due to systematic errors causing bias.⁴

Statistical methods

We used the LOGREG procedure in EPILOG for the logistic regression of subjects with a variable number of siblings as matched controls. The relative risks for subsequent suicide were estimated by multivariate analysis after stepwise regression, using a significance level of $P < 0.05$ as the criterion for inclusion. Determination of regression coefficients permitted estimation of odds ratios for various factors, taking confounders into account.⁵

The population attributable fraction (AF) was calculated according to Levin⁶ from $AF = [p(r-1)] / [pr + (1-p)]$, where p denotes the proportion of persons exposed to the risk and r denotes the relative risk ($r > 1$).

Results

Obstetric practices changed during the study period. The mean duration of labour with offspring that subsequently committed suicide and their siblings was 10.1 (SD=6.0) and 9.5 (SD=5.8) hours respectively. Duration of labour decreased slightly during the study period (fig 1). The average of the differences between the years of birth of the offspring who committed suicide and their siblings was 0.08 years.

Offspring who subsequently committed suicide were more frequently exposed to birth complications than their siblings (table). Instrumental delivery or internal version, resuscitation, and other complications during birth contributed to the mean trauma score more during 1966 to 1970 and 1971 to 1980 than before, and offspring who subsequently committed suicide were subjected to about twice as many interventions at birth than their siblings (fig 2).

During the birth of offspring who subsequently committed suicide the mothers were given on average fewer doses of opiates during five of the six periods: 1945-50, 1951-55, 1956-60, 1966-70, and 1971-80 (fig 3). Opiates were more commonly given at the ABB hospital (Allmänna BB), where 52 of 115 (45%) mothers received opiates compared with 69 of 530 (13%) mothers at the other hospitals.

During multivariate analysis, matching cases with their own siblings, the trauma score and treatment with opiates were tested by logistic regression in competi-

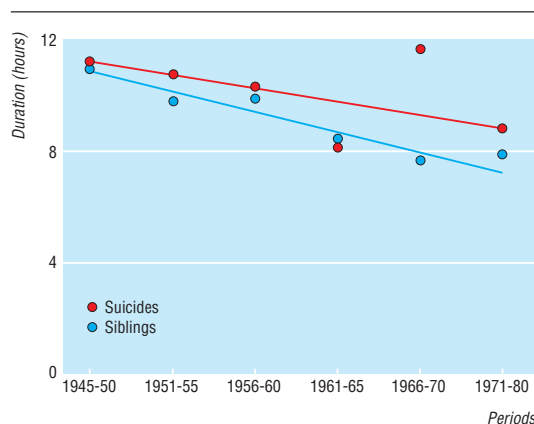


Fig 1 Mean duration of labour and regression lines during six periods for 237 adults who committed suicide (data missing in five cases) and 392 biological siblings (data missing in 11 cases)

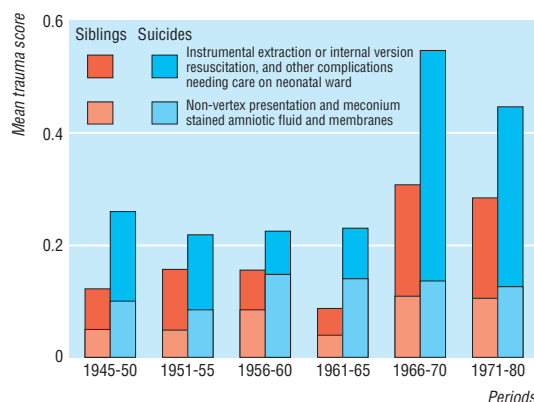


Fig 2 Mean trauma score per subject during six periods for 242 adults who committed suicide and their 403 biological siblings. Values are numbers of suicides and siblings; the 1971-75 and 1976-80 periods are combined

tion with potential confounders (see table A on the website). The following variables were significant: maternal age ($P = 0.009$), sex ($P = 0.006$), treatment with opiates ($P = 0.007$), and the interaction between men and the trauma score ($P = 0.002$) (see table B on the website).

The estimated relative risks in men of a single and multiple trauma (≥ 2) were 2.2 (95% confidence interval 1.3 to 3.6) and 4.9 (1.8 to 13) times higher than if no trauma had occurred respectively (fig 4). The corresponding risks in women were 1.02 (0.5 to 2.1) and 1.04 (0.2 to 4.6).

Comparison of birth variables included in trauma score for offspring who committed suicide who had or did not have siblings, and siblings. Values are numbers (percentages) unless stated otherwise

Perinatal risk factor	Offspring		Total (%)	Siblings (n=403)	Offspring to sibling percentage ratio	P value
	Who had siblings (n=242)	Who had no siblings (n=117)				
Presentation other than vertex	13 (5.4)	4 (3.4)	17 (4.7)	7 (1.7)	2.7	0.02
Meconium stained amniotic fluid and membranes	17 (7.0)	10 (8.5)	27 (7.5)	18 (4.5)	1.7	0.07
Instrumental delivery or internal version	10 (4.1)	13 (11.1)	23 (6.4)	15 (3.7)	1.7	0.09
Emergency caesarean section	1 (0.4)	1 (0.9)	2 (0.6)	2 (0.5)	1.1	0.91
Resuscitation	9 (3.7)	9 (7.7)	18 (5.0)	9 (2.2)	2.2	0.04
Other complication	15 (6.2)	10 (8.5)	25 (7.0)	9 (2.2)	3.1	0.002

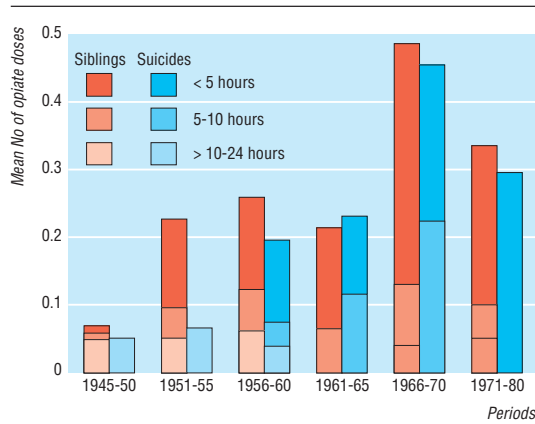


Fig 3 Mean number of opiate doses given to mother per subject for three periods preceding birth during six periods for 242 adults who committed suicide and 403 biological siblings

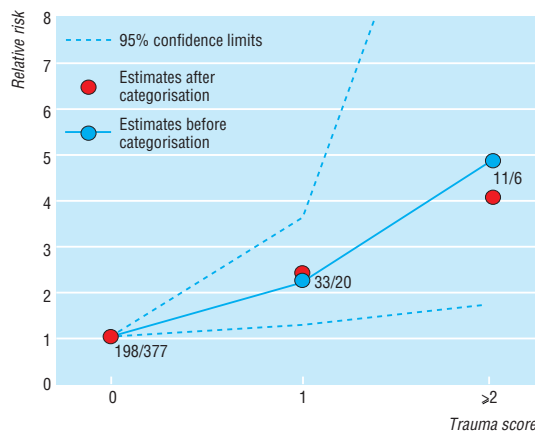


Fig 4 Relative risks (odds ratios) for committing suicide as an adult male after a single or multiple perinatal trauma. Values are numbers of suicides and siblings

The estimated relative risks of opiate doses were equal for both sexes: single dose (0.51, 0.31 to 0.83) and multiple doses (0.26, 0.09 to 0.69) (fig 5). A logistic regression of opiate administration as the dependent variable showed that only maternal age and birth order were significant. More opiates were given to the youngest maternal age group (odds ratio 16.8, 1.8 to 153) ($P=0.01$) relative to the 25-29 category. The youngest maternal age group showed the lowest relative risk of infants committing suicide as an adult of 0.31 (0.09 to 1.04, $P=0.06$).

When entered as indicator variables, perinatal trauma and absence of opiates to the mothers during delivery yielded relative risks of 2.70 (1.46 to 5.00) and 1.95 (1.1 to 3.4, $P=0.02$) respectively. If these risks are causal then they correspond to population attributable percentages of 17% and 43% respectively.

Discussion

Our prospective case-control study benefitted from no potential recall bias, since data were collected at the time of birth. The effectiveness of the study design using cases matched with biological siblings was

confirmed by 13 of 15 considered potential confounders, particularly order of birth, being non-significant. This suggests that influences from unknown potential confounders are also effectively reduced. Moreover, the number of unrecorded potential confounders is limited because the obstetric procedures that were found significant only occurred during the initial few hours of the subject's life.

The increase in the contribution of obstetric and neonatal measures to the trauma score after 1965 does not seem to be due to an increased accuracy in record keeping during recent years, since the number of recorded presentations other than vertex and meconium stained amniotic fluid and membranes has not correspondingly increased. We conclude that the observed increase is real and reflects more active obstetrical care for reducing perinatal complications.

We cannot exclude the possibility that it may be the circumstances giving rise to the need for a traumatic intervention that are the cause of the increased suicide risk, rather than the intervention itself. Perhaps these individuals are at a high risk in some subtle way, for which the need for obstetric intervention is merely a marker. Yet this does not explain why other trauma, not related to obstetric procedures, are also associated with violent suicide.

If opiates did not have any beneficial effects on the long term outcome, we would have expected that mothers had been given more opiates when giving birth to subjects who subsequently committed suicide, since those births were often the most complicated. But the opposite effect was observed, and we regard this as an indication that opiates might protect the infant from violent suicide as an adult.

Irrespective of the explanation for the opiate effect, it seems important that an obstetric procedure, of only a couple of hours at birth, might have a long term protective effect in adulthood. If treatment with opiates does not confer protection there must be another closely associated factor present at or before birth that makes an infant less prone than its sibling to violent suicide as an adult.

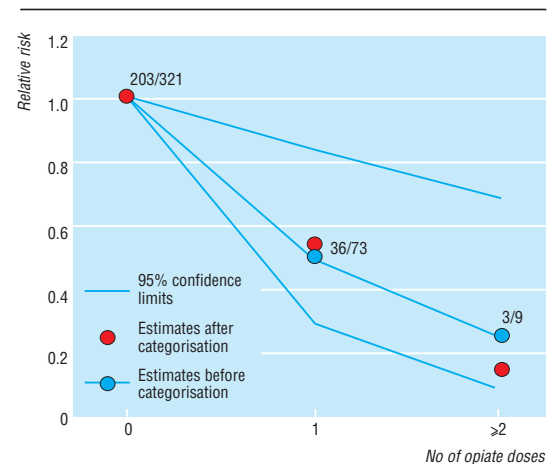


Fig 5 Relative risks (odds ratios) for committing suicide as an adult when a single or a multiple dose of opiates had been given to the mother within 24 hours before birth. Values are numbers of suicides and siblings

An alternative explanation could be that painful deliveries make women ambivalent towards their infants, and as a consequence they are less motivated to provide good child care, and that treatment with opiates might counteract such a mechanism. Obstetric procedures that alleviate pain are then equally important.

It seems strange that maternal age was significant, particularly as the highest risk of subsequent violent suicide was associated with the 25-29 age group, and that the risk was considerably lower for very young mothers. It should be noted, however, that the youngest mothers received the most opiates, which might have reduced the effect of any perinatal trauma on their infants.

The attributable fractions apply to the population studied only; because of familial factors (unpublished data) at least the opiate effect is not applicable to the general population. Yet the size of the fractions, 17% and 43%, respectively, indicates that the effects can be substantial.

This study suggests that the risk for a subsequent violent suicide is approximately halved in those subjects of certain mothers who received one treatment with opiates. But treatment with opiates might lead to subsequent opiate drug addiction in the offspring.⁷ Hence, in spite of the results of our study it seems incorrect to recommend the use of opiates. In one study subjects addicted to opiates had a 63 times greater mortality than expected.⁸ The gain in preventing a violent suicide in favour of an opiate addiction is dubious. We have no suggestion for an alternative drug for protecting infants that has no unwanted effects.

The incidence of adolescent suicide has increased in many developed countries during the past few decades. These are the cohorts that were born during the mid 40s and later when more active obstetric procedures were applied to reduce fetal asphyxia. We believe that obstetric procedures should be chosen to minimise pain and discomfort to the infant if an increased risk of suicide by violent means is to be avoided.

Our findings could be further corroborated by studies of not just subjects who commit suicide but also of those of accident proneness. Then, because of familial factors, it is of fundamental importance to eliminate confounders by using siblings as controls.

This study was approved by the ethics committee of the Karolinska Institute. We thank Karin Nyberg, Gunnar Eklund, and Ole Olsen for valuable assistance, and Rován Rajs and Kari

Key messages

- Adverse perinatal conditions are associated with an increased risk of suicide by violent means for adult men
- Giving opiates to the mother during delivery was associated with a decreased risk of subsequent suicide by violent means in offspring
- Similar studies of accident proneness as well as suicides by violent means are required possibly to corroborate the findings
- Obstetric procedures should be chosen that reduce perinatal trauma to minimise the possible risk for subsequent adult self destructive behaviour

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Contributors: BJ formulated the hypothesis, designed the protocol for the collection of forensic and birth record data, supervised data collection, analysed the results with assistance of expertise in statistics, and participated in interpreting the findings and in writing the paper. MB discussed core ideas, particularly regarding obstetric matters, and participated in analysing and interpreting the data and in writing the paper. Both authors will act as guarantors for the paper.

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Conflict of interest: None.

- 1 Salk L, Lipsitt LP, Sturmer WQ, Reilly BM, Levat RH. Relationship of maternal and perinatal conditions to eventual adolescent suicide. *Lancet* 1985;i:624-7.
- 2 Jacobson B, Eklund G, Hamberger L, Linnarsson D, Sedvall G, Valverius M. Perinatal origin of adult self-destructive behavior. *Acta Psychiatr Scand* 1987;76:364-71.
- 3 James H. Imprinting with visual flicker: Effects of testosterone cyclopentylpropionate. *Anim Behav* 1962;10:341-6.
- 4 Nyberg K, Allebeck P, Eklund G, Jacobson B. Obstetric medication versus residential area as perinatal risk factors for subsequent adult drug addiction in offspring. *Paediatr Perinat Epidemiol* 1993;7:23-32.
- 5 Breslow NE, Day NE. Statistical methods in cancer research. Lyons: World Health Organisation, International Agency for Research on Cancer, Scientific Publication No 32, vol 1, 1980:248-79.
- 6 Walter SD. The distribution of Levin's measure of attributable risk. *Biometrika* 1975;62:371-4.
- 7 Jacobson B, Nyberg K, Grönbladh L, Eklund G, Bygdeman M, Rydberg U. Opiate addiction in adult offspring through possible imprinting after obstetric treatment. *BMJ* 1990;301:1067-70.
- 8 Grönbladh L, Öhlund LS, Gunne LM. Mortality in heroin addiction: impact of methadone treatment. *Acta Psychiatr Scand* 1990;82:223-7. (Accepted 28 July 1998)

Fifty years ago The new NHS: NHS

No one expected that such a vast scheme as that outlined in the National Health Service Act of 1946 would begin in a way that would please everybody—least of all those upon whom the main burden of the work falls, the medical men and women of this country. The situation is still too confused to give anything like a clear picture of what is happening, but perhaps the most noteworthy fact is the eagerness with which the public has sought to take advantage of a service which, in effect, guarantees the supply, free of direct charge, of everything from wigs to iron lungs. There has been an overwhelming demand for spectacles and dentures, and a run on the chemist shops so fast at times as almost to exhaust the supplies of certain pharmaceutical products. Presumably in time the novelty will wear off and the

demand for such things as spectacles will decrease as the numbers of those apparently needing them diminish. This rush of the public for remedies and appliances has put an acute strain upon the medical professions especially those in general practice. Evidence comes in from all over the country that doctors' surgeries are crowded out, and the doctors themselves deplore that this heavy pressure of work has made it at times impossible for them to give their patients adequate care and attention. If the demand for the doctor's time continues at the present level we can foresee that in the event of an epidemic in the winter the life of the general practitioner in particular will become intolerable. (*Letter*, 3 November 1948, p 864. See also editorial by Gordon Macpherson, 3 January 1998, p 6.)