

**Objective:** The long-term suicide risk of depression was evaluated in a community sample by severity and gender.

**Method:** The Lundby study is a prospective, longitudinal cohort study on a population consisting of 3563 subjects. In 1947–1997 medium or severe depression according to the Lundby diagnostic system were registered in 503 subjects. The same subjects were also diagnosed according to DSM-IV showing major depressive disorder (MDD) in 293 and depressive disorder not otherwise specified (DDNOS) in 131 subjects.

**Results:** The overall long-term suicide risk varied from 5.6% to 6.8%. The long-term suicide risk was 3.1% for medium and 11.4% for severe ‘Lundby depression’, 3.7% for medium and 13.8% for severe MDD + DDNOS, 3.1% for medium and 13.7% for severe MDD. Severity and male sex were risk factors for suicide.

**Conclusion:** Males with a severe depression showed a high long-term risk for suicide, around 20%.

**Significant outcomes**

- Severity of depression and male gender were related to an increased suicide risk, independent of in-patient status.
- Taking severity and gender into account there were such disparate suicide risks as 0.5–0.8% for females with medium depression and 19.6–25% for males with severe depression.

**Limitations**

- Limited sample of suicides.
- The recall periods were of considerable length 10, 15 and 25 years.

**Introduction**

The life-time risk of suicide is a useful measure of the seriousness of depressive disorder and is ideally calculated by following a cohort until all are dead. But to our knowledge, no adequately defined cohort of subjects with depressive disorder has yet been followed to their extinction. An early often quoted review article including a large number of follow-up studies of patients with a primary affective disorder has shown that on the average 15% eventually die by suicide (1) and a later review concluded a similar rate (2). However, by using a computerized modelling technique in a later review on the data in these studies (1, 2), the final mortality in suicide was estimated to 6% (3). Further, a calculation on the incidence of depression and suicide mortality based upon an entire
sample of depressives showed an expected life-time risk of 3.5% (4). Another calculation was made on suicides in an English Health District and arrived at an even lower rate of 2.4% for any affective disorder (5).

Suicide risk is affected by severity. The finding of a higher suicide risk in studies on hospitalized patients (1–3) and a much lower risk in the general population (4, 5) may be related to a higher risk in more severely depressed persons. Being suicidal or a suicide attempt per se (6–9) is often a reason for hospitalization as well as a risk factor for completed suicide, but being suicidal may also lead to hospitalization independent of severe or non-severe depression. In a recent review on suicide risk in affective disorder, the estimated life-time risk for those ever hospitalized for suicidality was 8.6% and for those hospitalized without specification for suicide was 4.0%, and for a mixed in-patient/outpatient population of 2.2% (10). In a 6-year follow-up of hospitalized patients in Denmark, severe episode by ICD 10 was related to an increased suicide risk, 2% for severe vs. 1% for non-severe (11). Neither increased risk for committing suicide could be found for psychotic or melancholic depression in another study of this sample (12), nor in other short-term studies (13–16). A retrospective longitudinal epidemiological study on a community sample of Icelanders born in the late nineteenth century followed up to 1957 revealed higher suicide rates in manic– depressive psychosis (14%) as compared with depressive neurosis (1.7%) (17). Early studies usually do not distinguish between unipolar and bipolar depressive disorders, but in a recent review by Goodwin and Jamison (18) the authors stated that the distinction though important is inconclusive in relation to suicide risk and should not obscure the fact that both diagnoses are related to a high suicide risk.

Moreover, there is a gender difference in suicide, males committing suicide more often than females (19). By calculating this difference the suicide risk in females was estimated as low as 1% against 7% for males (20).

The Lundby study is a prospective longitudinal study on a geographically defined population in southern Sweden that started in 1947 (21–23). It has been followed up in three sessions in 1957, 1972, and 1997, thus extending over 50 years. The database enables the investigation of long-term suicide risks in a community-based sample.

Aims of the study

The first aim of the present study was to investigate if there was a higher suicide risk in severe than in medium depression. The second aim was to present data about the suicide risks for severe and medium depression by gender.

Material and methods

Material

The Lundby district comprised two adjoining parishes in the south of Sweden. Essen-Möller and collaborators (21) made a point-prevalence study of the total psychiatric morbidity including all the persons who were on the parish registers on July 1, 1947. In all, 99% of the persons (n = 2533/2550) aged 0–92 years (the Lundby 1947 cohort) were examined.

In 1957 Hagnell (22) made the first follow-up giving rise to the Lundby 1957 cohort. The Lundby 1957 cohort (n = 2612) aged 0–96 years at start of follow-up consists of the survivors of the 1947 cohort (n = 1599) still living in the Lundby in 1957 district and another 1013 persons, who had been added to the district since 1957 aged 0–95 years in 1957 (one-third through birth, the rest by immigration), and who were on the Lundby parish registers on July 1, 1957. After 1957, no new subjects have been added to the study.

Hagnell and Öjesjö performed the second follow-up of the subjects in 1972. The attrition rate for the follow-ups 1957 and 1972 was between 1% and 2% respectively. The third follow-up with an attrition rate of 6% was carried out 1997–2001 (23). By 1997, the total cohort, regardless of domicile, had been examined four times during 50 years (1947, 1957, 1972, and 1997). Each time trained psychiatrists carried out the examinations. The Lundby population can be considered as an initially unselected rural population, which has followed the same pattern as many European societies with a rapid economic development and socioeconomic changes after World War II.

Based upon information from registers, case notes, key-informants, and interview data, both for the living and the deceased subjects, best-estimate consensus diagnoses according to the DSM-IV in 1947, 1957, and 1972 were retrospectively and in 1997 simultaneously made for those subjects having been diagnosed as depression according to the Lundby system.

A total of 687 (259 males and 428 females) subjects had been assessed to have a depression in 1947–1997. Out of these 184 had mild impairment, 354 medium impairment, and 149 severe impairment. As depression with mild impairment was not considered pathological, the number of depressed prevalent cases according to the Lundby diagnostic
system was 503. As other diagnoses (dysthymic disorder, adjustment disorder) than major depressive disorder (MDD) or depressive disorder not otherwise specified (DDNOS) had been assessed in 79 subjects, they were excluded. MDD and DDNOS were registered in 424 subjects. MDD was registered in 293 subjects \( (n = 293; 106 \text{ males and 187 females}) \) and DDNOS in 131 subjects \( (n = 131; 57 \text{ males and 74 females}) \) according to DSM-IV (24). The DDNOS group probably also includes major depressions because data sometimes were insufficient to make diagnoses in retrospect. Thus, we received one smaller well-defined group with high specificity of diagnosis (MDD) and one larger less well-defined group (MDD + DDNOS, Fig. 1). There was only one bipolar case in the MDD-group.

Further, with the purpose to study risk factors for suicide 253 of the 293 subjects were identified with a first-incidence MDD depression according to the Lundby system in 1947–1997. In the remaining 40 subjects, the depression had started before July 1st 1947.

Sources of information

The information used in the present paper was obtained from interview data of the four field investigations carried out between 1947 and 1997 and from other sources. Official death certificates were collected from the parish registers, the Swedish Central Bureau of Statistics (25) and the national Cause of Death Register (26). In addition, information was obtained from the national Patient Register (27) covering all psychiatric inpatient care (diagnoses, sex, age, domicile, hospital) since 1972. Psychiatric hospital case records, other hospital case records, the records of GPs/doctors in private practice, autopsy reports, official death certificates, regional archives and key informants (mostly relatives and nursing staff) also provided us with information.

Criteria for suicide

Suicides were recognized based on the codes used in the International Classification of Diseases, revisions 6–9. Moreover, as a new category, undetermined deaths, E980-989 was introduced in 1968, suicides according to this definition were also noted after 1968. In the final classification, the categories E950-959 and E980-989 from the eighth revision of the ICD [1947–1983 (28)] and the ninth revision of the ICD [1984–1992 (29)] were used (World Health organization, 1965; 1985). In addition, one case, E910 (drowning) and another case E887.00 (fall/jumping from a high place) were reviewed and assigned to the category E980-989.

Diagnostic criteria

The Lundby study was initiated before the DSM system was established and before structured diagnostic instruments were developed. Hence, the DSM-IV system (24) was only applied in the latest field investigation in 1997. The diagnostic criteria of depression in the Lundby study remained the same over the years.
In respect to depression two categories are available: depression proper and depression plus other psychiatric symptoms. The main symptoms found in subjects diagnosed as suffering from depression proper were the following: lowered mood, depressive feelings, tendency to guilt feelings, gloomy outlook, reduced activity, lack of initiative, reduced self-esteem, lowered enjoyment of life and a feeling of low vitality, anxiety and fear and has more difficulty than usual, and is often unable to carry out his daily responsibilities. Sometimes retardation is present. The subject is often worse in the morning and better towards the evening. Often he has sleep disturbances and wakes up early in the morning. Loss of appetite and weight.’ (22).

Persons who in addition to depression as the most prominent symptom also had other coexisting psychiatric symptoms, such as anxiety and psychotic symptoms, were also included (depression plus). Thus, the Lundby diagnosis depression is a very broad category including conditions that, in the DSM, would be diagnosed as MDD, DDNOS, adjustment disorder with depressed mood, and dysthymic disorder.

Following Leighton (30), the degree of impairment for every episode was rated as minimal, mild, medium, severe and very severe. In the present study, three degrees of impairment were used: i) mild (minimal + mild), ii) medium, and iii) severe (severe + very severe). According to Eaton et al. (31), the Lundby diagnosis of medium, severe, and very severe depression roughly corresponds to major depressive disorder in DSM-IV (24). Severe cases mainly constituted depressions of psychotic dimensions and cases with severe melancholia. (Fourteen of the severe have been assessed to fulfill the criteria for major depressive disorder with psychotic features.) Mild impairment depression considered pathological in earlier investigations (32) was not considered as pathological in the present study. Medium impairment corresponding to a GAF score between 60 and 51 was regarded as threshold for caseness (33).

In order to transform the Lundby diagnosis depression to DSM-IV diagnoses, DSM-IV diagnoses based on all information available were made in retrospect for the subjects who were investigated in 1947, 1957, and 1972 and simultaneously for those investigated in 1997.

Statistics

The subjects were categorized by gender. Observation years were counted from the onset of the first episode of medium or severe (severe + very severe) major depression. Kaplan–Meier (univariate) and subsequent Cox regression (multivariate) analyses with a backward elimination of non-significant results were carried out on possible risk factors for suicide (severity, gender, previous suicide attempts, and previous in-patient admissions). Statistical significance was set at $P \leq 0.05$ (34).

**Results**

Severity of depression, gender, and suicide risk

A multivariate Cox regression on possible risk factors for suicide with a backward elimination of non-significant variables was performed on the sample of first-incident depressive disorder, where the first onset of depression was known between 1947 and 1997 ($n = 253$). There were 16 suicides. The variables entered were severity of depression, gender, previous suicide attempt, and in-patient admissions. There was an increased risk for suicide in severe depression and in males (Table 1). Severity and gender remained significant even after controlling for previous suicide attempt and in-patient admissions. However, there was only one previous suicide attempt among these 16 suicides.

Long-term suicide risk in depression

*Deceased sample.* A total of 214/503 (43%) in the depression group, 132/293 (45%) in the MDD group and 194/424 (46%) in the MDD + DDNOS group were deceased at follow-up. The major cause of death was cardiovascular disease in both severe and non-severe depression (no significant difference). In the Lundby depression group, there were 28 suicides giving 13.1% suicides among the deceased (28/214). In the MDD group, there were 20 suicides, i.e. 15.2% suicides among the deceased (20/132) and in the MDD + NOS, there were 28 suicides, i.e. 15.4% of the deceased (28/194).

*Total sample* The suicide risks for medium and severe impairment in Lundby depression, MDD and MDD + DDNOS, respectively, are presented in Table 2. Regardless of diagnosis the figures were much higher for severe than for medium impairment. The overall long-term suicide risk varied

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Hazard ratio</th>
<th>P-value</th>
<th>CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>4.46</td>
<td>0.007</td>
<td>1.51–13.18</td>
</tr>
<tr>
<td>Severe depression</td>
<td>3.83</td>
<td>0.008</td>
<td>1.42–10.35</td>
</tr>
</tbody>
</table>
from 5.6% to 6.8% for the different depressive diagnoses. Neither age nor number of episodes differentiated between severe and non-severe depression. There were 6/14 (43%) suicides in the psychotic depression group.

Gender differences

Suicide risks by gender for severe and medium depression for the Lundby diagnosis depression, MDD and MDD + DDNOS groups are presented in Fig. 2. There were high suicide risks among males with severe depression (11/58, 19.6%), MDD + DDNOS group (11/45, 24.4%) and the MDD (9/36, 25%), but a low rate in the female medium depression (1/220, 0.5%), the MDD + DDNOS group (1/183, 0.5%), and the MDD group (1/121, 0.8%).

Mild depression and dysthymic/adjustment disorders

The suicide risk in mild Lundby depression was low, i.e. 1/184 (0.5%). This case was a female and it represented a suicide risk of 1/117 (1%) in the female group and 0% in the male group. There was no suicide in the dysthymic/adjustment disorder group (0/79).

Table 2. Long-term suicides risk in depression in the Lundby cohort

<table>
<thead>
<tr>
<th>Severity of depression</th>
<th>Suicide risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium ‘Lundby’ depression</td>
<td>3.1 (11/354)</td>
</tr>
<tr>
<td>Medium MDD</td>
<td>3.1 (6/191)</td>
</tr>
<tr>
<td>Medium MDD + DDNOS</td>
<td>3.7 (11/301)</td>
</tr>
<tr>
<td>Severe ‘Lundby’ depression</td>
<td>11.4 (17/149)</td>
</tr>
<tr>
<td>Severe MDD</td>
<td>13.7 (14/102)</td>
</tr>
<tr>
<td>Severe MDD + DDNOS</td>
<td>13.8 (17/123)</td>
</tr>
<tr>
<td>Medium and severe ‘Lundby’ depression</td>
<td>5.6 (28/503)</td>
</tr>
<tr>
<td>Medium and severe MDD</td>
<td>6.8 (20/293)</td>
</tr>
<tr>
<td>Medium and severe MDD + DDNOS</td>
<td>6.6 (28/424)</td>
</tr>
</tbody>
</table>

Major depressive disorder, MDD; DDNOS, depressive disorder not otherwise specified. Data are represented as % (n values).

Fig. 2. Suicide and severity of depression by gender.

Long-term suicide risk of depression

Severity of depression and male gender were related to an increased risk for suicide. The overall long-term suicide risk varied from 5.6% to 6.8% for the different depressive diagnoses. The long-term suicide risk was 3.1% for medium and 11.4% for severe Lundby depression, 3.1% for medium MDD and 13.7% for severe MDD, and 3.7% for medium MDD + DDNOS, and 13.8% for severe MDD + DDNOS. Thus, our figures were rather robust regardless of the diagnostic procedure. However, these numbers were calculated when about half of the sample was deceased and are not the definitive values, as more suicides may occur before all the subjects are dead. The overall suicide risk is similar to the risk found in a recent review on suicide in affective disorders, which was 5% (18). However, an increased risk for severity and gender reveals a high risk for males with severe depression, around 20%.

The present study deals with a community-based sample, and is similar to a previous Icelandic study (11), but it is not really compatible with the other studies quoted above (1–5). Most of these studies deal with in-patient samples, or used mathematical calculations rather than observation (1–5). A retrospective longitudinal community study on Icelanders born 1895–1897 followed up to July 1 1957 (11) showed a high suicide risk in manic–depressive psychosis (14%) as compared with depressive neurosis (1.7%). The design of that study is similar to the present one. Diagnostic procedures are difficult to compare, but the finding of a higher suicide risk in more severe depression is in agreement with our results. Moreover, like in the present study (n = 28), the Icelandic study included a limited number of suicides (n = 36). There was a very high suicide risk associated with psychotic depression in the present study (6/14). In shorter follow-ups, however, no increased risk for committing suicide could be shown for psychotic or melancholic depression (12–16).

The high risks for suicide in previous studies of individuals with depression have been attributed to the sampling of in-patients (4). Severe depression and suicide attempts are both reasons for hospitalization. Accordingly, one does not know whether severity of depression per se or the suicide attempts or suicidal thoughts leading to admission is related to the high risk for suicide, when studying hospital samples. However, the present study shows an increased suicide risk for severity and gender, when previous in-patient admissions and suicide attempts are controlled for.

Discussion

Main findings
Severe depression could be seen as a degree of impairment or as a syndrome (such as MDD with melancholic or psychotic features) which to some extent overlap. In the present sample, severe depression probably corresponds to MDD with melancholic or psychotic features.

One has recently proposed that the concept of melancholia or the doctrine of two depressions, non-melancholia and melancholia, should be restored (35–37). Our findings suggest that identification and treatment of melancholia and depressive psychosis may have an important role in suicide prevention.

Subsyndromal depression has been focused on more recently, as minor depression sometimes develops into major depressive disorder later in life (38, 39) and this diagnosis may be mixed up with dysthymic/adjustment disorders (40). However, there was a very low suicide risk in the group of mild depression and dysthymic/adjustment disorders in the present sample.

A gender difference in suicide risks was expected and is well-known from the literature (19).

The relatively low risk for suicide in females with a severe depression as compared to males in our study is striking. Though every single suicide is one too many, it is clear that the high risk in severely depressed males is more alarming than the low risk in females with a medium major depression. Different suicide risks for males and females with depression have been pointed out with a difference between 1% and 7% (20). As our data show, the suicide risk in severely depressed males as compared with medium depressed females differs much more. A common figure of suicide risks for males and females without considering the severity and sex does not make sense.

There was no relation between previous suicide attempt and completed suicide, as expected from literature (6–9). Small sample size may explain this discrepancy, or the fact that in a community sample there are more suicides without previous suicide attempts.

A final remark: in older days (the eighteenth century) in Sweden (and other countries), one made a discrepancy between suicide under influence of melancholia or despair (41). The case was brought to court, and if one decided that the suicide victim had taken his/her own life under influence of melancholia he/she was considered innocent and deserved to be buried in the cemetery, or else the suicide was considered a sin! (It was not until 1908 that suicide was considered not to be a crime). However, this old distinction may convey the knowledge that suicides had different qualities because of the type of depression that preceded it!

Limitations

The recall periods were of considerable length 10, 15 and 25 years, possibly introducing bias and resulting in some depressive episodes being forgotten. There is also a possibility that severe depression is more easily remembered which may lead to a more adequate report for this group. Also, the diagnostic specificity may have been impaired by the use of retrospective DSM-IV diagnoses in 1947, 1957 and 1972. However, a good agreement with DSM-IV was found in a retrospective diagnosis on case records from the same diagnostic tradition (42). Finally, the limited number of suicides calls for carefulness when interpreting the data.

Acknowledgements


References


42. BRÅDKVIR L, BERGLOUND M. Treatment and suicide in severe depression. A case–control study on antidepressant treatment at last contact before suicide. J ECT 2000;16:399–408.