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Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study

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Abstract

Objective To estimate the risk of suicide in young people related to family and individual psychiatric and socioeconomic factors.
Design Population based nested case-control study.
Setting Data from longitudinal Danish registers.
Cases and controls 496 young people aged 10-21 years who had committed suicide during 1981-97 in Denmark and 24 800 controls matched for sex, age, and time.
Main outcome measures All suicides in Denmark compared with controls; parents and siblings identified from population based registers; inpatient information from discharge registers of national hospitals; and socioeconomic data from administrative registers.
Results Parental factors associated with an increased risk of suicide in young people were suicide or early death, admission to hospital for a mental illness, unemployment, low income, poor schooling, and divorce, as well as mental illness in siblings and mental illness and short duration of schooling in the young people themselves. The strongest risk factor was mental illness in the young people. The effect of the parents' socioeconomic factors decreased after adjustment for a family history of mental illness and a family history of suicide.
Conclusions Recognising mental illness in young people and dealing with it appropriately could help prevent suicides. The high relative risk associated with a low socioeconomic status of the parents may be confounded and overestimated if not adjusted for mental illness and suicide in the family.

Introduction

In recent years there has been growing concern over suicide in young people, particularly as the rates have increased in several countries.[1 2] Young people who commit suicide often have a history of mental illness, a family history of mental illness or suicidal behaviour, or dysfunctional family backgrounds such as divorce or socioeconomic adversity.[3–7]

Several countries have developed preventive strategies for suicide, and in some of these countries young people are considered an important target group.[8] Preventive strategies cannot, however, be based on empirical evidence as this does not exist.[9] Current knowledge of risk factors for suicide in young people stems from either studies of risk factors in people that have attempted suicide or studies of psychological autopsy (information collected on the deceased through interviews with family members, relatives, friends, and healthcare staff), in which recall bias cannot be excluded. We aimed to determine the effect of familial, psychiatric, and socioeconomic factors in young people who had committed suicide.

Methods

Sources of data

We obtained data from Danish population based registers on the basis of the unique identification number assigned to everyone living in Denmark.[10] We identified the biological mother, father, and siblings from the Danish civil registration system.[10]

The Danish medical register on vital statistics contains the dates and causes of all deaths in Denmark since 1976 and for suicides since 1970.[11] The Danish psychiatric central register includes the dates for admission and discharge and diagnoses for all psychiatric inpatients in Denmark since 1969.[12]

The integrated database for longitudinal labour market research contains detailed yearly information for the Danish population from 1980 onwards. Information was only recorded for people living in the country on 31 December, thus excluding those who had emigrated or died within the year.

Nested case-control design

We identified 496 cases of suicide during 1981-97 in young people aged 10-21 years who had a reference to a biological mother and who were living in Denmark the previous year. We matched each person to a representative random subsample of 50 people of the same sex who were born the same year, were alive at the particular age (days) and date, had a reference to a biological mother, and were living in Denmark the previous year.[13] This yielded 24 800 controls.

From the Danish psychiatric central register we added explanatory variables indicating whether the person, at the last admission before the matching date, had been admitted to a psychiatric hospital with schizophrenia, affective disorders, eating disorders, and other psychiatric diagnoses. Deliberate self harm before and during admission was only recorded for 1989-94.

We linked parents and siblings born before the matching date to the Danish medical register on vital statistics and the Danish psychiatric central register, and we obtained information on suicide and other causes of death and admission status before the particular matching date. We also included alcoholism in parents.

Variables for socioeconomic factors in the parents were marital status, job status, educational attainment, and income. We included these only for parents alive at the matching date and living in Denmark on December 31 the previous year. We grouped educational attainment into university, vocational training, high school, primary school, and unknown.

Statistical analysis

We used Fisher's Monte Carlo sampled exact test for homogeneity between the two sexes with age among the cases. We analysed data by conditional logistic regression. We calculated the attributable risk after adjustment for other risk factors from the fitted model.

Table 1 Suicide in relation to individual mental illness and educational level, suicide and admission for mental illness in parent, and socioeconomic status of parents for 496 young people who committed suicide and 24 800 controls. Values are incidence rate ratios (95% confidence intervals) unless stated otherwise

Risk factor and category	No of cases/controls	Adjusted for age and sex	Adjusted for psychiatric admission in parent*	Adjusted incidence rate ratio
Father				
Vital status:				
Death by suicide	10/138	3.80 (1.99 to 7.26)	3.03 (1.53 to 5.98)	2.30 (1.10 to 4.80)
Death by other cause	9/350	1.35 (0.69 to 2.63)	0.80 (0.39 to 1.65)	0.63 (0.29 to 1.35)
Emigrated or unknown at subject's birth	38/1280	1.56 (1.11 to 2.19)	1.36 (0.96 to 1.94)	1.08 (0.66 to 1.75)
Living in Denmark	439/23032	1	1	1
Psychiatric history:				
Admitted versus not admitted	54/1170	2.46 (1.85 to 3.29)	1.90 (1.39 to 2.57)	1.56 (1.12 to 2.19)
Marital status:				
Married or cohabitant versus other	334/19794	0.52 (0.42 to 0.65)	0.67 (0.53 to 0.85)	0.77 (0.58 to 1.03)
Job status:				
Fully employed or self employed	308/17835	1	1	1
% employment in year:				
80-99	26/1586	0.95 (0.63 to 1.42)	0.90 (0.59 to 1.36)	0.85 (0.56 to 1.29)
20-79	40/1619	1.43 (1.02 to 2.00)	1.37 (0.98 to 1.93)	1.19 (0.82 to 1.72)
0-19	15/453	1.92 (1.13 to 3.25)	1.61 (0.93 to 2.78)	1.34 (0.74 to 2.41)
Recipient of social benefits	50/1539	1.89 (1.39 to 2.55)	1.35 (0.96 to 1.88)	1.12 (0.76 to 1.65)
Educational achievement:				
University or other of longer duration	66/4349	0.68 (0.51 to 0.90)	0.71 (0.53 to 0.95)	0.73 (0.52 to 1.01)
Vocational training	159/9203	0.77 (0.62 to 0.97)	0.80 (0.64 to 1.01)	0.83 (0.66 to 1.05)
High school	7/233	1.33 (0.62 to 2.88)	1.09 (0.47 to 2.50)	1.13 (0.48 to 2.65)
Unknown	86/3380	1.03 (0.75 to 1.42)	1.01 (0.73 to 1.40)	0.95 (0.68 to 1.33)
Primary school	159/7137	1	1	1
Income:				
Lowest quarter versus other	129/4946	1.52 (1.24 to 1.88)	1.26 (1.01 to 1.57)	1.04 (0.79 to 1.36)
Mother				
Vital status:				
Death by suicide	9/63	7.55 (3.74 to 15.3)	4.77 (2.20 to 10.3)	4.75 (2.10 to 10.8)
Death by other cause	10/212	2.49 (1.31 to 4.75)	2.05 (1.04 to 4.01)	2.06 (1.02 to 4.19)
Emigrated	17/314	2.86 (1.74 to 4.70)	2.34 (1.38 to 3.97)	2.09 (1.11 to 3.96)
Living in Denmark	460/24211	1	1	1
Psychiatric history				
Admitted versus not admitted	75/1375	3.06 (2.37 to 3.93)	2.02 (1.53 to 2.66)	1.73 (1.29 to 2.32)
Marital status:				
Married or cohabitant versus other	341/19800	0.71 (0.58 to 0.88)	0.84 (0.67 to 1.05)	1.04 (0.80 to 1.37)
Job status:				
Fully employed or self employed	280/16386	1	1	1
% employment in year:				
80-99	32/1725	1.08 (0.75 to 1.57)	1.08 (0.75 to 1.57)	1.02 (0.70 to 1.49)
20-79	49/2095	1.37 (1.01 to 1.86)	1.22 (0.89 to 1.67)	1.13 (0.82 to 1.56)
0-19%	21/715	1.72 (1.10 to 2.69)	1.51 (0.95 to 2.39)	1.37 (0.85 to 2.20)
Recipient of social benefits	78/3290	1.39 (1.08 to 1.79)	1.10 (0.84 to 1.45)	1.05 (0.76 to 1.47)
Educational achievement:				
University or other of longer duration	76/4258	0.89 (0.68 to 1.17)	0.96 (0.73 to 1.26)	1.15 (0.84 to 1.56)
Vocational training	135/7758	0.88 (0.70 to 1.09)	0.98 (0.78 to 1.23)	1.11 (0.88 to 1.41)
High school	10/307	1.63 (0.85 to 3.11)	1.35 (0.68 to 2.72)	1.46 (0.72 to 2.98)
Unknown	50/1821	1.13 (0.79 to 1.62)	1.13 (0.78 to 1.63)	1.10 (0.76 to 1.60)
Primary school	206/10381	1	1	1
Income:				
Lowest quarter versus other	137/6349	1.19 (0.98 to 1.46)	1.04 (0.84 to 1.28)	0.99 (0.77 to 1.28)
Siblings				
At least one sibling versus none	466/23103	1.14 (0.79 to 1.66)	1.17 (0.80 to 1.72)	1.29 (0.87 to 1.90)
Psychiatric history:				
Admitted versus other	27/586	2.39 (1.61 to 3.56)	1.29 (0.83 to 2.01)	1.21 (0.78 to 1.88)
Dead by suicide:				
One or more siblings versus none	1/19	2.64 (0.35 to 19.8)	1.34 (0.16 to 11.6)	1.40 (0.17 to 11.7)
Dead by other cause				
One sibling versus none	7/282	1.25 (0.59 to 2.67)	1.18 (0.54 to 2.56)	1.13 (0.52 to 2.45)
Psychiatric history:				
Schizophrenia	15/23	39.5 (20.4 to 76.7)	35.5 (18.0 to 69.7)	33.1 (16.5 to 66.3)
Affective disorders	4/8	35.0 (9.97 to 123)	25.7 (7.10 to 92.9)	24.3 (6.64 to 88.7)
Eating disorders	2/1	120 (10.6 to 1356)	74.2 (6.35 to 865)	84.9 (7.17 to 1006)
Other diagnoses	57/222	15.3 (11.2 to 20.8)	11.9 (8.61 to 16.5)	10.8 (7.75 to 15.0)
Never admitted	418/24546	1	1	1
Educational achievement:				
High school or other of longer duration	31/2238	0.55 (0.37 to 0.81)	0.66 (0.45 to 0.99)	0.71 (0.47 to 1.07)
Vocational training	10/1480	0.26 (0.14 to 0.49)	0.35 (0.18 to 0.68)	0.37 (0.19 to 0.70)
Primary school	455/21082	1	1	1

*Adjusted for age, sex, calendar time, and individual and family history of admission for mental illness.

Table 2 Percentage attributable risk according to individual and parental history of suicide or admission for mental illness

Risk factor	Attributable risk (95% CI)
Father:	
Suicide	1.1 (0.0 to 2.0)
Admission for mental illness	3.9 (1.3 to 6.4)
Mother:	
Suicide	1.4 (0.0 to 2.4)
Admission for mental illness	6.4 (3.5 to 9.3)
Individual admission for mental illness	15 (12 to 17)

Results

Overall, 496 young people in Denmark committed suicide during 1981-97. Males were three and a half times more likely to commit suicide than were females (386 *v* 110), and the number of suicides increased homogeneously with age in both sexes.

The risk of suicide was increased among young people with a parental history of suicide, admission for a mental illness, being single, being unemployed (dose-response association), or being a recipient of social benefits, or whose sibling had been admitted with a mental illness, whose mother had died from other causes or had emigrated, or whose father had a poor education or was in the lowest quarter for income (table 1). In the young people themselves a strong association was found between suicide and admission to hospital for mental illnesses, and an inverse association was found between risk of suicide and education.

The effect of the risk factors decreased after adjustment for a family history of admission for a mental illness (table 1). This decrease was more pronounced for parental socioeconomic factors and less distinct for factors related to parental vital status and psychiatric history, whereas the effect of individual admission for a mental illness remained the main risk factor.

When all factors were considered a history of admission with a mental illness among the young people was relatively unchanged and remained the strongest risk factor.

The distribution of risk factors and the adjusted relative risk associated with the most significant factors were transformed into attributable risks (table 2). If all individuals had a similar risk to those not exposed to individual mental illness, mental illness in a parent, or suicide of a parent, the proportion of suicides that would be prevented was about 30%, of which 15% was attributed to mental illness in the young person.

What is already known on this topic

Young people who commit suicide have a history of mental illness or a family history of mental illness or suicidal behaviour

Dysfunctional family backgrounds and socioeconomic adversity also contribute to suicide in young people

Targets for preventive strategies are controversial, as few population based studies have been done and none have included all risk factors

What this study adds

Suicide is more likely among young people if a parent commits suicide or there is a history of mental illness in the individual and their siblings

Socioeconomic risk factors seem to be less important

Preventive strategies should be aimed at the early recognition and optimal treatment of mental illnesses

Discussion

Our results from the unadjusted model agree with previous reports of increased risks of suicide associated with aggregation of mental illness, suicidal behaviour, divorce, decreasing levels of employment, and increasing poverty in the family.[4–7] However, we found that when the results from studies of divorce and socioeconomic status in parents were not adjusted for mental illness and suicide in the family they were likely to be confounded by overestimating the effect of the risk factors. We lacked data for quantifying the effect of exposure to adverse, dysfunctional, or abusive circumstances in the family or during childhood. A further hypothesis, supported by a recent study of suicides in adults, could be that the importance of socioeconomic factors might be different in families with a history of mental illness or suicide.[14]

Studies in twins and adopted children suggest that genetic factors play a part in suicide in families.[15 16] However, it is unknown whether suicide is mediated by mental illness or by specific genes. Our study confirms an increased risk of suicide in the offspring of parents that commit suicide, although the effect of upbringing cannot be separated from genetic factors. This effect could not be explained by a history of admission for a mental illness in the family, and therefore our findings could be explained only by the effect of untreated or under treated mental illness in the family or by genetic factors.

We also found that young people were at a higher risk of committing suicide if their mother had died early, making the link between early death and unmeasured socioeconomic hardship less likely. Young people were also more likely to commit suicide if their mother had emigrated the year before the suicide or was living abroad. Although these differences are crude proxies for the parent-child relationship, they do suggest that an impaired relationship and poor attachment and bonding between mother and child are more important than those between father and child.[2 5]

We found that 15% of the young people who had committed suicide had been admitted for a mental illness, which compares to a Finnish study but is lower than in other studies and less than in the adult population.[17–20] Studies that are based on psychological autopsy, selected populations, or interviews with survivors, carry a risk of overestimating the prevalence of mental illness because of recall bias. The effects of mental illness in our study could be overestimated if those who had the more severe mental illness were also more likely to be admitted to a psychiatric hospital. Otherwise, the effect of mental illness could be underestimated if the distributions of severity were the same among individuals admitted as those not admitted. Thus a limitation of our study is that the results were based solely on histories of inpatient admissions.

The effect of mental illness and suicide in a parent as well as the effect of limited schooling in the young people themselves may partly reflect a deficiency in the

diagnosis and treatment of mental illnesses. A substantial proportion of young people who commit suicide may have an untreated, under treated, or undiagnosed mental illness.

The rate of suicide was even greater in females admitted with a mental illness, confirmed by a recent study of suicide in adults.[21] The most likely explanation for this is that young males, not treated for mental illness had a higher suicide rate than their female counterparts. Furthermore, the rate is strongly linked to disorders that are more common among females; in our study all but schizophrenia.[22]

We found that mental illness in young people and a family history of suicide and mental illness were the most important risk factors for suicide among young people. Therefore an important target in the prevention of suicide in young people would be the early recognition and treatment of mental illness. Improved psychopathological assessment and treatment after discharge from psychiatric facilities could therefore help decrease suicide rates. However, as only 30% of the suicides in our study could be attributed to these factors, preventive measures should be aimed at the general population.

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Drug points

Interaction between warfarin and topical miconazole cream

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Miconazole is a broad spectrum antifungal agent. When co-administered with warfarin it may increase the anticoagulant effect of the warfarin by inhibiting hepatic microsomal cytochrome *P*-450 enzymes.[1] Trace amounts of miconazole have been detected systemically after topical administration.[2] An interaction of warfarin with miconazole oral gel and pessary formulations has also been reported.[3–5] We report the loss of control of anticoagulation in a patient taking over the counter miconazole cream for flexural intertrigo.

An 80 year old man had been taking warfarin long term for atrial fibrillation, and his mean dose over the preceding 12 months was 6 mg daily. This dose had kept his international normalized ratio between 2.2 and 3.1, but at a routine appointment it was found to be 21.4, although there had been no evidence of bruising or bleeding. He denied any change to his normal warfarin dose and had continued with his other usual once daily drugs (atenolol 50 mg, isosorbide mononitrate 20 mg, and diltiazem 400 mg). However, he had been applying topical miconazole cream for a fungal infection over the right groin area during the previous two weeks. He was admitted to hospital, where his warfarin and miconazole were withdrawn and he was given fresh frozen plasma. His international normalized ratio returned to 3.2 and his warfarin was reinstated five days later at a daily dose of 6 mg. Since he was discharged he has remained on warfarin 6 mg and his international normalized ratio has been stable.

In the absence of other explanations, we assume that topical absorption of miconazole had occurred, which led to loss of anticoagulant control. On the basis of this and reports about other topical formulations, patients taking warfarin should be advised to avoid any form of treatment with miconazole. If this is not possible, control of anticoagulation must be monitored closely.

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