Suicide in perinatal and non-perinatal women in contact with psychiatric services: 15 year findings from a UK national inquiry

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Summary

Background Suicide in pregnant and postnatal women is an important cause of maternal death, but evidence to guide suicide prevention in this group is scarce. We aimed to compare the trend, nature, and correlates of suicide in perinatal and non-perinatal women in contact with psychiatric services.

Methods We used 1997–2012 data from the UK National Confidential Inquiry into Suicides and Homicides by People with Mental Illness, which includes all suicides by people (age ≥10 years) who had been in contact with psychiatric services in the previous year. The study sample comprised all women who died by suicide in pregnancy or the first postnatal year (perinatal suicides), and all women in the same age range who died by suicide outside this period (non-perinatal suicides). We compared suicides among perinatal and non-perinatal women with logistic regression of multiply imputed data.

Findings The study sample included 4785 women aged 16–50 years who died by suicide, of whom 98 (2%) died in the perinatal period. Of the 1485 women aged 20–35 years, 74 (4%) women died in the perinatal period. Over the course of the study, we recorded a modest downward trend in the mean number of women dying by suicide in the non-perinatal period (–2·07 per year [SD 0·96]; p=0·026), but not the perinatal period (–0·07 per year [0·37]; p=0·58). Compared with non-perinatal women, women who died by suicide in the perinatal period were more likely to have a diagnosis of depression (adjusted odds ratio [OR] 2·19 [95% CI 1·43–3·34]; p<0·001) and less likely to be receiving any active treatment (0·46 [0·24–0·89]; p=0·022) at the time of death. Women who died by suicide within versus outside the perinatal period were also more likely to be younger (crude OR –6·39 [95% CI –8·15 to –4·62]; p<0·0001) and married (4·46 [2·93–6·80]; p<0·0001), with shorter illness duration (2·93 [1·88–4·56]; p<0·001) and no history of alcohol misuse (0·47 [0·24–0·92]; p=0·027). There were no differences in service contact or treatment adherence.

Interpretation In women in contact with UK psychiatric services, suicides in the perinatal period were more likely to occur in those with a depression diagnosis and no active treatment at the time of death. Assertive follow-up and treatment of perinatal women in contact with psychiatric services are needed to address suicide risk in this group.

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See Comment page 191

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Introduction

Suicide is an important cause of death during pregnancy and the first postnatal year, accounting for about 5–20% of maternal deaths in high-income countries,[1–7] and 1–5% in low-income and middle-income countries.[8] National inquiries have repeatedly called for improved detection and management of suicide risk in perinatal (pregnant and post-partum) women.[1,2] Suicide in women is rare, with an annual rate of about five to ten deaths per 100 000 population,[9] and rarer still in the perinatal period, with a rate of one to five deaths per 100 000 livebirths in high-income settings.[7,10,11] Prevention of such a rare outcome is challenging, and will probably require targeted intervention in high-risk women.[12]

Most women who die by suicide in the perinatal period have a known history of mental illness,[1,3,7,13] and, in Europe, 50–60% receive care from psychiatric services during their index pregnancy or postnatal period,[1,2,7] which provides an opportunity for suicide prevention. Mental illness in the perinatal period has a distinct clinical presentation. For example, women are more likely to stop medication in the perinatal period than at other times,[14–16] and are more likely to have abrupt onset, rapidly deteriorating psychosis in the postnatal period.[17] Although most women have increased contact with health service during pregnancy, some might avoid services because of fear of stigma or child custody loss.[13] These clinical differences might be reflected in a distinct suicide risk profile, but the risk profile of perinatal compared with non-perinatal suicides is poorly understood.

Previous studies of suicides in the perinatal period have several limitations: many focus on a single geographical area[3,18–21] and examine a small number of correlates.[22,23] Studies based on maternal death inquiries have a brief reference period, examine only a few suicides at a given time, have insufficient data for psychiatric illness and service contact, and focus exclusively on the maternal population, and thus do not allow direct comparisons with suicides outside the perinatal period.[1,2,24,25] Women in contact with psychiatric services are an important high-risk group,[6,7,23,26] but few studies have examined their clinical presentation and treatment before suicide.

Research in context

Evidence before this study

We aimed to inform suicide prevention strategies in the perinatal period (during pregnancy and in the first postnatal year) by comparing the characteristics of women who died by suicide within and outside the perinatal period for women who had been in recent contact with UK psychiatric services. We searched MEDLINE for reviews and peer-reviewed articles published between Jan 1, 1990, and Oct 25, 2015, with evidence of the extent or risk factors for perinatal suicide in the general population and in psychiatric patients. Our search terms were (suicide or Suicide/) and (pregnancy or antenatal or postnatal or perinatal or maternal or Pregnancy/ or Perinatal Death/ or Perinatal Mortality/ or Maternal Mortality/). We also reviewed all available publications from the UK Confidential Enquiries into Maternal Deaths. Most studies used general population data and reported that suicide rates during pregnancy and the postnatal period were about two to three times lower than age-adjusted rates in non-perinatal women, in both high-income countries and low-income and middle-income settings. The proportion of maternal deaths attributable to suicide in most studies ranged from roughly less than 1% to 5% in low-income and middle-income countries (Fuhr DC, et al, 2014) and from 3% to 13% in high-income countries (as reported in studies from Europe, North America, and Australia). Few studies examined risk factors for maternal suicides. Reported risk factors included mental illness (present in 30–70% of maternal suicides), substance misuse, intimate partner violence, neonatal complications (particularly perinatal death), and medical comorbidity. Associations with age and socioeconomic status differed by setting and timing of suicide, with teenagers reported to have a higher risk of pregnancy suicide than women of other ages, especially in low-income and middle-income countries.

We identified one study of psychiatric patients, which investigated suicide rates in women admitted to a psychiatric hospital in the first postnatal year in Denmark over a 21 year period. This study reported that 0·9% of the women died by suicide in the first postnatal year (a 70 times higher risk than women in the general population) and 3·3% died by suicide over the whole study period (a 17 times higher risk). These findings suggest that the post-partum period, which is protective against suicide in the general population, is a high-risk period for women with severe post-partum mental illness. Qualitative evidence from maternal death inquiries suggest that mental illness is often undetected in perinatal women who die by suicide and, when detected, is often suboptimally managed, but these findings have not been investigated quantitatively. We did not find other evidence of the characteristics or risk profile of psychiatric patients who die by suicide in the perinatal period.

Added value of this study

This study is one of the largest case series of perinatal suicides among women in contact with psychiatric services, and uniquely compares sociodemographic and clinical characteristic of patients who died by suicide within and outside the perinatal period. We reported that women in contact with psychiatric services who died by suicide in the perinatal period were more likely to be young and married, and to have shorter mental illness duration and no history of alcohol misuse, than were those who died outside that period. Almost half of perinatal women had a diagnosis of depression (compared with a third of non-perinatal women) and a fifth had a diagnosis of schizophrenia or personality disorder; a quarter had a history of self-harm. A substantial minority were not receiving any active treatment or follow-up at the time of death. About three-quarters of women who died by suicide in the perinatal period used a violent suicide method (possibly indicating severe illness and serious intent).

Implications of all the available evidence

In the general population, suicide in the perinatal period is less common than at other times in a woman's life, but this protective effect might not apply to women in contact with psychiatric services (ie, those with severe mental illness), who might have a particularly high suicide risk in the first postnatal year. Women who die by suicide in the perinatal period are more likely to have a brief illness and depression diagnosis, and are less likely to be receiving active treatment, than are women who die by suicide outside this period. Clinicians should be aware that women with severe perinatal depression in particular are a group at risk of suicide who need careful monitoring and treatment.

To address some of these evidence gaps, we aimed to compare the characteristics of women who died by suicide within and outside the perinatal period for women who had been in recent contact with UK psychiatric services, and to compare suicide trends and methods in these two groups. More specifically, we aimed to test the hypotheses that women who died by suicide in the perinatal period were more likely to be non-adherent with medication and less likely to have been assessed as high risk by clinicians (on the basis of clinical differences between perinatal and non-perinatal patients).[17,27]

Methods

Study design and study sample

We used 1997–2012 data from the UK National Confidential Inquiry into Suicide and Homicide by People with Mental Illness (NCISH). NCISH aims to identify all UK suicides by people aged 10 years and older who had been in contact with psychiatric services (in this context, any service provided by a secondary mental health-care provider) in the 12 months preceding the suicide. This contact can comprise outpatient, day-care, inpatient, or crisis home treatment care provided by one

or more members of the multidisciplinary team, which commonly includes psychiatrists, psychologists, nurses, mental health social workers, and occupational therapists. Inquiry data collection is done in three steps. First, preliminary data is obtained for all UK suicides (ie, deaths that received a suicide or open verdict at a coroner's inquest), by use of the relevant national death registers in England, Scotland, Wales, and Northern Ireland. Second, providers of psychiatric services in each deceased person's district of residence or death (and neighbouring districts) are contacted to establish whether the person had been in contact with them in the 12 months preceding suicide. The Inquiry contacts both National Health Service (NHS) and private providers. UK residents are entitled to free NHS health care in the boroughs where they live, and most patients use local public (NHS) psychiatric services rather than private services. Finally, for individuals with psychiatric contact, demographic and clinical data are obtained by sending a structured questionnaire to the patient's consultant psychiatrist.[28] The questionnaire is completed by the consultant psychiatrist or another senior team member, with information derived from personal knowledge of the patient, all available psychiatric records, and from other team members involved in the patient's care as appropriate. The questionnaire includes a question about whether the person who died by suicide was a woman who was pregnant or less than 1 year postnatal. We used the responses to this question to define perinatal versus non-perinatal suicides in this study.

The study sample comprised all women who died by suicide in pregnancy or the first postnatal year (perinatal suicides), and all women in the same age range who died by suicide outside this period (non-perinatal suicides). We excluded women with missing data for whether suicide was in the perinatal period. We compared several characteristics in women who died by suicide within and outside the perinatal period (as reported by the clinical team in the Inquiry's structured questionnaire): sociodemographics, clinical characteristics, treatment at the time of death, symptom profile and risk assessment at last contact, and suicide method. We also compared the above characteristics in women who died by suicide in pregnancy with those who died in the postnatal period.

Statistical analysis

We assessed binary associations with χ^2 tests for categorical measures and *t* tests for continuous measures; two-sided p values are reported. We did trend analysis with Poisson regression with identity link function.

We investigated the extent and pattern of missing data to guide modelling strategy. We used multiple imputation to handle missing data. This technique was done with sequential regression multivariate imputation (M=20 imputations), and included all variables used in the post-imputation analysis models. Crude and

	Perinatal women (n=98)	Non-perinatal women (n=4687)	p value*
Sociodemographic characteristics			
Age (years)	30·5 (6·4)	36·9 (8·9)	<0·0001
Race or ethnic origin			0·204
White	86 (87%)	4288 (91%)	
Other†	10 (10%)	324 (7%)	
Missing‡	2 (2%)	75 (2%)	
Relationship status			<0·0001
Single	16 (16%)	40·7 (1906)	
Separated, or divorced, or widowed	18 (18%)	29·4 (1376)	
Married	63 (64%)	28·7 (1345)	
Missing	1 (1%)	60 (1%)	
Living circumstances			<0·0001
Alone	14 (14%)	1710 (36%)	
With partner (with or without children)	62 (63%)	1386 (30%)	
With other adults (with or without children)	6 (6%)	935 (20%)	
With children only‡	14 (14%)	542 (12%)	
Missing	2 (2%)	114 (2%)	
Employment status			<0·0001
Unemployed	32 (33%)	2076 (44%)	
Long-term sickness	11 (11%)	877 (19%)	
Housewife	28 (29%)	584 (12%)	
Paid employment§	22 (22%)	821 (18%)	
Other (student, retired)	1 (1%)	187 (4%)	
Missing	4 (4%)	142 (3%)	
Accommodation at time of suicide			0·38
House or flat	90 (92%)	4231 (90%)	
Other (temporary, institution, or homeless)	5 (5%)	351 (7%)	
Missing	3 (3%)	105 (2%)	
Clinical characteristics			
Primary diagnosis			0·051
Depression	47 (48%)	1463 (31%)	
Bipolar affective disorder	8 (8%)	524 (11%)	
Schizophrenia and delusional disorders	13 (13%)	703 (15%)	
Personality disorder	11 (11%)	842 (18%)	
Anxiety disorder	7 (7%)	418 (9%)	
Alcohol misuse or dependence	4 (4%)	381 (8%)	
Drug misuse or dependence	5 (5%)	214 (5%)	
Other	2 (2%)	65 (1%)	
No mental disorder	0	38 (1%)	
Missing	1 (1%)	39 (1%)	
Duration of mental illness (years)¶			<0·0001
<1	38 (39%)	671 (14%)	
1–5	28 (29%)	1246 (27%)	
>5	30 (31%)	2652 (57%)	
No mental disorder	0	39 (1%)	
Missing	2 (2%)	79 (2%)	
Psychiatric admission in past			0·017
No	36 (37%)	1210 (26%)	
Yes	62 (63%)	3462 (74%)	
Missing	0	15 (<1%)	

(Table 1 continues on next page)

	Perinatal women (n=98)	Non-perinatal women (n=4687)	p value*
(Continued from previous page)			
History of alcohol misuse			0·0015
No	69 (70%)	2497 (53%)	
Yes, recent (<3 months)	10 (10%)	1000 (21%)	
Yes, not recent	18 (18%)	1109 (24%)	
Missing	1 (1%)	81 (2%)	
History of drug misuse			0·67
No	65 (66%)	3110 (66%)	
Yes, recent (<3 months)	10 (10%)	580 (12%)	
Yes, not recent	22 (22%)	912 (19%)	
Missing	1 (1%)	85 (2%)	
History of self-harm			0·35
No	26 (27%)	961 (21%)	
Yes, recent (<3 months)	24 (24%)	1286 (27%)	
Yes, not recent	48 (48%)	2373 (51%)	
Missing	1 (1%)	67 (1%)	
History of violence			0·036
No	88 (90%)	3848 (82%)	
Yes	8 (8%)	749 (16%)	
Missing	2 (2%)	90 (2%)	

Data are mean (SD) or n (%). *Excluding missing data. †Black African; Black Caribbean; Indian, Pakistani, or Bangladeshi; Chinese; mixed race and other. ‡p=0·41. §p=0·18. ¶Illness duration since clear onset of the primary diagnosis.

Table 1: **Sociodemographic and clinical characteristics**

	Perinatal women (n=98)	Non-perinatal women (n=4687)	p value
Treatment given at time of death			
Psychotropic medication			0·040
No	16 (16%)	518 (11%)	
Yes	60 (61%)	3464 (74%)	
Missing	22 (22%)	705 (15%)	
Psychological treatment			0·13
No	68 (69%)	3154 (67%)	
Yes	11 (11%)	830 (18%)	
Missing	19 (19%)	703 (15%)	
Other non-pharmacological*			0·32
No	54 (54%)	2471 (53%)	
Yes	28 (29%)	1651 (35%)	
Missing	17 (17%)	565 (12%)	
At least one of above treatments			0·008
No	13 (13%)	331 (7%)	
Yes	63 (64%)	3753 (80%)	
Missing	22 (22%)	603 (13%)	

(Table 2 continues on next page)

independent correlates of perinatal versus non-perinatal suicides were then assessed using logistic regression of imputed data, with adjustment for potential a-priori confounding when conceptually appropriate: clinical characteristics were adjusted for sociodemographics; and treatment, service contact, risk assessment, and suicide methods were adjusted for sociodemographics and clinical characteristics. We did three sets of sensitivity analyses: (1) complete data analyses with standard logistic regression, with findings compared with imputed data analyses; (2) complete data analyses with use of penalised maximum likelihood regression to explore and minimise small sample-size bias,[29,30] with findings compared with those from standard logistic regression; and (3) comparisons of postnatal suicides only (excluding pregnancy suicides) versus non-perinatal suicides. We did analyses with STATA (version 13.0).

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

The Inquiry case series included 5135 deaths by suicide in women aged 16–50 years who were in contact with psychiatric services in the year preceding their death. After exclusion of 350 (7%) cases with missing data for whether suicide was in the perinatal period, the study sample included 4785 women who died by suicide, of whom 80 (2%) women died in the first postnatal year and 18 (<1%) women died during pregnancy. 98 (2%) of 4785 suicides in women aged 16–50 years and 74 (4%) of 1845 suicides in those aged 20–35 years were in the perinatal period. Over the course of the study, we recorded a significant modest downward trend in the mean number of women dying by suicide in the non-perinatal period (–2·07 per year [SD 0·96]; p=0·026), but not in the perinatal period (–0·07 per year [0·36]; p=0·58).

The 98 women who died by suicide in the perinatal period had a mean age of 30·5 years; most were married, roughly a fifth were employed, and 5% were living in temporary or supported accommodation (table 1). The most common primary diagnosis was depression, followed by schizophrenia and other delusional disorders, personality disorder, and bipolar disorder (table 1). Other primary diagnoses such as alcohol or drug dependence were reported for only a few women. More than a third of perinatal women had a mental illness duration (since clear onset of the primary diagnosis) of less than 1 year, and had no previous admissions (table 1). Roughly a tenth of these women had recent alcohol or drug misuse, and a quarter had self-harmed in the past 3 months (table 1).

At the time of death, 61% of perinatal women were prescribed psychotropic medication, 11% were receiving psychological treatment, and 29% were receiving other non-pharmacological treatment (table 2). At least 13% of

women were reported not to be receiving any of the above treatments (table 2). A fifth of women had not been seen for more than a month, a quarter had missed their last appointment with a mental health professional, and a fifth were non-adherent with prescribed medication (table 2). Risk was deemed to be moderate or high for 13% of women in the immediate term and for 30% of women in the long-term (table 2). The most common symptoms at the patients' last contact with a mental health professional were emotional distress (n=37) and depressed mood (n=35), followed by recent self-harm (n=16), suicidal ideas (n=12), and hopelessness (n=11; figure). Delusions or hallucinations were relatively rare (figure).

Most women who died by suicide in the perinatal period used a violent method, mainly by hanging or jumping (table 3). Roughly a quarter died by self-poisoning, with only 4% dying by overdose of psychotropics (table 3). Homicide followed by suicide was reported for 2% of the women who died by suicide in the perinatal period (in both cases the victims were the patients' children) and in less than 1% of women who died by suicide outside the perinatal period (the victims were known for only two of 11 cases, and both involved the patient's children).

Women who died by suicide within the perinatal period were more likely to be younger, married, and living with a partner than were those who died outside that period (table 4). After accounting for sociodemographic variables, perinatal women were more likely to have a primary diagnosis of depression and a mental illness duration of less than 1 year, and were less likely to have a history of alcohol misuse, than were non-perinatal women (table 4). After accounting for sociodemographic and clinical differences, perinatal women were half as likely to be receiving medication, or any pharmacological, psychological, or other treatment, at the time of death as were non-perinatal women (table 4). There were no crude differences in other demographic or clinical characteristics, including medication adherence and risk assessment (table 4). Perinatal women were more likely to use violent suicide methods than non-perinatal women (table 4), but this finding was no longer significant after adjustment for sociodemographic and clinical differences (table 4). Since most non-violent suicides were attributable to overdose (table 3), these findings are also reflected in the odds of dying after overdose of any substance (table 4). However, the odds of dying after overdose of psychotropic medication were a third lower in perinatal than non-perinatal women (table 4).

We report differences between suicide during pregnancy and suicide during the postnatal period at the 0·20 significance level, because the number of women who died by suicide during pregnancy was small, and statistical power to detect differences was low. Women who died by suicide during pregnancy (n=18) were less likely to have a diagnosis of depression than were women who died by suicide in the postnatal period (n=80; 33% *vs* 51%; p=0·16) and more likely to have a diagnosis of schizophrenia or related disorders (28% *vs* 10%; p=0·12) or bipolar disorder (17% *vs* 6%; p=0·15; appendix). Moreover, women who died by suicide during pregnancy were more likely to be non-adherent with prescribed medication in the month before their suicide than were women who died in the postnatal period (33% *vs* 15%; p=0·11), and were less likely to have self-harmed in the

See Online for appendix

	Perinatal women (n=98)	Non-perinatal women (n=4687)	p value*
(Continued from previous page)			
Service contact and treatment adherence at time of death			
Psychiatric inpatient			0·71
No	84 (86%)	4077 (87%)	
Yes	14 (14%)	610 (13%)	
Missing	0	0	
Suicide within 3 months of discharge			0·77
No	63 (64%)	3017 (64%)	
Yes	19 (19%)	1056 (23%)	
Not applicable (inpatient)	14 (14%)	610 (13%)	
Missing	2 (2%)	4 (<1%)	
Time since last contact before death			0·42
≤7 days	57 (58%)	2419 (52%)	
>7 days and ≤1 month	21 (21%)	1096 (23%)	
>1 month	19 (19%)	1115 (24%)	
Missing	1 (1%)	57 (1%)	
Missed last appointment			0·92
No	57 (58%)	2782 (59%)	
Yes	25 (26%)	1240 (26%)	
Not applicable (inpatient)	14 (14%)	610 (13%)	
Missing	2 (2%)	55 (1%)	
Non-adherent with medication in month before suicide)†			0·26
No	72 (73%)	3617 (77%)	
Yes	18 (18%)	671 (14%)	
Missing	8 (8%)	399 (9%)	
Symptoms and risk assessment at last contact			
Any symptoms			0·28
No	38 (39%)	1564 (33%)	
Yes	57 (58%)	2948 (63%)	
Missing	3 (3%)	175 (4%)	
Risk assessment, immediate			0·45
No or low risk	79 (81%)	3663 (78%)	
Medium or high risk	13 (13%)	756 (16%)	
Missing	6 (6%)	268 (6%)	
Risk assessment, long-term			0·10
No or low risk	48 (49%)	2045 (44%)	
Medium or high risk	29 (30%)	1816 (39%)	
Missing	21 (21%)	826 (18%)	

Data are n (%). *Mainly described as emotional and rehabilitation support, support from community mental health teams or day hospitals, and support by care coordinators, occupational therapists, and social workers. †Refusal to take medication as prescribed (ie, non-compliant) in the month before death.

Table 2: **Treatment, service contact, and risk assessment**

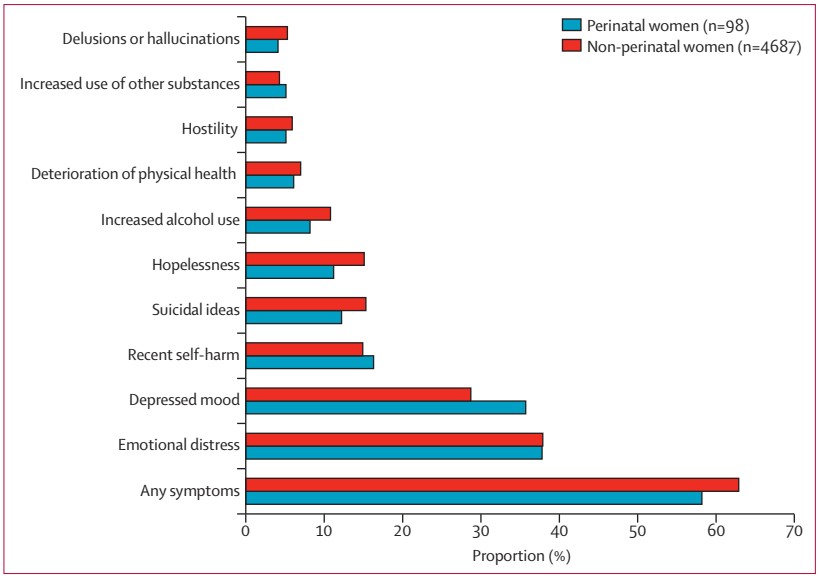

Figure: **Symptoms at the time of last contact**

3 months preceding the suicide (11% *vs* 28%; p=0·17; appendix). No other variables differed significantly at the 0·20 significance level (appendix).

In sensitivity analyses, we recorded only minor differences between main analyses (table 4) and analyses using complete data (appendix). Main analyses likewise did not differ substantially from analyses comparing postnatal women only (excluding pregnant women) with non-perinatal women (data not shown).

Discussion

Our findings show that roughly one in 50 suicides in women aged 16–50 years and one in 25 suicides in women aged 20–35 years were in the perinatal period. Over the course of the study, we recorded a modest downward trend in the number of women dying by suicide in the non-perinatal period, but not in the perinatal period. Compared with women who died by suicide outside the perinatal period, women who died by suicide in the perinatal period were more likely to

	Perinatal women (n=98)	Non-perinatal women (n=4687)	p value
Suicide method			<0·0010
Violent method	71 (72%)	2610 (56%)	
Strangulation or hanging	29 (30%)	1525 (33%)	
Jumping from a height or multiple injuries	16 (16%)	405 (9%)	
Jumping or lying before a vehicle	8 (8%)	284 (6%)	
Drowning	9 (9%)	218 (5%)	
Other*	9 (9%)	178 (4%)	
Non-violent method	27 (28%)	2077 (44%)	
Self-poisoning	27 (28%)	1844 (39%)	
Other†	0	199 (4%)	
Unknown or missing	0	34 (1%)	
Suicide by poisoning, among all suicides			0·015
Psychotropics	4 (4%)	728 (16%)	
Analgesics	6 (6%)	342 (7%)	
Opiate	8 (8%)	325 (7%)	
Other	9 (9%)	242 (5%)	
Unknown or missing	0	207 (4%)	
Not applicable (not self-poisoning)	71 (72%)	2843 (61%)	
Suicide by poisoning, among women who died by self-poisoning			0·005
Psychotropics	4/29 (14%)	757/1922 (39%)	
Analgesics	7/29 (24%)	355/1922 (18%)	
Opiate	8/29 (28%)	342/1922 (18%)	
Other (insulin, other)	10/29 (34%)	257/1922 (13%)	
Unknown or missing	0	211/1922 (11%)	
Homicide followed by suicide‡			0·001
No	92 (95%)	4515 (96%)	
Yes	2 (2%)	11 (<1%)	
Missing	4 (4%)	162 (3%)	

Data are n (%) or n/N (%). *Cutting or stabbing, firearms, burning, electrocution (<5% each per group). †Carbon monoxide poisoning, asphyxiation or suffocation, other (<5% each per group). ‡In the perinatal group, both homicides involved infants; details of the homicide victims were unavailable for nine of the 11 non-perinatal suicides.

Table 3: **Suicide methods**

	Crude OR (95% CI)	p value	OR adjusted for sociodemographic characteristics (95% CI)*†	p value	OR adjusted for demographic and clinical characteristics (95% CI)†‡	p value
Sociodemographic characteristics						
Age (years)	−6·39 (−8·15 to −4·62)	<0·001	..	..	..	..
Race or ethnic origin other than white§	1·58 (0·81 to 3·07)	0·18	..	..	..	..
Married or cohabiting	4·46 (2·93 to 6·80)	<0·001	..	..	..	..
Lone carer of child	1·31 (0·74 to 2·32)	0·36	..	..	..	..
In paid employment	1·43 (0·89 to 2·31)	0·14	..	..	..	..
Clinical characteristics						
Primary diagnosis of depression	2·06 (1·38 to 3·09)	<0·001	2·19 (1·43 to 3·34)	<0·001	..	..
Primary diagnosis of bipolar disorder	0·71 (0·34 to 1·47)	0·35	..	..	..	..
Primary diagnosis of schizophrenia or related illness	0·86 (0·48 to 1·55)	0·62	..	..	..	..
Primary diagnosis of personality disorder	0·57 (0·30 to 1·07)	0·083	0·56 (0·29 to 1·07)	0·081	..	..
Illness duration <1 year¶	3·74 (2·47 to 5·68)	<0·001	2·93 (1·88 to 4·56)	<0·001	..	..
Any past psychiatric admissions	0·60 (0·40 to 0·91)	0·016	0·79 (0·49 to 1·14)	0·18	..	..
Alcohol misuse in the past 3 months	0·44 (0·23 to 0·84)	0·013	0·47 (0·24 to 0·92)	0·027	..	..
Drug misuse in the past 3 months	0·79 (0·41 to 1·53)	0·049	..	..	..	..
Self-harm in the past 3 months	0·85 (0·53 to 1·35)	0·049	..	..	..	..
Violence towards others (ever)	0·47 (0·23 to 0·98)	0·043	0·50 (0·24 to 1·05)	0·068	..	..
Treatment given, service contact, and treatment adherence at time of death						
Medication	0·53 (0·30 to 0·91)	0·023	0·63 (0·35 to 1·10)	0·106	0·55 (0·30 to 1·01)	0·053
Psychological therapy	0·66 (0·34 to 1·27)	0·21	..	..	..	..
Other non-pharmacological treatment	0·80 (0·51 to 1·24)	0·32	..	..	..	..
At least one of above	0·45 (0·24 to 0·82)	0·010	0·54 (0·29 to 1·00)	0·052	0·46 (0·24 to 0·89)	0·022
Inpatient at time of suicide	1·11 (0·63 to 1·97)	0·71	..	..	..	..
Suicide within 3 months of discharge	0·87 (0·53 to 1·45)	0·603	..	..	..	..
Last contact >1 month before suicide	0·77 (0·47 to 1·28)	0·32	..	..	..	..
Missed last appointment before suicide	0·97 (0·61 to 1·53)	0·89	..	..	..	..
Non-adherent with prescribed medication in the month before suicide‖	1·34 (0·80 to 2·26)	0·26	..	..	..	..
Symptoms and risk assessment at last contact			..	..	..	..
Any psychiatric symptoms	0·80 (0·53 to 1·22)	0·304	..	..	..	..
Assessed as moderate or high risk to immediate risk	0·78 (0·43 to 1·42)	0·42	..	..	..	..
Suicide method					..	..
Violent *vs* non-violent	2·07 (1·32 to 3·24)	0·001	1·69 (1·07 to 2·67)	0·024	1·52 (0·95 to 2·42)	0·079
Overdose of any substance	0·58 (0·37 to 0·91)	0·018	0·74 (0·47 to 1·18)	0·21	..	..
Overdose specifically of psychotropic medication	0·23 (0·08 to 0·63)	0·004	0·28 (0·10 to 0·76)	0·012	0·31 (0·11 to 0·85)	0·024

The table shows univariate and multivariate associations using imputed data. OR=odds ratio. *Adjusted for age, race or ethnic origin, marital status, and employment. †Adjusted analyses were done when the preceding model had a p value of 0·10 or less. ‡Adjusted for age, race or ethnic origin, marital status, employment, depression diagnosis, alcohol misuse, drug misuse, personality disorder, illness duration, and psychiatric admission history. §Black African; Black Caribbean; Indian, Pakistani, Bangladeshi; Chinese; mixed race; and other. ¶Illness duration since clear onset of the primary diagnosis. ‖Refusal to take medication as prescribed (ie, non-compliant) in the month before death.

Table 4: **Correlates of dying by suicide within versus outside the perinatal period**

have a diagnosis of depression with recent illness onset and no history of alcohol misuse. Furthermore, women who died by suicide in the perinatal period were less likely to be receiving active treatment, particularly medication, at the time of death than were women who died outside that period. There was no difference in recorded treatment adherence, symptoms at last contact or risk assessment. Almost three-quarters of women who died by suicide in the perinatal period used a violent method. Two of the 98 women killed their infant before dying by suicide; a finding that should be interpreted with caution in view of the very low absolute number.

Fortunately, women who are new or expectant mothers rarely die by suicide,[6,8,22,23] but, when death by suicide does occur, it is a strikingly tragic event. Women in the general population are less likely to die by suicide in the perinatal period than at other times,[19,31,32] but previous studies suggest that this protective effect is lost in women with severe post-partum illness.[33] One study[33] of national Danish

data reported that of women admitted to psychiatric wards in the first postnatal year, 0·9% died by suicide in that year (a risk 70 times higher than in the general population). This finding suggests there is an appreciable risk of suicide in the perinatal period in women in contact with psychiatric services, but little is known about these women's risk profile or treatment history.

Our study describes the largest case series of perinatal suicides among women in contact with psychiatric services. Depression was the most common diagnosis in all women who died by suicide, occurring in about half of postnatal suicides and a third of pregnancy and non-perinatal suicides. For all women, the most common symptoms at last contact were distress, depressed mood, suicidal ideas, and hopelessness; few reported hallucinations or delusions. Women who died by suicide in the perinatal period were also less likely to be receiving active treatment than were women who died outside that period. Depression is arguably under-recognised as a leading cause of perinatal suicide, with much public and clinical attention focused on the rare, but very high-risk, presentation of postnatal psychosis. The point prevalence of major depressive disorder is about 5% in pregnancy and in the first 3 postnatal months.[17] Women often discontinue their antidepressant medication in the perinatal period,[15] mostly because of fears of potential harm to the unborn baby or breastfeeding infant, leaving them vulnerable to relapse in pregnancy and beyond.[17,34] In practice, these findings suggest that clinicians need to closely monitor perinatal suicide risk not only in women with psychotic illnesses, but also in those with depression. Decisions about discontinuation of medication need to be made after a careful individual risk–benefit analysis.[35] For women who choose to discontinue medication, adequate and timely alternative treatments (eg, psychological treatment), and appropriate, proactive follow-up, should be ensured.[35]

In general population studies, other reported risk factors for dying by suicide in the perinatal period include a history of suicide attempts (found in a quarter of patients in this study and a fifth in a recent Swedish general population study[7]), being a victim of intimate partner violence,[6,7,11,36,37] teenage pregnancy,[8,23] older age in some high-income settings,[1,7] being an immigrant from a low-income country,[7] obstetric or neonatal complications[7] (especially perinatal deaths),[3] and medical comorbidity.[3] Women with severe mental illness are known to have a high prevalence of intimate partner violence, medical comorbidity, and obstetric or neonatal complications,[16,27] which might contribute to their increased suicide risk.

Our study confirms previous findings that maternal suicides are often violent.[3,7,13,22,31] This finding might reflect greater illness severity or higher suicidal intent in this group than in the general population.[38] In our study, in which most women had a depressive illness, the use of violent suicide methods suggests severe depression, possibly with psychotic symptoms. Although psychotic symptoms at last contact were scarcely reported in this study, early post-partum psychosis tends to have an abrupt onset with rapid deterioration,[27] so symptoms might not have been detected by professionals.

Our finding that rates of perinatal suicides did not decrease over the study time period is supported by a static rate of perinatal suicides in the Swedish general population over a 27 year period.[7] Maternal death inquiries have made specific recommendations to decrease suicide risk in perinatal women, including a focus on women with a history of severe mental illness and the provision of specialist perinatal mental health care;[25,39] however, the real-life effect of such recommendations on suicide incidence remains unknown.

Overall, there are some similarities between our findings of the characteristics of women who died by suicide in the perinatal period and those from other studies (such as the high prevalence of violent suicide), but also some differences (such as the higher proportion of women with a diagnosis of depression, age, marital status, and substance misuse history).[7] Notably, we included only women who had been in contact with psychiatric services in the 12 months preceding their deaths. The differences between this and other studies are likely to be related to differences in study design and inclusion criteria, study setting, and health service provision. Therefore, some of our findings might be specific to the women in contact with psychiatric services in the UK. We are unable to comment on the characteristics of women who die by suicide in the perinatal period without contact with psychiatric services in the previous year.

The key strength of this study is that it is a large, nationally representative case series of suicides in women in contact with psychiatric services, allowing a detailed quantitative analysis of the characteristics and correlates of perinatal versus non-perinatal suicides in this population. A further strength is that the analysis was carefully designed to account for potential confounding. Our study has three key limitations. First, the data are limited to women in contact with psychiatric services in the year before their death, and are therefore unlikely to be generalisable to all perinatal suicides. Nevertheless, at least in the UK setting, roughly 60% of women who die by suicide in the perinatal period have contact with psychiatric services, and the findings will be generalisable to this large subgroup. Second, we used data from a case series rather than an epidemiological sample of women at risk; as such, we were unable to estimate suicide rate or to investigate suicide risk factors. The correlates of perinatal suicides reported in this study could reflect a difference in the baseline prevalence of examined characteristics, or a difference in the nature or strength of the association between a given factor and suicide timing. Clarification of the above requires large epidemiological studies, which are difficult to do because of the rarity of perinatal suicides

and the limitations of routinely available data. Our findings should be interpreted with caution, in the absence of denominator data for the population at risk of suicide within and outside the perinatal period. Third, all data were reported by a clinician (most often the consultant psychiatrist) on the basis of their knowledge of the patient and clinical records. Although investigation of suicides through seeking of information from treating clinicians and medical records is a well-established method, this technique has limitations, including staff changes, recall biases, and varied quality of documentation. Information might be particularly insufficient when the patient has had only short-term contact with psychiatric services, which could lead to data errors or to reporting bias. However, this limitation is unlikely to differ by whether suicide was perinatal or not, so is unlikely to materially affect study conclusions.

Other limitations include missing data for some covariates (eg, medication treatment at time of death), although findings from complete case and imputed data analyses were very similar; the fact that the inquiry was not designed to specifically investigate perinatal deaths, so did not address risk factors that are specific to this population (eg, obstetric or neonatal complications); and restricted measures of social adversity (important potential correlates of perinatal suicide, such as a history of partner violence and socioeconomic position, were not measured).

In conclusion, our findings show that roughly one in 50 female suicides were in new or expectant mothers. Suicide in this group was often violent and more likely to occur in women with a depression diagnosis and recent illness onset, with a substantial minority not receiving follow-up or treatment at the time of death. Assertive follow-up and treatment of women who are under the care of mental health services in the perinatal period is needed to address suicide risk in this group.

Contributors

LMH and HK designed the study with input from all authors. Staff at the National Confidential Inquiry collected the data, supervised by IMH and LA. IMH did final data preparation and HK did data analyses, with further input from all authors. HK produced the initial draft of the paper and all authors contributed to the final manuscript. LA and LH are the joint study guarantors.

Declaration of interests

LA chairs the National Suicide Prevention Strategy Advisory Group at the Department of Health and is a non-executive Director for the Care Quality Commission. All other authors declare that they have no competing interests. LMH is national clinical adviser to the National Health Service (NHS) England perinatal access and waiting time standards perinatal mental health programme.

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