Trends
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Review Article

Risk factors of suicide attempts by poisoning: review

Fatores de risco para tentativa de suicídio por envenenamento: revisão

Maria Cláudia da Cruz Pires,[1] Tatiana de Paula Santana da Silva,[2] Marcela Pires dos Passos,[3] Everton Botelho Sougey,[4] Othon Coelho Bastos Filho[5]

Abstract

Introduction: Suicide, a complex and universal human phenomenon, is a major public health problem. This study reviewed the literature about the major risk factors associated with suicide attempts by poisoning.
Methods: An integrative review of the literature was performed in databases (LILACS, PubMed and MEDLINE) to search for studies published between 2003 and 2013, using the following keywords: suicide, attempted; poisoning; risk factors. Inclusion criteria were: original study with abstract, sample of adults, and attempted suicide by poisoning in at least 50% of the study population.
Results: Two hundred and nineteen studies were retrieved and read by two independent examiners, and 22 were included in the study. The main risk factors for suicide attempts by poisoning were female sex, age 15-40 years, single status, little education, unemployment, drug or alcohol abuse or addiction, psychiatric disorder and psychiatric treatment using antidepressants.
Conclusion: Further prospective studies should be conducted to confirm these risk factors or identify others, and their findings should contribute to planning measures to prevent suicide attempts.

Keywords: Suicide, attempt, poisoning, risk factors.

Resumo

Introdução: O suicídio é um fenômeno humano complexo, universal e que representa um grande problema de saúde pública. Diante disso, o presente estudo tem por objetivo revisar a literatura acerca dos principais fatores de risco associados à tentativa de suicídio por envenenamento.
Método: Foi realizada uma revisão integrativa em bases de dados (LILACS, PubMed e MEDLINE). A pesquisa focou artigos publicados entre os anos de 2003 a 2013, utilizando os seguintes descritores: suicide, attempted; poisoning; risk factors. Foram considerados os seguintes critérios de inclusão: ser artigo original, com resumo disponível, amostra composta por adultos, e que pelo menos 50% da população do estudo tenham tentado o suicídio por envenenamento.
Resultados: Foram selecionados 219 artigos. Após a leitura por dois pesquisadores independentes, 22 foram incluídos na revisão. Os principais fatores de risco encontrados para a tentativa de suicídio por envenenamento foram: gênero feminino, idade entre 15 a 40 anos, estado civil solteiro, baixa escolaridade, desemprego, abuso/dependência de substancias e/ou álcool, ser acometido por transtorno psiquiátrico e estar em tratamento psiquiátrico com uso de antidepressivo.
Conclusão: Considera-se que pesquisas adicionais, bem como a ampliação de estudos prospectivos, deverão ser realizadas para a confirmação ou identificação de novos fatores de risco. Estas medidas objetivam contribuir para o planejamento e prevenção da tentativa e do suicídio.

Descritores: Tentativa de suicídio, envenenamento, fatores de risco.

[1] Psychiatrist. PhD, Graduate Program in Neuropsychiatry and Behavioral Sciences, Universidade Federal de Pernambuco (UFPE), Recife, PE, Brazil. [2] Speech therapist. Doctoral student, Graduate Program in Neuropsychiatry and Behavioral Sciences, UFPE, Recife, PE, Brazil. [3] Psychologist. PhD, Graduate Program in Neuropsychiatry and Behavioral Sciences, UFPE, Recife, PE, Brazil. [4] PhD. Professor, Graduate Program in Neuropsychiatry and Behavioral Sciences, UFPE, Recife, PE, Brazil. [5] Psychiatrist. Full Professor of Psychiatry, UFPE, Recife, PE, Brazil.

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Introduction

The comprehension of the definitions of suicide and attempted suicide is based on several theoretical domains, such as theology, psychology, philosophy and sociology, as well as psychiatry.[1] The World Health Organization[2] defines suicide as the deliberate act of killing oneself. One of the first definitions of attempted suicide classified it as "any non-fatal act of self-damage inflicted with self-destructive intention, however vague and ambiguous."[3]

In later publications, the objective intention to kill oneself has not been found as an obligatory requisite in the definition of attempted suicide. The term "suicidal behavior" might, therefore, be equivalent to the term "self-harm", and both define "an act of intentional self-poisoning or injury irrespective of the apparent purpose of the act".[4] This definition is closer to the terms "attempted suicide" and "parasuicide" used in several countries.[4]

These definitions are, however, imprecise, as it is difficult to evaluate and measure the intention of a desire to die or not die underlying the acts described.[5] Therefore, despite all efforts, no unanimous and consensual definition of attempted suicide has been reached.

Epidemiological data show that, when compared with rates in other countries, mortality due to suicide in Brazil is one of the lowest, although Brazil is one of the ten countries with the highest absolute number of deaths due to suicide.[6,7] From 2003 to 2009, there were 60,637 deaths due to suicide in Brazil, at a mean 24 deaths per day, which results in a mean coefficient of 4.5 deaths per 100 thousand inhabitants (Departamento de Informática do SUS - Sistema de Informações sobre Mortalidade – Brazilian Mortality Information System).[8] Of all deaths due to external causes (6.6%), suicide accounts for 0.8% of the total in Brazil.[9]

The number of attempted suicides is expected to be higher than that of suicides. For each actual suicide, about 20 to 30 suicidal behaviors are expected, and only about one fourth of them will have any contact with healthcare services.[10,11] In Brazil, attempted suicides are not compulsorily reported, and reports currently made are rare and less reliable than those made for suicides.[12] The analysis of suicide attempt methods reveals an association between method used or chosen and the sex of individuals. For example, men prefer potentially lethal methods, such as hanging or shooting,[13-15] whereas women use less aggressive and slower methods, such as some types of poisoning.[16-18]

The study of suicide attempts by poisoning is justified by the consistent evidence of a growing use of toxic agents as a method.[19-22] Of the main toxic agents, medications have been increasingly used in the last decades, and are now more frequent than pesticides. For example, in 2006, according to our review, the number of attempted suicides by using medications was greater than twice the number of attempts by using pesticides. When compared with other agents, their numbers are relatively stable from 1994 to 2006.[23,24]

Attempted suicides have been classified as a public health problem because of their reach.[9,10,20] There are several explanations for this type of behavior, in addition to easy access to toxic agents, and in some cases there is a clear association with complex psychosocial phenomena, mental disorders and negative life events.[18,25]

Possible risk factors associated with this phenomenon should be studied to support the development of more efficacious preventive strategies. This study reviewed the current literature about the main risk factors associated with attempted suicide by poisoning.

Method

This integrative literature review was conducted in three phases. In the first, the MEDLINE, LILACS and PubMed databases were chosen for the searches. In the second, the keywords and inclusion criteria to identify studies of interest were defined. Keywords were chosen according to searches conducted in the keyword collections of two of the databases, that is, the Medical Subject Headings (MeSH) and the Descritores em Ciências da Saúde (DeCS, a Brazilian database of medical keywords).

The keywords used to select studies were suicide, attempted, poisoning and risk factors, as well as their equivalent Portuguese terms (*tentativa de suicídio, envenenamento, fatores de risco*). The Boolean operators AND and AND NOT were used to combine keywords and terms for the publication searches.

The selection was limited to studies published in Portuguese, English or Spanish from January 2003 to March 2013. The last database search was conducted in July 2013.

In the third phase, study titles and abstracts of all the studies selected were read to identify those that dealt with the topic of this review. Additionally, the following inclusion criteria were adopted: original study; and studies in which poisoning was the main method for at least 50% of the population that attempted suicide. Studies were excluded if published as editorials, interviews, clinical notes or reviews, as well as those with samples that included only children, adolescents or the elderly.

The initial search retrieved 222 potentially eligible studies: 180 in PubMed, 37 in MEDLINE and 5 in LILACS. They were read independently by two examiners. When they disagreed, a third examiner was asked to give an

opinion about whether the study should be included or excluded. At the end of those analyses, 22 studies were included in this review.

The flowchart in Figure 1 describes the literature review and the selection of studies.

Table 1 shows the characteristics of the studies included in this review. A greater number of studies were published from 2010 to 2012. Most studies were retrospective, followed by multi-center studies. These results indicate that the study of situations with an imminent risk of death, such as attempted suicide, is a difficult task, although necessary for the understanding of the problem and the planning of more efficient preventive measures.[26,45]

This extensive review of risk factors found that some studies reported an incidence of attempts by self-poisoning greater than 50%. However, only the risk factors exclusively associated with poisoning are discussed here, as shown in Table 1, in the column for attempt method.

The impact factor of each publication was analyzed to classify studies according to level of evidence. Of the 22 studies, 10 were published in journals with an impact factor greater than 1.0. This criterion is a measure used in bibliometrics to evaluate the quality of a journal in terms of citations and access and provides, therefore, one of the best indices of evidence for any topic.[46]

Most of the studies in this review were conducted in Europe, followed by Asia, and most included samples with more than 900 individuals.

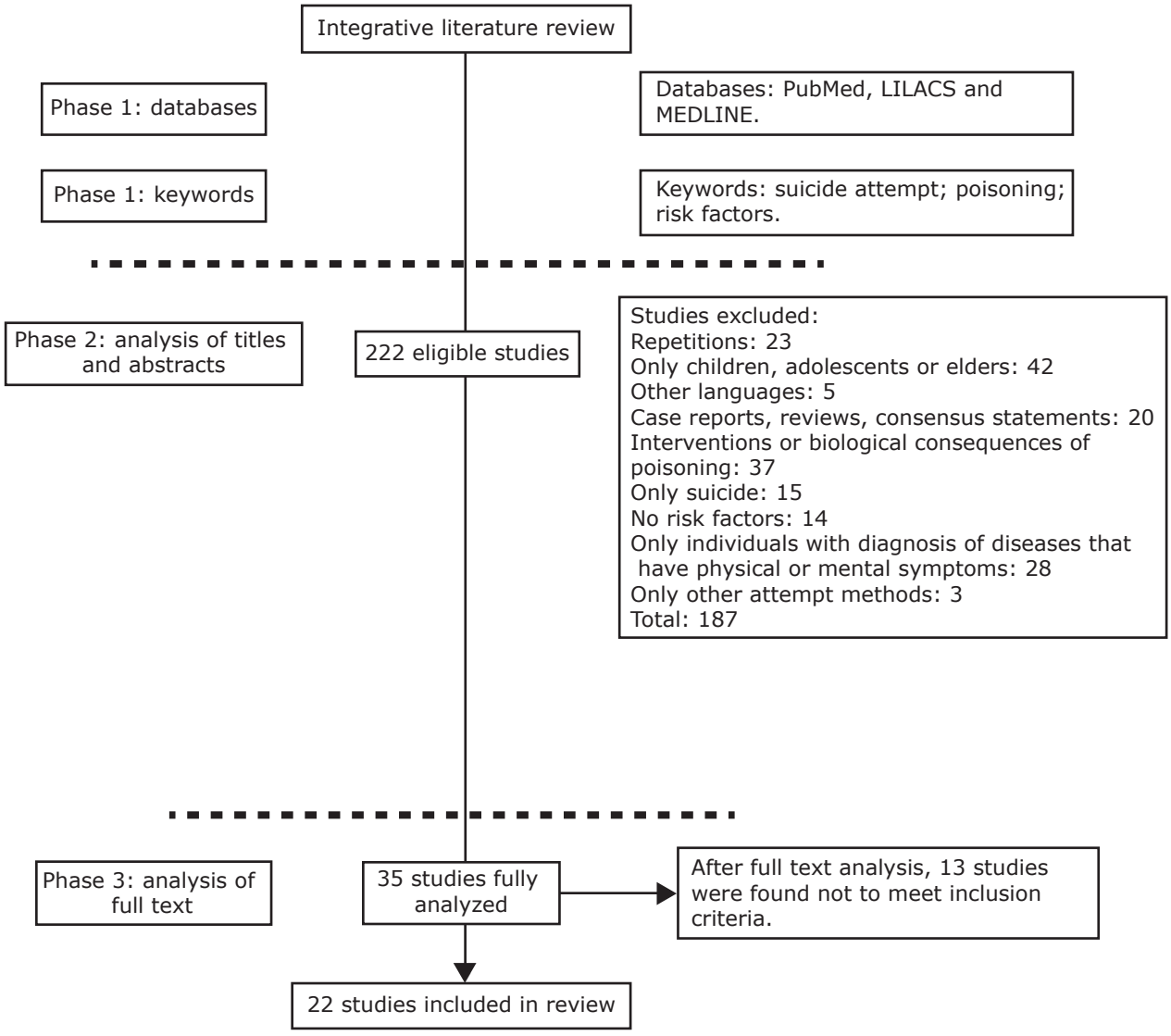

Figure 1 - Literature review flowchartResults and discussion

Table 1 - Characteristics of the studies included in the literature review

Authors, year and impact factor	Type of study	Place and country	Study duration and sample size	Sex and age	Attempt method
Flavio et al., 2013[26] Swiss Med Wkly Impact factor: 1.895	Comparative	Basel City, Switzerland	35 months (Jan 2003 to Dec 2006) Sample: 778	Men: 326 (33%) Women: 658 (67%) Age: 15 to 103 years	Poisoning: more than 50%
Williams-Jonshon et al., 2012[27] West Indian*	Retrospective	Kingston, Jamaica	48 months (2005-2009) Sample: 127	Men: 31 (24.4%) Women: 96 (75.6%) Age: 10 to 55 years	All by poisoning
Rancic et al., 2012[28] Med Glas Impact factor: 0.056	Retrospective	Kragujevac, Serbia	240 months (1990-2010) Sample: 715	Men: 310 (43.5%) Women: 405 (56.5%) Age: 15 to ≥ 65 years	Poisoning: 395 (55.3%) Hanging: 63 (8.8%)
Lee et al., 2012[29] J Korean Med Impact factor: 0.993	Cross-sectional	Suwon, Korea	36 months (2007-2009) Sample: 2996	Men: 1259 (42%) Women: 1737 (58%) Age: 10 to ≥ 60 years	Poisoning by medication overdose 68.8% Other methods: 28,2%
Turhan et al., 2012[30] Neurosciences (Riyadh) Impact factor: 0.121	Retrospective (historical cohort)	Hatay, Turkey	36 months (2007-2009) Sample: 1.613	Men: 343 (21.1%) Women: 1270 (78.9%) Age: 10 to 63 years	Poisoning by medication overdose 97.5% Other methods: 2,5%
Garcia-Rabago et al., 2010[31] Rev Salud Pub*	Prospective, observational, comparative	Jalisco, Mexico	6 months (2005) Sample: 106	Men: 32 (30.2%) Women: 1270 (78.9%) Age: 15 to 61 years	Poisoning by medication overdose (60.3%)
Yip et al., 2011[32] Crisis*	Comparative	Hong Kong and Oxford	3 months (2005) Sample: 90	Men: 26 (29%) Women: 64 (71%) Age: mean age: 35 years	Poisoning by medication ingestion (78%)
Oh et al., 2011[22] Am J Emerg Med Impact factor: 1.976	Retrospective	Seoul, Korea	2000-2009 Sample: 967	Men: 220 (22.8%) Women: 747 (77.3%) Age: 13 to 94 years	All by poisoning
Rezaie et al., 2011[33] Burns Impact factor: 1.962	Intervention; quasi-experimental	Kermanshah, Iran	3 months (Jun to Sept 2006) Sample: 200	Men: 67 (34%) Women: 133 (63%) Age: 26.4±9.5 years	Poisoning: 137 (68%) Immolation 63 (32%)
Chowdhury et al., 2010[34] Natl Med J indian Impact factor: 0.595	Prospective	Bengal, India	12 months (2002) Sample: 1614	Men: 619 (38.4%) Women: 995 (61.7%) Age: 7 to 80 years	Poisoning: 1588 (98.4%) Other methods: 1.6%
Zyoud et al., 2010[24] Hum Psychopharmacol*	Descriptive and retrospective	Malaysia, Asia	36 months (2006-2008) Sample: 177	Men: 28 (15.8%) Women: 149 (84.2%) Age: < 20 to > 30	All by poisoning with acetaminophen overdose
Heyerdahl et al., 2010[35] BMC Psychiatry Impact factor: 2.552	cohort prospective multi-site	Oslo, Norway	11 months (2003-2004) Sample: 908	Men: 418 (46%) Women: 490 (54%) Age: < 16-89 years	All by poisoning
Ozdel et al., 2009[36] Crisis*	Cross-sectional	Pamukkale, Turkey	24 months (2006-2007) Sample: 144	Men: 36 (25%) Women: 108 (75%) Age: < 16-89 years	Poisoning by medication: 70% Other methods: 30%
Payne et al., 2009[37] Public Health Impact factor: 1.35	Retrospective cohort	Scotland, United Kingdom	84 months (1996-2002) Sample: 50.891	Men: 21883 (43%) Women: 29007 (57%) Age: 15 to > 65 years	All by poisoning
Carter et al., 2007[38] Suicide Life Threat Behav*	Case-control	Australia	44 months (1998-2001) Sample: 581	Men: 180 (31%) Women: 401 (69%) Age: 18 to > 65 years	All by poisoning
Kapur et al., 2006[4] J Clin Psychiatry Impact factor: 5.799	Prospective cohort Multi-site	United Kingdom	60 months (1997-2002) Sample: 9.213	Men: 3991 (43%) Women: 5222 (57%) Age: older than 15 years	Poisoning: 87% Other methods: 15%
Carter et al., 2006[39] Suicide Life Threat Behav*	Comparative cohort	Newcastle, Australia	60 months (1996-2002) Sample: 2629	Men: 991 men (38%) Women: 1638 (62%) Age: < 25 to > 35 years	All by poisoning
Alaghehbandan et al., 2005[40] Can Psychiat Impact factor: 2.417	Secondary database; retrospective	Newfoundland and Labrador, Canada	24 months (1998-2000) Sample:978	Men: 423 (43%) Women: 550 (57%) Age: 10 to ≥ 75 years	Poisoning: 87.0%. Cutting:7.1% Hanging: 2.0%

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Ichimura et al., 2005[41] Psychiatry Clin Neurosci Impact factor: 2.133	Case-control	Isehara, Japan	12 months (Jan to Dec 2000) Sample: 235	Men: 104 (44%) Women: 131 (56%) Age: 49.2 years (±16.9)	Poisoning: 172 (70%) Other methods: 73 (30%)
Fekete et al., 2005[42] Croat Med J Impact factor: 1.796	Multi-site; retrospective	Hungary, Romania	48 months (1997-2001) Sample: 1.158	Men: 430 (37%) Women: 728 (63%) Age: 36.4 years (±15.2)	All by poisoning
Douglas et al., 2004[43] J Affect Disorders Impact factor: 3.517	Case-control	Saltford, United Kingdom	18 months (Mar 1999 to Aug 2000) Sample: 1748	Men: 710 (6%) Women: 1038 (94%) Age: suicide group: 41; NFDSH group: 34; DSH group: 31	Poisoning: 74% Other methods: 26%
Carter et al., 2003[44] Aust NZJ Psychiatry Impact factor: 2.929	Case-control	Newcastle, Australia	26 months (Apr 1998 to Jun 2000) Sample: 82	Men: 23 (28%) Women: 59 (72%) Age: 18 to 24 years	All by poisoning

* Journal with no impact factor.

Table 2 - Summary of studies that describe risk factors of attempted suicide by poisoning according to objective, risk factors, conclusions and general comments

Authors, year	Study objective	Risk factors	Conclusions	Comments
Flavio et al., 2013[26]	To analyze rate of attempted suicides and their methods and to identify risk groups of attempted suicide.	Women aged 37.43±16.87 ($p \leq 0.001$) Risk groups include single individuals, of foreign nationality, low education and low employment status	Men were significantly more frequently affected by substance abuse disorder or psychosis, whereas in women adjustment disorders and personality disorders were diagnosed significantly more often.	This study offers the first published representative data of an entire Swiss county. Established sociodemographic and clinical risk factors for suicide attempts were reproduced. The identification of risk factors contributes to the development of local targeted prevention strategies, for example education of risk groups and caregivers, and pharmacolegal consequences for package sizes. Gender- and age-specific prevention and aftercare programs are indicated.
Williams Jonshon et al., 2012[27]	To document the characteristics of self-poisoning suicide attempters who were brought to the Emergency Room of the University Hospital of the West Indies (UHWI) and to outline the type of drug used in the attempt.	Women ($p < 0.001$) Age 16 to 30 years ($p < 0.001$) Use of chemical agents greater among women ($p < 0.019$)	Findings consistent with global trends of attempted suicides according to sex and age group.	Substance ingested different from other data in the literature (women: chemicals; men: medication)
Rancic et al., 2012[28]	To determine the frequency and distribution of suicide attempts relating to the manner of execution and (...) possible risk factors.	Women: 405 (56.5%) Depression: 336 (48.4%) Mean age at attempt: 42.6 (SD = 16.78) Schizophrenia and delirious disorders: 150 (20.4%) Substance abuse: 85 (11.2%)	Suicide attempts were two times more frequent among women than among men. Young people, both men and women.	Patients hospitalized in general wards and not in psychiatric wards. No control group.

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Lee et al., 2012[29]	To describe risk factors of attempted suicide associated with intensity of self-inflicted injuries.	Men: p = 0.001 (severe injury group) Age: 10 to 19 years; p = 0.001 (severe injury group) consumed no alcohol: p = 0.001 (severe injury group)	Male sex, older age and not having consumed alcohol were predictors of severe suicide attempt.	Data may be underestimated, as Koreans tend to mask their suicidal intent.
Turhan et al., 2012[30]	To determine suicide rates, risk factors and reasons for suicide attempts.	Young people (15-24 years): 87.1 (odds ratio) Women/men: 3.27 (odds ratio) Single women: 2.7 (odds ratio) Higher education level: 8.4 (odds ratio)	Young people, women, single status and people with higher educational level and history of psychiatric disease in the family had a higher risk of attempts and recurrence.	Study based on medical records. Higher educational level was a risk factor in this study.
Garcia-Rabago et al., 2010[31]	To identify differences between patients with high-and low-lethality risk factors.	Living alone: 6.7 (odds ratio) Prior alcohol poisoning: 3.8 (odds ratio)	In the high-lethality group, chances of attempted suicide were 6.7 times greater among people that lived along and 3.8 times among people with a history of previous alcoholic poisoning.	Lethality evaluated using instruments (Insa and Barrachina scale).
Yip et al., 2011[32]	To compare the characteristics of patients hospitalized in Hong Kong and Oxford after repeated suicide attempt.	Single (p = 0.04) Victim of violence in the last 5 years (p = 0.02) Hospitalization (p = 0.02) Adverse life problems (p = 0.01) Consequences of sexual abuse in childhood (p = 0.04) Consequences of physical abuse in childhood (p = 0.01) Repetitive self-mutilation (p = 0.00)	Suicide intent: Hong Kong (48.9%) and Oxford (29%). Intent was higher among men in Oxford (35.71) than among women (25.7). Defaulted psychiatric treatment: 44. 6% in Hong Kong and 35.3% in Oxford. Alcohol abuse: Oxford 33.2%; and Hong Kong 14%.	Study conducted in only one hospital. Short repetition follow-up (6 months). Large number of interviewees had a previous attempt. Authors believe more details are essential to evaluate actual risk factors and suggest that suicide intent scales should be different for different sexes.
Oh et al., 2011[22]	To describe factors associated with repeated suicide attempts.	Female sex (p = 0.002) Not having a family (p < 0.001) Attempt method: analgesics (p < 0.001) History of psychiatric treatment (p < 0.001)	The most relevant factors were female sex, not having a family, having a history of psychiatric treatment and use of antidepressants.	Data were collected from self-reports. Attempt repetitions may have been underreported due to collection at one site only. Study did not examine reasons for attempt, social class, marital status, use of substances, or other diseases.
Reazie et al., 2011[33]	To compare the profile of suicide attempts by self-immolation and poisoning.	Self-poisoning: women 53.3% (p < 0.001); younger (25 years) (p < 0.007); single 59.9%; higher educational level (p < 0.001) Positive suicidal intent behavior: 44.5% (p < 0.001)	Risk factors were different in the two groups.	Data from one hospital only and short study duration. No validated instruments for assessment.
Chowdhury, et al., 2010[34]	To evaluate the characteristics of people that attempted suicide and survived and those that died, seen in a primary public healthcare service	In both groups, risk factors were: Age: 24 years Women: 61.7% Illiterate: 39.5% Married: 71.9% Domestic conflicts and violence: 46.8%	Both groups were classified as an important public health problem in the Sudarban area; correct pesticide management is essential as a preventive strategy.	Cultural factors seem to have affected results, which differed from other data reported in the literature (marital status and low educational level).

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Zyould et al., 2010[24]	To determine risk factors and life stressors that predominate in cases of deliberate self-poisoning (DSP) with acetaminophen and identify gender differences in associated factors, as well as to determine the prevalence of psychiatric diagnoses and the patterns and types of psychotherapeutic interventions provided by psychiatrists.	Risk factor for men: Chronic alcohol intake ($p = 0.04$) Higher reported dose ingested ($p = 0.01$) Higher latency time ($p = 0.04$) Length of hospital stay ($p = 0.03$)	There were no significant differences between sexes. Men had greater toxicity because of greater chronic use of alcohol, greater doses and longer latency time.	Specific findings for male sex, particularly associated with alcohol intake and DSP with acetaminophen. Psychiatric diagnoses made according to clinical examination and not by means of structured instruments.
Heyerdahl et al., 2010[35]	To investigate differences in psychosocial factors and referrals to follow-up among self-poisoned patients according to intention.	Age: 30 to 49 years; OR: 0.51 (95% CI 0.34-0.77) Immigrant from Asian countries, OR: 0.23 (95% CI 0.11 – 0.49) Living alone, OR: 2.21 (95% CI 1.12-4.37) Sick leave, OR: 0.30 (95% CI 0.15-0.61)	Considerable similarities in social deprivation, drug use, previous attempts and previous or current psychiatric treatment between groups of attempted suicide and appealing attempts. The drug or alcohol misuse group had no referral after discharge and seemed to be excluded from follow-up, although their risk is well known.	No validated instruments for assessment. Relevance of findings stress importance of physical examination. Drug and alcohol misusers (risk group) were not referred to treatment.
Ozdel et al., 2009[36]	To examine the sociodemographic and clinical characteristics of a sample of 144 suicide attempters in an emergency clinic for suicide attempts.	Female sex: 75% Low educational level ($p = 0.05$) Low religious orientation ($p = 0.02$)	Suicide attempts were more frequent among internal immigrant women with a low educational level and low religious orientation; the main method was drug overdose, and the main cause, depression due to conflict within the family.	Low educational level was a risk factor of attempted suicides. No control group.
Payne et al., 2009[37]	To identify factors that influence hospital readmission due to self-poisoning.	Risk factors for readmission: Previous psychiatric hospital admission (OR 2.85, $p < 0.01$) Personality disorder (OR 4.59, $p < 0.01$) Increased deprivation (quintile 3: OR 1.6, $p < 0.01$; quintile 5: OR 1.15, $p < 0.01$, compared with quintile 1) Taking medicines for chronic disease, drug dependency (OR 1.6 and 1.19, $p \leq 0.02$) Medication dependency (OR 1.6 and 1.19, $p \leq 0.02$) Use of antidepressants (compared with paracetamol) (OR 1.11, $p = 0.01$) Coingestion of three or more agents (OR 1.37, $p < 0.01$)	Younger age, greater deprivation (quintile), ingestion of certain groups of drugs or multiple drug types and previous hospital admission were risk factors for readmission due to self-poisoning.	The study did not provide an analysis of the effects of drug dependency on readmission rates, a factor that has been associated with recurrent self-harm. Study did not evaluate suicide intent.

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Carter et al., 2007[38]	To determine whether similar social and psychiatric factors are associated with suicide attempts in community and clinical settings, and whether magnitude of effect is greater in clinical populations.	Male individuals in the community: Anxiety disorder (OR = 3.30) Substance use disorders (OR = 2.88) Current unemployment (OR = 1.98) Female individuals in the community: Affective disorder (OR = 1.52) Anxiety disorder (OR = 3.13) Substance use disorders (OR = 2.44) Personality disorder (OR = 2.41) Current unemployment (OR = 1.40) Male patients in clinical setting: Affective disorder (OR = 16.23) Anxiety disorder (OR = 3.82) Substance use disorders (OR = 3.01) Current unemployment (OR = 4.42) Female individuals in clinical setting: Affective disorder (OR = 7.48) Anxiety disorder (OR = 3.67) Substance use disorders (OR = 6.88) Personality disorder (OR = 1.92) Current unemployment (OR = 3.70)	Magnitude of risk factors among clinical cases was equal to or greater than that among community cases.	The study suggests that public health interventions should be aimed at modifiable psychosocial factors, such as education, income and psychiatric treatment.
Kapur et al., 2006[4]	To determine the proportion of individuals that repeated suicide attempt within 12 months, to investigate timing of repetition and risk factors associated with repetition and their population impact.	Age > 54 years ($p < 0.01$) Widowed ($p < 0.01$) Current psychiatric treatment ($p < 0.01$) Psychiatric treatment more than 12 months before ($p < 0.01$) Alcohol use ($p < 0.01$) Childhood abuse ($p < 0.01$) Problems in relationships with friends ($p < 0.01$) Response to mental problems ($p < 0.01$) Index episode (premeditation) ($p < 0.01$) Attempt method (presence and suicidal behavior) (drowning or asphyxiation) ($p < 0.01$)	Risk factors for repetition of suicide attempt were psychiatric treatment, being unemployed or registered sick, self-injury, alcohol misuse and reporting suicidal plans or hallucinations at the time of index episode. The combined population attributable fraction (an indicator of the potential population impact) for these variables was 65%.	Study was part of the Manchester and Saltford Self-Harm Project (MASSH) of the University of Manchester. Study did not evaluate suicidal intent; Not all cases of repetition were included (patients seen in other hospitals); "Suicidal behavior" equal to "self-harm", both defined as an "act of intentional self-poisoning or injury irrespective of the apparent purpose of the act." This definition is similar to the terms "attempted suicide" and "parasuicide" used in several countries.

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Carter et al., 2006[39]	To describe risk factors of referral to psychiatric hospitalization after hospitalization in general hospital due to self-poisoning in an Australian sample.	Age 25-34 (1.61:1.22-2.14) and 35 years or older (1.94:1.44-2.59) Divorced or separated (0.60:0.46-78) High school education (1.31:0.74-2.32) Homelessness (3.29:1.82-5.03) Unemployment (1.39:1.04-1.86) Self-injury (1.35:1.11-1.65) Psychiatric hospitalization within 12 months (2.63:2.06-3.35) Previous psychiatric treatment (1.92:1.54-2.40) Low to moderate suicidal ideation (4.97:3.83-6.43) Suicidal planning (39.72: 29.05-54.33) Mood disorders (2.22:1.69-2.92) Adjustment disorder (0.83: 0.49-1.41) Other attention disorders (0.85: 0.67-1.01) Schizophrenia and other psychotic disorders (4.68:3.00-7.30)	Psychiatric hospitalization referral after a suicide attempt is a complex decision that should take into consideration ideation, planning, psychiatric history and sociodemographic variables.	Analysis in a single geographic area; No structured instruments to evaluate ideation, planning and mental disorder.
Alaghehbandan et al., 2005[40]	To examine epidemiology and factors associated with suicide attempts requiring hospitalization in the province of Newfoundland and Labrador.	Female sex when individuals in Labrador were compared with those in Newfoundland ($p < 0.001$) Younger age (15-24 years) when individuals in Labrador were compared with those in the island portion of the province (teen or young adult) ($p < 0.001$) Single status ($p < 0.001$) Less than 12 years of education ($p < 0.001$) Suicide attempt rates among single individuals in Labrador was higher than in Newfoundland ($p – 0.001$) Greater rates of mental disorder in Newfoundland ($p < 0.001$) Lower mean age at time of attempt in Labrador than in Newfoundland ($p < 0.01$) Women in Labrador were younger than in Newfoundland ($p < 0.01$) Both men and women were significantly younger in Labrador than in Newfoundland ($p < 0.001$)	Differences between suicide attempt rates in Newfoundland and Labrador probably reflect social, economic and cultural factors that cannot be fully evaluated in studies using secondary data.	Comparison between two samples (city and province).
Ichimura et al., 2005[41]	To clarify characteristics of depression and measures to prevent suicide due to depression in comparison with other mental disorders.	Mean age between groups: 49.2 vs. 33.2 ($p < 0.001$) Female sex between groups: ($p < 0.001$) Divorce between groups: ($p < 0.01$) Other attempt methods: ($p < 0.01$) Less severe physical injury between groups: ($p < 0.01$) Older patients: ($p < 0.001$) Odds: 0.953 (0.933-0.934); Married or cohabiting: ($p < 0.004$) Odds: 0.351 (0.173-0.714) Methods other than poisoning: ($p < 0.007$) Odds: 0.161(0.043-0.601)	In this study, risk factors of patients with depression were different from those of patients that attempted suicide and similar to those of individuals that committed suicide.	Data analyzed in a single hospital; No semi-structured interviews were used to diagnose suicide attempts; No firm criterion to define injury severity.

(cont.)

Fekete et al., 2005[42]	To determine differences of suicidal behavior between sexes and investigate factors associated with suicide attempts.	Female sex characterized by: Retired or economically inactive (OR = 2.38) Widowed (OR = 6.55) Divorced (OR = 1.64) Depression in personal history (OR = 1.27)	There are significant differences in risk factors of suicide attempts between men and women. These factors should be taken into consideration in treatment and prevention.	Data only from patients that received medication, and inclusion of patients with more than one attempt.
Douglas et al., 2004[43]	To describe clinical and demographic characteristics of near-fatal suicide attempts (NFDSH); To determine whether age and sex profile of NFDSH cases is similar to that of cases of suicide; To describe clinical evaluation of NFDSH group; To collect data about individuals in the NFDSH group, including their views on prevention.	Risk factors in both groups: Not married: Odds: 1.63 (1.04-2.54) Wanted to die: Odds: 2.11 (1.40-3.18) Previous psychiatric treatment: Odds: 11.70 (1.17-2.46) Previous self-harm: Odds: 1.82 (1.24-2.66) Feeling depressed: Odds: 2.24 (1.36-3.68) Eating disorders: Odds: 1.69 (1.16-2.47)	NFDSH cases are important clinical phenomena associated with indicators of high risk of suicide. Their study may contribute to suicide prevention.	Clinical conditions of patients prevented further questioning; NFDSH definition was based on initial evaluations; Other NFDSH definitions may be used. Suicidal intent was not evaluated. Cases of overdose, if excluded, might have changed results.
Carter et al., 2003[44]	To explore the differences between a clinical sample of deliberate self-poisoning patients and a community sample that reported previous suicide attempts. To examine correlates of suicidal behavior in these groups compared with a community control group (CC) with no suicidal behavior.	In the clinical group: Female sex (OR = 5.7; CI = 1.7-19.4) Anxiety (OR = 7.4; CI = 2.2-25.1) Affective disorder (OR = 23.0; CI = 6.9-76.5) Substance use disorders (OR = 19.2; CI = 5.6-65.4) Mental health related disability (OR = 0.5; CI = 0.3-0.7) In the community group: Anxiety (OR = 9.4; CI = 1.7-52.8) Substance use disorders (OR = 3.0; CI = 1.1-8.7) Mental health related disability (OR = 0.5; CI = 0.4-0.7) Affective disorder (OR = 4.0; CI = 0.9-17.1)	Correlates of deliberate self-poisoning were usually more powerful in the clinical group, but had a similar pattern of psychiatric disorders and disability factors in both groups.	This study stresses the importance of analysis of modifiable risk factors and interventions based on them According to authors, main limitation was the memory bias in the group that attempted suicide at any time in life.

Poisoning is globally accepted as the most common method of suicide attempt, which is confirmed by data reported by WHO and EURO.[47-50]

Table 2 describes the studies according to objectives, risk factors, main conclusions and comments. Although the studies had different objectives, they all described the characteristics or profiles of their samples.

Several explanations were provided for including sex as a risk factor, and one of them was its association with other risk factors, such as unemployment, which is an important social stressor, and marital conflicts[51] and divorce,[38] some of the typical stressors of life.

The greatest incidence of suicide attempts was found in the group of individuals 15 to 40 years old. Similar data were found in a multi-center study conducted in Switzerland, which reported that suicide attempts by poisoning were more common among teens and young adults.[26]

A recent consensus statement, prepared in 2009 and published in 2010 by several specialists in the study of suicide and suicide attempts, stresses that suicide attempts by adolescents may be associated with suicide ideation or impulsivity, but suicide in this age group is rare when compared with rates for the elderly.[5]

The analysis of marital status revealed that it might be both a protective and a risk factor for suicide and suicide attempts,[52] as this variable is strongly affected by associated factors. Family conflicts seem to be a trigger for suicide attempts even among married women.[34] Moreover, divorced and separated women had a rate of suicide twice as great as that for married women.[53]

Data published by the American Psychiatric Association (APA)[45] have drawn attention to the importance of several social factors, as single people may have a limited kinship and social support network. Isolation may predispose to the triggering of events

associated with vulnerability and, consequently, possible suicide. Feelings of loneliness are associated with a greater risk of suicide attempts, and family and social support are, in general, protective factors.[5,22,38]

Both unemployment and low educational level have been found to be significant risk factors of suicide attempts, as they are associated with social disadvantages that may pose a greater risk of suicidal behavior.[54]

The data collected in this review support studies that found that psychiatric comorbidities, such as depression and generalized anxiety disorder, or depression and oppositional defiant disorder, increase the risk of suicide attempts, particularly among younger individuals.[37] Some studies found that the use of drugs and alcohol abuse were important risk factors.[28,29,31]

Depression was one of the most relevant risk factors associated with suicide in almost all studies. This disease, taken by its own symptoms or together with other factors, usually involves physical and psychological distress, life terminality, social, economic and cultural problems, losses, abandonment, loneliness and family conflicts.[55] The powerful association between suicide and depression demands that greater attention should be paid to the diagnosis of this mental disorder,[41] particularly in primary healthcare, and to the interventions designed to treat is, as important measures to prevent suicide.[56]

Of all studies included in this review, only the one conducted by Yip et al. found that previous self-harm was a risk factor of repeated suicide attempt.[32]

Conclusion

According to the results reported here, the main risk factors of suicide attempts by self-poisoning are female sex, age 15 to 40 years, single status, low educational level, unemployment, drug or alcohol abuse or addiction and psychiatric disorder, which is the most relevant factor.

Further investigations should be conducted, such as case-control studies to confirm current findings and identify new risk factors. Their results may contribute to planning interventions to prevent suicide attempts.

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Correspondence:
Maria Cláudia da Cruz Pires
Universidade Federal de Pernambuco
Rua das Pernambucanas, 282, sala 305, Graças
52011-010 - Recife, PE - Brazil
Tel./Fax: +55 (81) 9469.4387
E-mail: claudiacpires@globo.com