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Review

Risk factors for suicide in individuals with depression: A systematic review

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ABSTRACT

Background: Depression is the most common psychiatric disorder in people who die by suicide. Awareness of risk factors for suicide in depression is important for clinicians.
Methods: In a systematic review of the international literature we identified cohort and case-control studies of people with depression in which suicide was an outcome, and conducted meta-analyses of potential risk factors.
Results: Nineteen studies (28 publications) were included. Factors significantly associated with suicide were: male gender (OR=1.76, 95% CI=1.08–2.86), family history of psychiatric disorder (OR=1.41, 95% CI=1.00–1.97), previous attempted suicide (OR=4.84, 95% CI=3.26–7.20), more severe depression (OR=2.20, 95% CI=1.05–4.60), hopelessness (OR=2.20, 95% CI=1.49–3.23) and comorbid disorders, including anxiety (OR=1.59, 95% CI=1.03–2.45) and misuse of alcohol and drugs (OR=2.17, 95% CI=1.77–2.66).
Limitations: There were fewer studies than suspected. Interdependence between risk factors could not be examined.
Conclusions: The factors identified should be included in clinical assessment of risk in depressed patients. Further large-scale studies are required to identify other relevant factors.

Contents

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1. Introduction

In most studies of people dying by suicide, approximately nine out of every ten individuals appear to have had a psychiatric disorder at the time of their death (Henriksson et al., 1993; Cavanagh et al., 2003). Psychological autopsy studies have shown that depression is the most common of these disorders, occurring in half to two thirds of cases (Rich et al., 1986; Henriksson et al., 1993; Conwell et al., 1996; Harwood et al., 2001). Every sixth death among individuals receiving treatment for depression by psychiatric services is by suicide (Wulsin et al., 1999). However, suicide risk varies with the nature of the depressive disorder and other factors (e.g. previous history). Just over a quarter of those who die by suicide with major depression are in contact with psychiatric services at the time of their death (National Confidential Inquiry into Suicide and Homicide by People with Mental Illness, 2006, 2012), indicating that primary care may also have a vital role to play in suicide prevention in this group. Approximately 50% of those who die by suicide have seen their general practitioner in the three months before death, 40% in the month beforehand, and 20% in the week before death (Barraclough et al., 1974; Pirkis and Burgess, 1998). Depression is a very common disorder in the general population (Joyce, 2012) and, therefore, detection of individuals at risk of suicide, while clearly extremely important, can be difficult. The identification of key risk factors for suicide in individuals with depression is therefore essential if clinicians are to identify those most at risk and intervene appropriately, as there is good evidence that monitoring and active treatment in high-risk patients may result in reduced suicide rates (Isometsa et al., 1994).

There is an extensive literature on risk factors for suicide (Hawton and van Heeringen, 2009), including in depression (Lönnqvist, 2000). But as far as we are aware there have been no systematic reviews which have assimilated the findings of studies specific to people with depression. We have conducted a systematic review of international literature on risk factors for suicide in people with depression.

2. Methods

2.1. Study eligibility

Studies were selected for inclusion if they met the following criteria:

i. The included patients had an ICD-10 diagnosis of depressive disorder (F32) or recurrent depressive disorder (F33), or a DSM-IV diagnosis of major depressive disorder. Samples using earlier versions of these diagnostic systems for unipolar depressive disorder were also included. The following diagnostic categories were included: unipolar depression, major depression disorder, depressive disorder NOS, melancholia, and mood disorder.
   Given that approximately 20% of individuals with a diagnosis of major depressive disorder may go on to develop bipolar disorder (Ghaemi et al., 1999; Goldberg et al., 2001; Goodwin and Jamison, 2007), samples where fewer than 20% of participants had bipolar disorder were also included although where possible we tried to obtain the data specific to those with depression from the authors.
ii. Cohort studies and case control studies.
iii. An outcome of suicide was reported.
iv. Specific risk factors for suicide and attempted suicide were investigated.

We excluded studies which were focused solely on individuals in prison, with learning difficulties and bipolar disorder or other psychiatric disorders than depression.

2.2. Search strategy

A broad search strategy for potential articles was used to include all relevant studies. We conducted electronic searches of BIOSIS Previews Archive (1926–1968), EMBASE (1980–2011 week 52), MEDLINE (1948–2011 week 52), PsycINFO (1967 to December Week 4 2011) using the following search terms: DEPRESSION, AFFECTIVE DISORDER, SUICIDE, *with* COHORT ANALYSIS, CASE CONTROL STUDIES, COHORT STUDIES, RISK FACTORS, FOLLOW UP STUDIES; and text words including DEPRES*, SUICID* *with* RISK*, FOLLOW UP STUD*, CASE CONTROL STUD*, COHORT STUD* and COHORT ANALYS*. (See Appendix 1 for the complete search strategy). No language restrictions were used.

Titles, abstracts and full texts of identified studies were screened by two members of the research team independently where study results were reported in more than one article, data were extracted from the most recent report, and from both if different variables were reported in each paper. Bibliographies of selected papers were checked for relevant studies. International experts in the field were consulted regarding any omissions from the identified studies and asked whether they knew of any unpublished studies. In instances where there was uncertainty about the data presented in reports, authors were approached for further clarification. Original data were supplied by a number of authors.

2.3. Design of studies

Identified studies were categorised to reflect study design (Sackett et al., 1991) and quality independently assessed by two investigators using a structured proforma adapted from the checklist proposed by the Scottish Intercollegiate Guidelines Network (Scottish Intercollegiate Guidelines Network, 2001) (see Appendix 2). The studies were categorised either as:

(i) cohort, or
(ii) case-control.

2.4. Data extraction

Data were independently extracted from reports by two members of the research team using a structured proforma (available from the authors on request). Additional variables were added to the list as necessary. Suicides were considered as cases and non-suicides as controls.

2.5. Statistical analysis

Data were entered into RevMan 5.1® software (The Cochrane Collaboration, 2011). For meta-analysis of the binary variables an odds ratio (OR) (with 95% confidence interval (CI)) was calculated

for each comparison, using a random-effects model to incorporate the assumption that the different studies were estimating different, yet related, effects. We used visual inspection of the forest plots to investigate the possibility of statistical heterogeneity. This inspection was supplemented with the I^2 statistic, which provides an estimate of the percentage of variability due to heterogeneity rather than a sampling error. We considered I^2 to be low (0–24%), moderate (25–49%), high (50–74%) and very high (75% and over) (Higgins et al., 2003). We used a *p* value from a standard test for heterogeneity to assess evidence of its presence.

3. Results

The search strategy identified 3374 papers for potential inclusion. Of these, 155 were retrieved for a detailed evaluation. Thirty-two articles fulfilled the detailed eligibility criteria. Four publications had to be excluded as the authors were not able to provide the original data that we needed. Hence, 28 articles were included in this review, from a total of 19 studies. There were no unpublished studies. Of these, 9 were cohort studies and 9 were case-control studies, and one study combined both methodologies. The flow chart for the literature search is shown in Fig. 1. A summary of the studies is presented in Table 1.

All of the studies except two were conducted in patients in psychiatric care. Barraclough and Pallis (1975) included general population subjects (the controls were under psychiatric care), and Conwell et al. (2000) included older primary care patients. There were four studies where bipolar patients constituted up to 20% of the sample (maximum 19%) and we were unable to get data for patients with unipolar depression separately (Dahlsgaard et al., 1998; Gladstone et al., 2001; Høyer et al.,

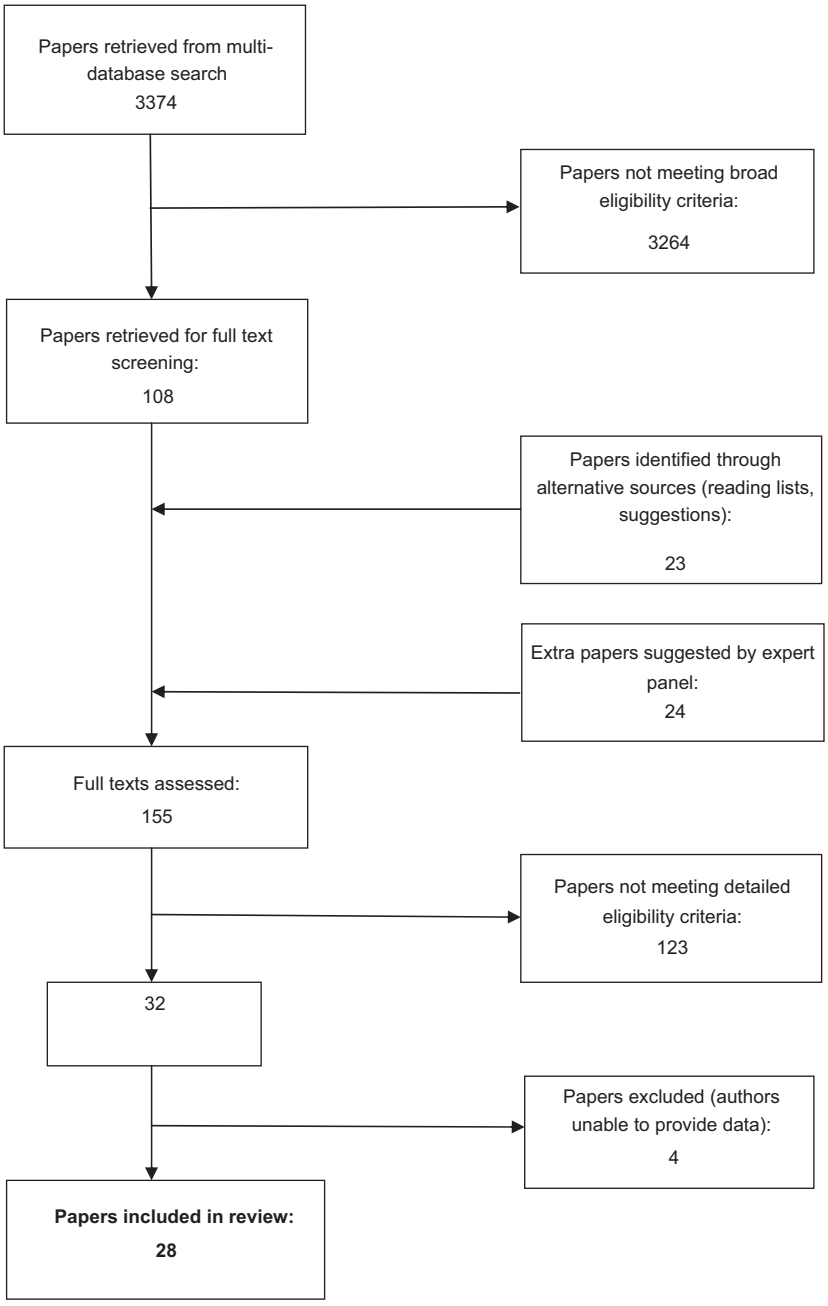

Fig. 1. Flow chart of search strategy.

Table 1
Summary of included studies.

Authors (place, date)	Study design	Subjects and controls, source, date of recruitment, follow-up period, important exclusion criteria, diagnostic criteria, other details	No. of suicides	No. of controls	Quality
Angst et al., 1995 (Angst and Preisig1995) (Swirtzerland)	Cohort	Mood-disorder patients admitted to a university psychiatric hospital between 1959 and 1963 (N=406) were followed-up until 1985. Of those, 186 were unipolar depressives. Controls: surviving unipolar cohort. Diagnostic criteria: ICD-9 and DSM-III-R.	25	161	5
Angst et al. (2005) (Angst et al., 2005) (Switzerland)	Cohort	As above. Follow-up period: 40–44 years (from 1963 to 2003).	27	159	5
Barraclough and Pallis (1975) (Barraclough and Pallis, 1975) (UK)	Case-control	General population adults who died by suicide between 1967 and 1969 (N=100), with a retrospective diagnosis of depression (N=64). Controls: were 128 adult depressives referred for treatment to a psychiatric service between 1960–61 (matched for gender and age). Data from matched gender and age controls were not used in this review. Diagnostic criteria: ICD-8 "*modified to accommodate the peculiarities of an enquiry where the patient was missing*".	64	128	6
Black et al. (1988) (Black et al., 1988) (U.S.A.)	Cohort	Patients admitted to a psychiatric hospital between 1970 and 1981 (N=1593), of which 1007 were major depression. Controls: surviving depressives from the cohort. Follow-up period: 0 to 14 years. Diagnostic criteria: DSM-III.	34	973	3
Brådvik and Berglund (1993) (Brådvik and Berglund, 1993) (Sweden)	Case-control	Patients admitted to a psychiatric hospital between 1956 and 1969 with a rating of severe depression and melancholia (N=1206) from cohort below. Of those, 73 suicides with primary unipolar depression were identified. Cases were diagnosed retrospectively. Controls: matched for diagnosis, age, sex and index admission year. Diagnostic criteria: Research Diagnostic Criteria (RDC).	73	70	4
Brådvik and Berglund (2011) (Brådvik and Berglund, 2011) (Sweden)	Case-control	As above. Monitored to 2010.	80	80	6
Brådvik et al. (2008) (Brådvik et al., 2008) (Sweden)	Cohort	Patients from above cohort, diagnosed with major depressive disorder or depressive disorder NOS and followed up between 1947 and 1997.	28	475	7
Mattisson et al. (2007) (Mattisson et al., 2007) (Sweden)	Cohort	Individuals who had experienced their first episode of depression during the follow-up period between 1947 and 1997 from above study. Patients with alcohol problems, or who had suffered other types of mental disorders (including depression) before inclusion in the cohort, were excluded. Controls: non-suicides from cohort. Diagnostic criteria: DSM-IV (retrospective for patients included before 1972).	17	327	7
Buchholtz-Hansen et al. (1993) (Buchholtz-Hansen et al., 1993) (Denmark)	Cohort	Patients diagnosed with major depression disorder (N= 219, including 17 (8.37%) BP patients), admitted to seven different psychiatric centres were followed-up prospectively for 3 to 10 years (from admission until 1990 or time of death). Severely suicidal patients with retarded depression requiring ECT, patients with serious somatic disease, chronic drug or alcohol abuse or paranoid psychosis were excluded. Controls: non-suicides from cohort. Diagnostic criteria: DSM-III.	16	203	5
Conwell et al. (2000) (Conwell et al., 2000) (U.S.A.)	Case-control	Older (> 60 years) patients who visited Primary Care services within 30 days of death between 1987 and 1995 (N=42). Of those, 33 were diagnosed with major affective illness, organic mood disorder, dysthymia/minor depression or depression NOS. Controls: older Primary Care patients with same range of mood disorders. Diagnostic criteria: DSM-III-R.	33	31	4
Coryell and Young, 2001 (Coryell and Young, 2005) (U.S.A.)	Cohort	Inpatients at university hospital who met criteria for major depressive disorder, mania or schizoaffective disorder and underwent a Dexamethasone Suppression Test, followed up between 1978 and 1981 (N=78). Data from BP patients (24%) were not included in this review. Controls: non-suicides from cohort. Diagnostic criteria: Research Diagnostic Criteria (RDC).	5	47	7
Dahlsgaard et al. (1998) (Dahlsgaard et al., 1998) (U.S.A.)	Case-control	Outpatients diagnosed with mood disorder and treated at cognitive therapy centre between 1978 and 1994, who died by suicide (N=17). Controls: living outpatients from the same centre, matched for gender, age, intake diagnosis, date of intake and Beck Depression Inventory (BDI) score. Data from matched variables were not used in this review. Diagnostic criteria: DSM-III or DSM-III-R.	17	17	6
Dumais et al. (2005) (Dumais et al., 2005) (Canada)	Case-control	Consecutive men who died by suicide and were diagnosed with major depression disorder or depression NOS in the 6 months before their death (N=104). Controls: living men who met criteria for major depression and were outpatients in psychiatric clinic. Controls were matched for age (within 2 years). Data from matched age were not used in this review. Female patients and patients with psychotic disorder were excluded. Diagnostic criteria: DSM-IV.	104	74	5
Gladstone et al. (2001) (Gladstone et al., 2001b) (Australia)	Cohort	Patients diagnosed with a current major depressive disorder referred to a specialist Mood Disorders Unit over a 10-year period (N=813), of which 31 died by suicide. Two control groups, both from the total sample: a) 31 age- and gender-matched living depressives who had *never* attempted suicide, and b) 24 age-and gender-matched living depressives who had made *at least one* suicide attempt. Data from matched age and gender controls were not used in this study. Diagnostic criteria: DSM-III, DSM-III-R or DSM-IV.	31	31	6
Høyer et al. (2004) (Høyer et al., 2004) (Denmark)	Cohort	National sample of patients (> 15 y.o.) with an affective disorder who had been admitted to a psychiatric hospital or department for the first time between 1973 and 1993 (N=53466). Patients with schizophrenia	3141	50325	5

Table 1 (*continued*)

Authors (place, date)	Study design	Subjects and controls, source, date of recruitment, follow-up period, important exclusion criteria, diagnostic criteria, other details	No. of suicides	No. of controls	Quality
		did not enter the study. Sample included 5455 BP patients (10.2%). Controls: non-suicides from cohort. Diagnostic criteria: ICD-8.			
Ilgen et al. (2009) (Ilgen et al., 2009); Zivin et al. (2007) (Zivin et al., 2007); Valenstein et al. (2009) (Valenstein et al., 2009) (U.S.A.)	Cohort	All veterans treated for depression at veterans' health services between 1999 and 2004 (N=887859). Patients with bipolar I disorder, schizophrenia or schizoaffective disorders were excluded. Controls: non-suicides from cohort. Diagnostic criteria: ICD-9.	1892	885967	4
			1683	806011	6
			1892	885967	6
Ilgen et al. (2010) (Ilgen et al., 2010) (U.S.A.)	Cohort	As above. Followed up period from 1999 until 2006 or time of death.	2397	475092	4
Krupinski et al. (1998) (Krupinski et al., 1998) (Germany)	Case-control	All patients admitted to a psychiatric hospital during the period from 1981 to 1992 (N=19158), of which 3792 were depressives. Of those, 33 died by suicide. Patients with monopolar mania or mania due to a bipolar disorder were excluded. Controls: depressives non-suicides from cohort. Diagnostic criteria: ICD-9.	33	3759	6
Lin et al. (2008) (Lin et al., 2008) (Taiwan)	Case-control	All patients discharged from psychiatric departments or hospitals with a principal diagnosis of depression between 2002 and 2004, and who died by suicide within a 90-day period post-discharge (N=85). Patients with bipolar disorder, schizophrenia, other psychoses, mental retardation or dementia/delirium were excluded. Controls: randomly selected cases matched for age, gender and date of discharge. Data from matched variables were not included in this review. Diagnostic criteria: ICD-9.	85	425	5
López de Lara et al. (2006) (López de Lara et al., 2006) (Canada)	Case-control	Suicide completers who met criteria for a major depression disorder (MDD) or depression NOS, recruited between 2000 and 2004. Controls: living subjects suffering from MDD and attending a specialised psychiatric outpatient clinic. Patients with bipolar or psychotic disorders were excluded. Diagnostic criteria: DSM-IV.	106	152	5
McGirr et al. (2008) (McGirr et al., 2008); McGirr et al. (2007) (McGirr et al., 2007) (Canada)	Case-control	As above. Follow-up period between 2000 and 2005.	154	143	4
			156	81	3
Nordström et al. (1995) (Nordström et al., 1995) (Sweden)	Cohort	Patients with mood disorders at the departments of psychiatry of three different university hospitals between 1973 and 1987 were followed up for a period of 1 to 11 years (N=346). In this review only the results from the major depression subsample were used (including 21 depressed suicides). Controls: non-suicides from cohort. Diagnostic criteria: DSM-III.	21	251	7
Roose et al. (1983) (Roose et al., 1983) (U.S.A.)	Case-control	All the suicides at a psychiatric institute between 1955 and 1980 (N=39). Of those, 14 met criteria for unipolar endogenous depression. Controls: randomly selected patients admitted to the same institute over the same period of time, who met the same diagnostic criteria. Diagnostic criteria: DSM-III.	14	28	3
Schneider et al. (2001) (Schneider et al., 2001) (Germany)	Cohort	Consecutively admitted patients with major depression followed up for a period of 5 years, from 1983 to 1987 (N=280). Of those, 278 could be located at the end of the follow-up period. Sixteen had died by suicide. Controls: non-suicides from cohort. Diagnostic criteria: DSM-III-R.	16	262	7
Sinclair et al. (2005) (Sinclair et al., 2005) (U.K.)	Case-control	Patients who died by suicide during or within 1 year of discharge from psychiatric inpatient care in the period between 1988 and 1987 (N=373). Of those, 322 were unipolar depressives. Controls: matched for gender, age (±10 years), primary diagnosis, hospital and admission date. Data from matched variables were not used in this review. Diagnostic criteria: ICD-10.	127	195	6

2004; Sinclair et al., 2005). Studies included were from nine different countries (six studies from the USA, two each from Canada, Denmark, Germany, Sweden, and the UK, and one each from Australia, Switzerland and Taiwan). The distribution by decade of publication was: one article was published in the seventies, two were published in the eighties, six were published in the nineties, and nineteen papers were published between 2000 and 2012.

3.1. Sociodemographic factors

Suicide risk was significantly greater in males (OR=1.76, 95% CI 1.08 to 2.86), although this result was associated with high heterogeneity (Fig. 2). It was not associated with marital status, living alone, having children or employment status, although there was considerable heterogeneity between studies in which living alone and employment status were examined.

3.2. Family and personal psychiatric history

Suicide risk was increased where there was a family history of mental disorder (OR=1.41, 95% CI 1.0 to 1.97) (see Fig. 3). While risk was increased where there was a family history of suicide in all three studies in which this was examined, the result of the meta-analysis was not quite statistically significant (OR=1.83, 95% CI 0.96 to 3.47).

There was a non-significant trend towards higher risk in those with a history of previous psychiatric hospital admissions (OR=2.37, 95% CI 0.86 to 6.55), but this result being associated with very high heterogeneity. A history of suicide attempts or self-harm was strongly associated with increased risk of suicide (OR=4.84, 95% CI 3.26 to 7.20).

3.3. Characteristics of the disorder

More severe depressive psychopathology was associated with suicide risk (OR=2.20, 95% CI 1.05 to 4.60), but not presence of

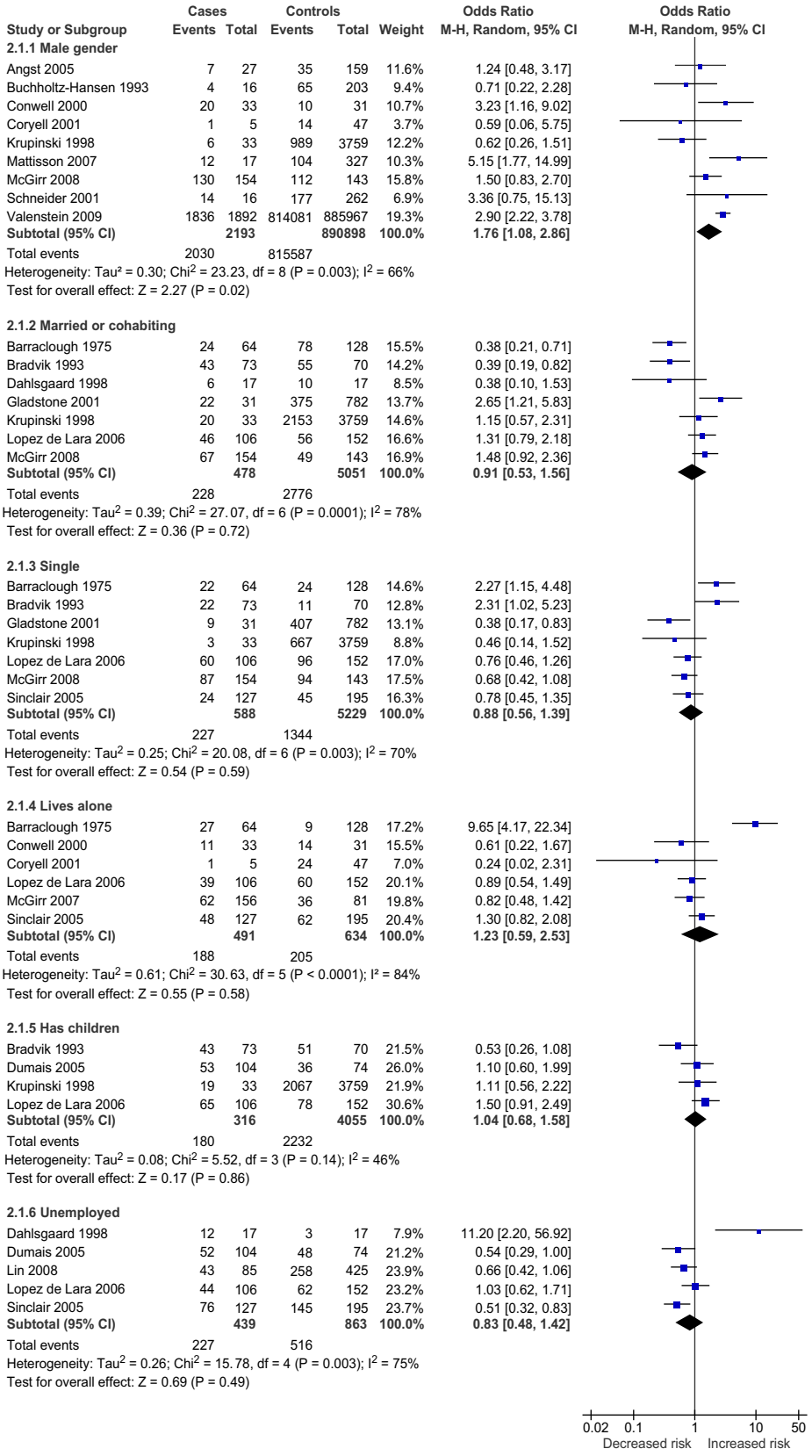

Fig. 2. Sociodemographic characteristics.

psychotic features, although both findings involved high heterogeneity (Fig. 4). In keeping with higher risk in those with more severe psychopathology, in a single study severe degree of impairment was also associated with increased risk of suicide (Mattisson et al., 2007). Risk was also substantially increased where individuals had expressed feelings of hopelessness (OR=2.20. 95% CI 1.49 to 3.23). There was wide variation in the findings from the three individual studies for suicidal ideation, with the overall result showing a non-

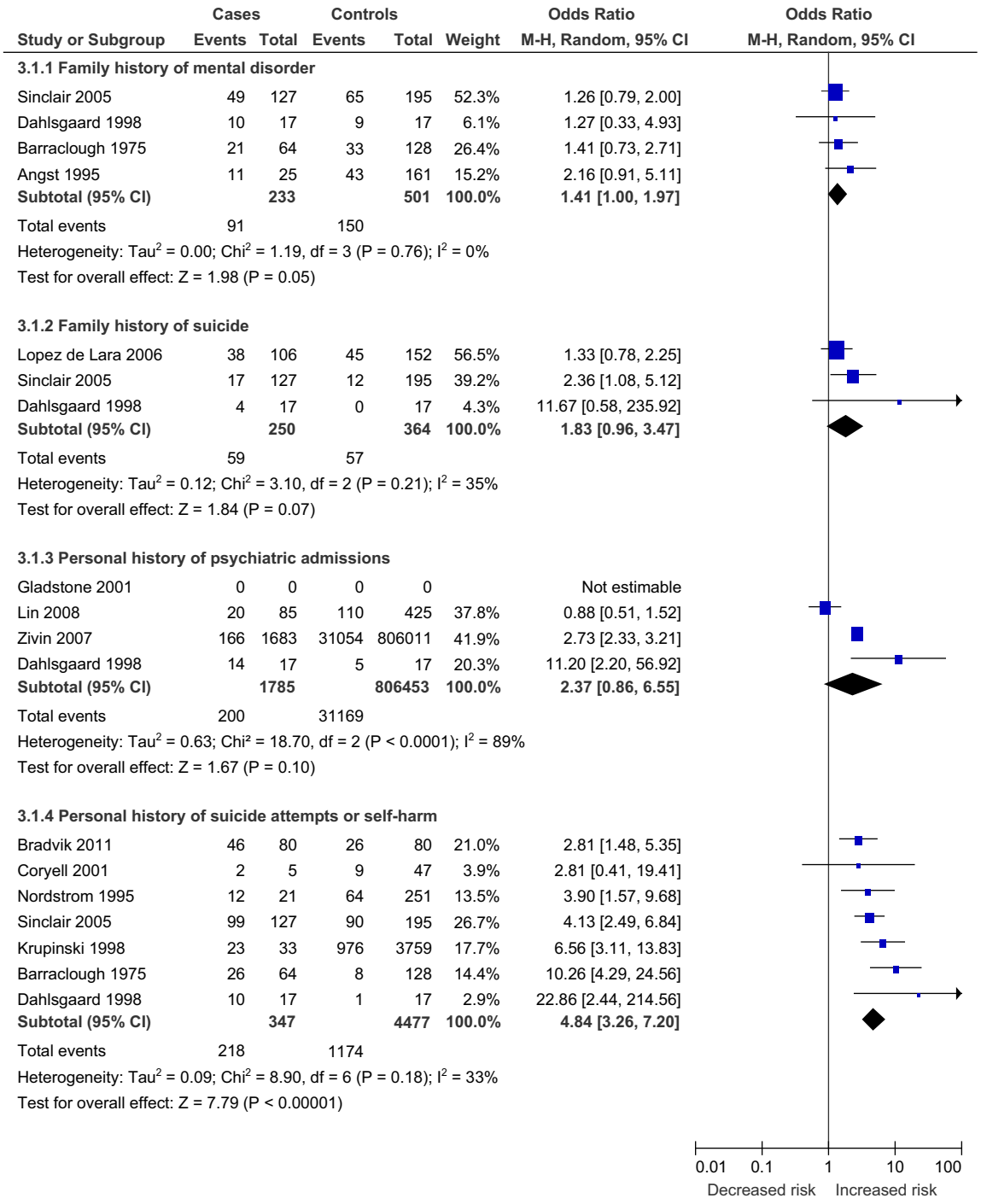

Fig. 3. Family and personal psychiatric history.

significant trend towards an association (OR=2.39, 95% CI 0.80 to 7.11). Feelings of guilt were only assessed in two studies but were not associated with suicide risk. Nor was an association found with reduced sleep, weight loss, retardation, loss of concentration, hypochondriasis or psychomotor disturbance, although each was only assessed in two or three studies. In a single study increased risk of suicide was found in people with self-neglect and also in those with impaired memory (Barraclough and Pallis, 1975).

3.4. Comorbid disorders and behaviour

Suicide was significantly increased in the presence of current substance misuse (i.e. alcohol and/or drug, OR=2.17, 95% CI 1.77 to 2.66) (Fig. 5). This also applied in the two studies in which alcohol (OR=2.47, 95% CI 1.40 to 4.36) or drug (OR=2.66, 95% CI 1.37 to 5.20) misuse were examined separately. The presence of symptoms of anxiety was also associated with increased risk of suicide (OR=1.59, 95% CI 1.03 to 2.45).

Risk of suicide was strongly associated with the presence of an Axis II (i.e. personality) disorder (OR 4.95, 95% CI 1.99 to 12.33). Despite the very high heterogeneity in the results, findings of all three studies included in the meta-analysis were strongly suggestive of a positive association.

In a single study suicide risk was associated with the presence of a non-fatal physical illness (Brådvik et al., 2008).

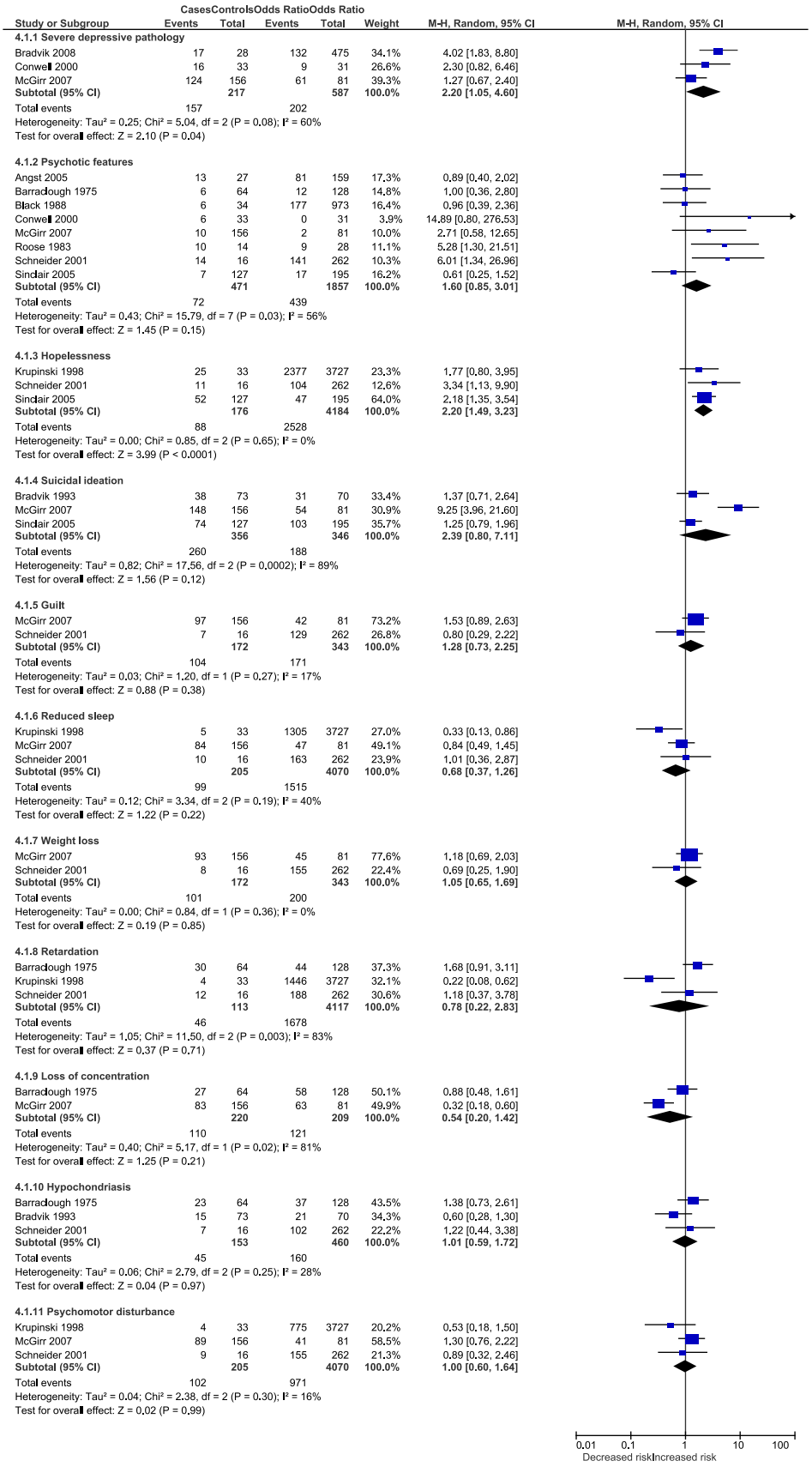

Fig. 4. Characteristics of disorder.

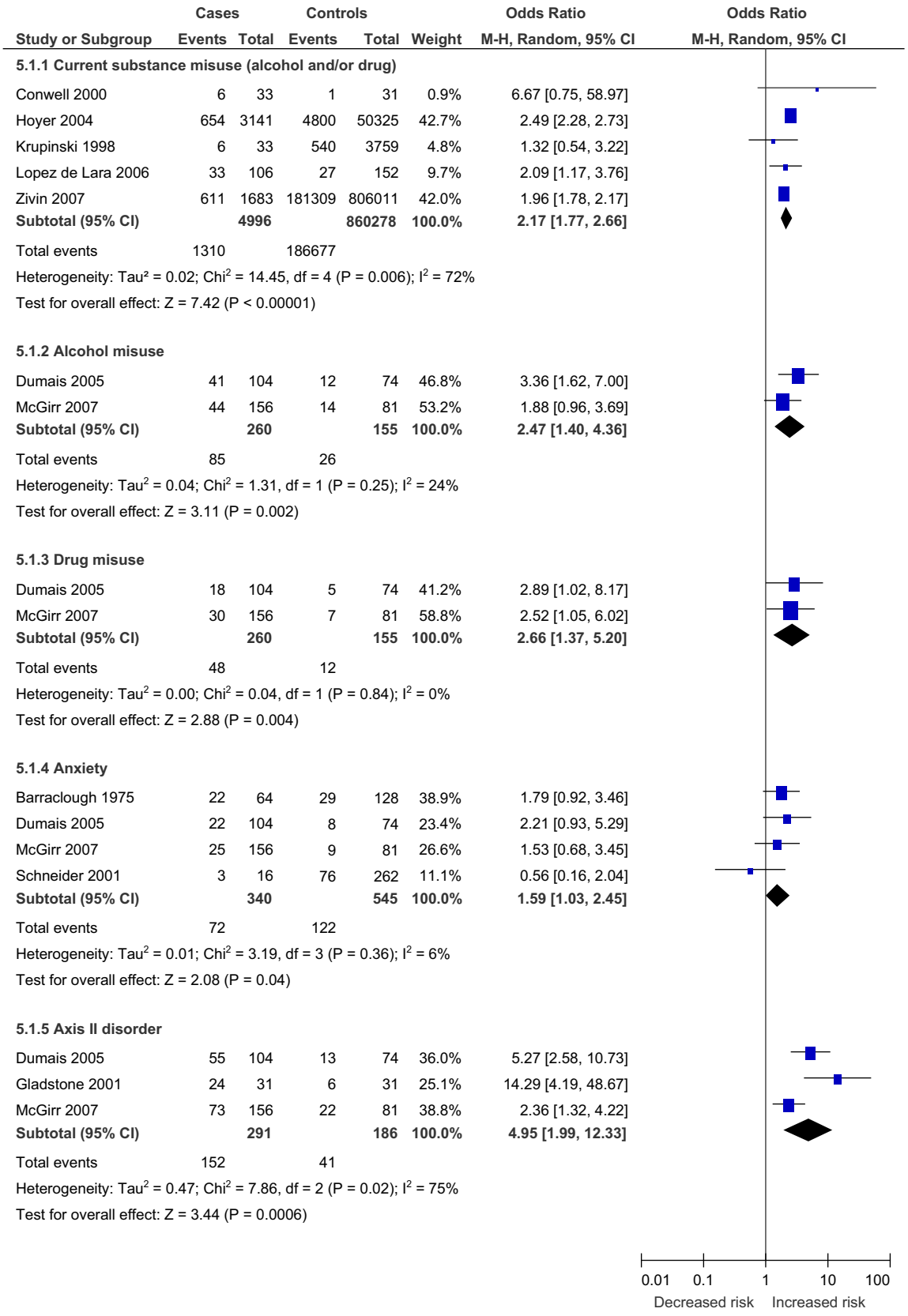

Fig. 5. Comorbid disorders and behaviour.

3.5. Treatment

In two studies of psychiatric hospital patients there was a non-significant trend towards lower risk in those who were voluntary patients (Fig. 6). Antidepressant treatment was also only examined in two studies; while the risk of suicide was reduced in patients receiving antidepressants in both studies, the overall trend was non-significant. However, in a single study increased

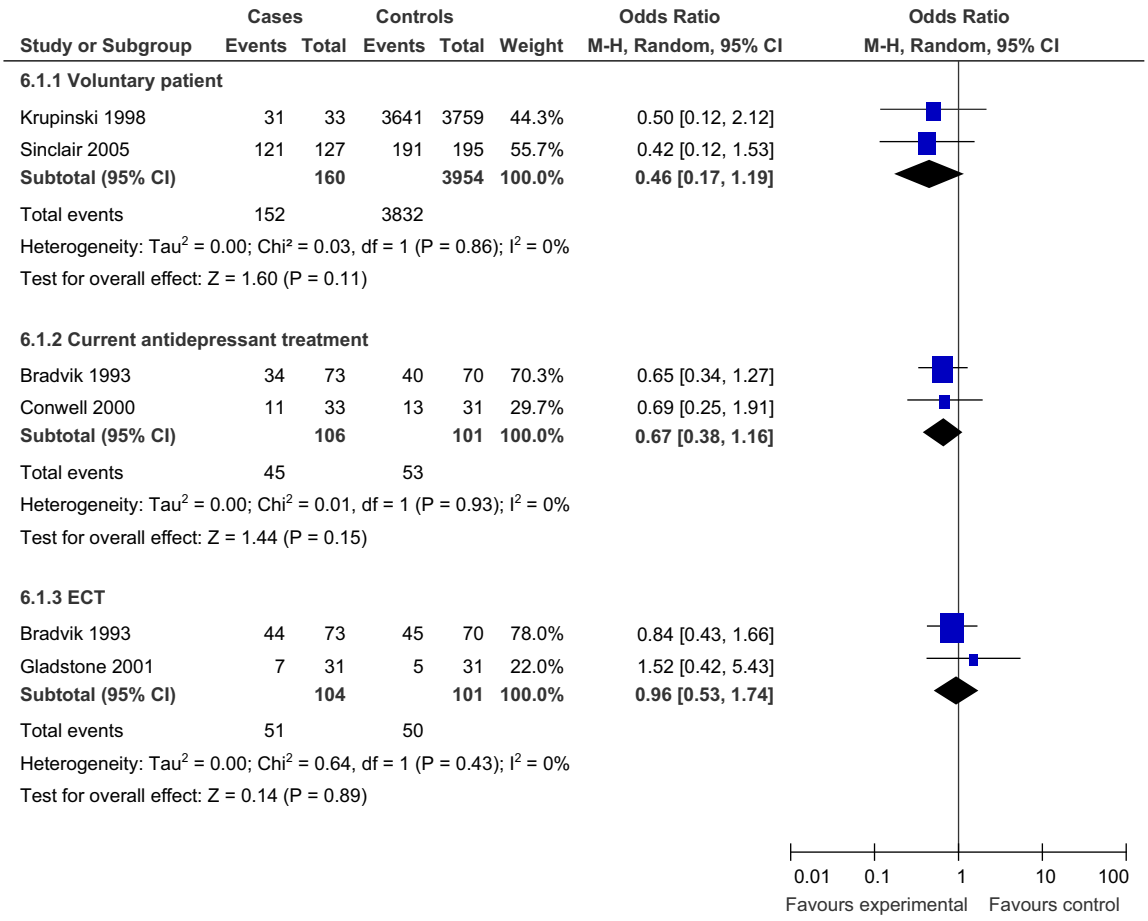

Fig. 6. Treatment.

risk of suicide was associated with starting an antidepressant and with an antidepressant dose change (Valenstein et al., 2009). There was no indication of reduced risk in patients who had received ECT. In a single study discharge from psychiatric hospital inpatient care was associated with significantly increased risk of suicide (Lin et al., 2008). In another single study risk was found to be increased in the first 12 weeks following discharge from psychiatric hospital inpatient care (Valenstein et al., 2009).

4. Discussion

Depression is strongly associated with suicide and non-fatal suicidal behaviour and ongoing assessment of suicide risk should be integral to the management of patients with this disorder. In this study we have focused on risk of suicide as this will be the principal concern of clinicians.

We have used a systematic approach to searching the world research literature on risk factors for suicide in people with depression, including studies in any language. Some authors reanalysed data for us, including providing data on patients with depression from studies of broader populations of psychiatric patients. One striking finding was the relative paucity of studies exploring risk factors for suicide in this diagnostic group. Thus there were 19 studies with usable data, with findings reported in 28 papers. Relatively few risk factors for suicide were identified and those that were identified are similar to risk factors for suicide in general. This is perhaps not surprising given that depression is the predominant diagnosis associated with suicide. No studies examined risk factors in primary care populations. Given that the majority of depression is managed in this context, and, at least in the UK, approximately three-quarters of suicide deaths occur in individuals who are not known to secondary care services (National Confidential Enquiry into Suicide and Homicide by People with Mental Illness, 2006, 2012), this is particularly concerning.

Suicide risk was greater in males than females, as found for suicide in general (Hawton and van Heeringen, 2009). One of the stronger findings was the level of increased risk associated with a history of attempted suicide. While a trend towards increased risk where there was a family history of suicide, risk was significantly increased where there was a family history of psychiatric disorder. Few clinical characteristics of depression were indicators of risk, just more severe psychopathology and hopelessness, with only a trend for suicidal ideation. Comorbid disorders were associated with increased risk, including substance misuse, specific abuse of alcohol and drugs, anxiety and presence of a personality disorder. To this list should be added the well recognised heightened risk during the first few weeks after discharge from psychiatric inpatient care (Goldacre et al., 1993; Geddes and Juszczak, 1995; Valenstein et al., 2009). While initiation of antidepressant treatment (and change of antidepressant dose) was found to be a risk factor in only a single study (Valenstein et al., 2009), it appears that risk is also increased just prior to starting treatment and applies equally to psychotherapy as to antidepressants (Simon and Savarino, 2007). This is probably therefore an artifact due to severity of disorder and degree of psychosocial problems.

These factors should be included in assessment of suicide risk in patients with depression, along with others that can generally

increase risk (e.g. family history of suicide or self-harm, physical illness (especially when this is recently diagnosed, chronic and/or painful), exposure to suicidal behaviour of others, either directly or via the media, recent discharge from psychiatric inpatient care, access to lethal means of suicidal behaviour) (Hawton and van Heeringen, 2009). It is also useful to be aware of factors which may offer some protection against suicide (e.g. supportive relationship(s), young children, religious beliefs) (Hawton and van Heeringen, 2009), although such factors may only provide a certain degree of protection. It is essential that clinicians recognise the limitations or reliance on presence or absence of risk factors for assessment of the extent to which an individual is at risk of suicide. Due to the low base rate of this outcome and the poor specificity of risk factors, the predictive power of such assessment is bound to be extremely limited (Large et al., 2011; National Collaborating Centre for Mental Health, 2011). Also, while we were unable to study factors by age-group and specific depression diagnoses, it is important to recognise that certain factors may have greater or lesser significance in certain subgroups (e.g. physical illness/pain in older people, misuse of drugs in younger people).

4.1. Strengths and limitations

Nearly half the studies included in this review were solely based on a case-control design, which is a somewhat weaker methodology than a cohort design (used in the remainder of the studies). Patients in a substantial proportion of the studies were identified as psychiatric inpatients, with only one of the studies being conducted in primary care. This may limit the applicability of the findings. While where possible we were able to exclude individuals with bipolar disorder (which has been the subject of a separate systematic review of risk factors for suicidal behaviour (Hawton et al., 2005)) and in several cases original authors assisted us with this, we included studies where up to 20% of patients were diagnosed with bipolar disorder. In fact, the proportion of patients with bipolar disorder in these studies was relatively small. Also, as noted earlier, approximately 20% of the patients originally diagnosed with major depression will subsequently receive a diagnosis of bipolar disorder (Ghaemi et al., 1999; Goldberg et al., 2001). While meta-analysis allows results from a large range of studies to be synthesised, it was not possible to adjust the estimates associated with specific risk factors for the confounding effects of other variables as we were unable to access individual participant data. Several of the studies were rather small, increasing the risk of Type I errors, although where the results of these types of studies could be combined, especially with those of larger studies, the size of this problem should have been reduced. Finally, it is important to note that only one of the studies was from a non-western country (Lin et al., 2008, from Taiwan) and hence the generalisability of the findings to other cultures or geographical contexts might be limited.

4.2. Conclusions and implications

From this systematic review we have identified the following risk factors for suicide in people with depression: male gender, family history of psychiatric disorder, previous attempted suicide, more severe depression, hopelessness, and comorbid disorders, including anxiety and misuse of alcohol and drugs. These should certainly be considered in assessing people with depression at possible risk.

Given the strength of the association between depression and suicide, the number of studies we identified was small. There is a need for large prospective studies of risk factors for suicide in this diagnostic group. In addition there is a particular need for studies in primary care populations. The findings of such work would better inform detection and assessment of those most at risk and enable appropriate therapeutic and preventive interventions to be instituted.

Role of funding source

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Conflict of interest

The authors declare no conflict of interest.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.jad.2013.01.004.

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