

# Factors related to suicide attempts among individuals with major depressive disorder

Chidchanok Ruengorn<sup>1,2</sup>  
Kittipong Sanichwankul<sup>3</sup>  
Wirat Niwatananun<sup>2</sup>  
Suwat Mahatnirunkul<sup>3</sup>  
Wanida Pumpaisalchai<sup>3</sup>  
Jayanton Patumanond<sup>1</sup>

<sup>1</sup>Clinical Epidemiology Unit, Faculty of Medicine, <sup>2</sup>Department of Pharmaceutical Care, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand; <sup>3</sup>Suanprung Psychiatric Hospital, Chiang Mai, Thailand

**Background:** Major depressive disorder (MDD) is the leading cause of suicidal behaviors. Risk related to suicide attempts among individuals with MDD remains uninvestigated in upper northern Thailand, where the completed suicide rate is the highest in the nation.

**Objective:** To examine risk related to suicide attempts among individuals with MDD.

**Methods:** Individuals diagnosed with MDD using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10), codes F32.x and F33.x, seeking care at Suanprung Psychiatric Hospital between October 2006 and May 2009 were eligible. All individuals with MDD admitted due to suicide attempts were defined as cases (n = 186), and four controls per case were selected from those who did not attempt suicide on the same day or within a week of case selection (n = 914). Their medical charts were reviewed for sociodemographic and clinical factors influencing suicide attempts using multivariable logistic regression analysis.

**Results:** Factors related to suicide attempts were stressful life events (adjusted odds ratio [OR], 2.32; 95% confidence interval [CI]: 1.27–4.24), alcohol use (adjusted OR, 2.08; 95% CI: 1.29–3.34), intermittent or poor psychiatric medications adherence (adjusted OR, 2.25; 95% CI: 1.44–3.51), up to two previous suicide attempts (adjusted OR, 3.64; 95% CI: 2.32–5.71), more than two previous suicide attempts (adjusted OR, 11.47; 95% CI: 5.73–22.95), and prescribed antipsychotics (adjusted OR, 3.84; 95% CI: 2.48–5.95). Risk factors that were inversely related to suicide attempts were increasing years of MDD treatment; one to five years (adjusted OR, 0.22; 95% CI: 0.11–0.44), over five years (adjusted OR, 0.44; 95% CI: 0.23–0.86), and antidepressant prescribed (norepinephrine [NE] and/or serotonin reuptake inhibitors [SRIs], adjusted OR, 0.28; 95% CI: 0.10–0.78). The final model explained 85.8% probability of suicide attempts.

**Conclusion:** Seven key factors suggested from this study may facilitate clinicians to identify individuals with MDD at risk of suicide attempt and provide them close monitoring, timely assessment, and intensive treatments.

**Keywords:** mood disorders, affective disorders, suicide behaviors, risk factors

## Introduction

It is expected that major depressive disorder (MDD) will be the second-highest cause of global morbidity and mortality by 2020.<sup>1</sup> Suicide is the primary reason for increased mortality in depression, with a general standard mortality ratio (SMR) of 20.4%.<sup>2</sup> Suicidal ideation is highly prevalent (58%) among those with MDD, and appears to be a precondition for suicide attempts. Suicide attempts are strongly predictive of further suicide attempts and completion of suicide.<sup>3</sup> Between 20% and 65% of those with MDD who died by committing suicide have had a history of previous

Correspondence: Jayanton Patumanond  
Clinical Epidemiology Unit, Faculty of  
Medicine, Chiang Mai University,  
Suthep Rd, Muang District,  
Chiang Mai 50200, Thailand  
Tel +66 53 946 306  
Fax +66 53 945 476  
Email j.patumanond@yahoo.com

suicide attempts.<sup>4</sup> The understanding of the characteristics related to suicide attempts in those with MDD is important to identify the individuals at high risk and may be beneficial in preventing future suicide.

Several previous studies have reported factors that are predictors of suicide attempts as being younger age,<sup>3</sup> low perceived social support and occupational functioning,<sup>3,5</sup> low level of education,<sup>6</sup> lack of a partner,<sup>5,7</sup> severity or duration of depression,<sup>3,8</sup> time spent in a major depressive episode or in partial remission,<sup>5,7</sup> smoking,<sup>9</sup> current alcohol dependence or substance abuse,<sup>1,3,6,10</sup> suicidal ideation,<sup>3,8,11</sup> previous suicide attempts,<sup>5,7,12</sup> negative life events,<sup>6,11</sup> hopelessness,<sup>13,14</sup> family history of suicide,<sup>14</sup> aggression, impulsivity,<sup>8,15</sup> and hostility.<sup>8</sup> However, causation of suicide attempts in MDD is complex, and it may not be applicable to generalize the predictive factors identified in previous research because of discrepancies in population and methodology.

To date, the risk factors related to suicide attempts in individuals with MDD in upper northern Thailand remain uninvestigated. This area is known to have the highest incidence rate of completed suicides in the country; 12.5 compared to 5.90 per 100,000 of the nationwide population in 2010.<sup>16</sup> The suicide attempt rate was also markedly high: 34.1 per 100,000 people. This study explored the risk factors related to suicide attempts in individuals with MDD.

## Materials and methods

### Study setting

Suanprung Psychiatric Hospital, a large university-affiliated, 700-bed, referral tertiary psychiatric hospital, located in Chiang Mai, has provided medical care to people in the upper northern region of Thailand since 1938. Each year, over 6000 and 60,000 services are given to inpatients and outpatients, respectively, at this hospital. Among the high burden of psychiatric illnesses treated by the hospital, MDD has always ranked in the top five. In the consecutive years from 2009 to 2011, the numbers of MDD inpatients were 306, 344, and 270, respectively. A total of 6412, 6687, and 6980 outpatient visits were made by individuals with MDD in the corresponding years, respectively.<sup>17</sup>

### Study population

Eligible participants were individuals with MDD who had been diagnosed by psychiatrists and coded using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10): ICD-10 F32.x and F33.x. All participants were those who had been admitted due to suicide attempts, regardless of the number of

attempt(s) (n = 186), and four controls per case were selected from MDD inpatients/outpatients who did not attempt suicide on the same day first, then within a week of case selection (n = 914). That visit date was set as an index date. A simple random sampling method was used to select controls from the hospital database if possible numbers exceeded four. The medical files of inpatient and outpatient visits between October 2006 and May 2009 were reviewed.

### Procedures and data collection

Information from medical charts was extracted by five trained nursing staff at the hospital. Prior to data collection, two meetings of the researchers were held to discuss and clarify a definition, and measures, of each variable.

Sociodemographic and clinical factors at the index date were collected and were then selected and categorized based on both a review of the literature and on the opinion of the psychiatrists in the research team. The sociodemographic factors that were included were: sex; age; marital status; educational level; occupation; religion; living status (alone or with others); having children; and stressful life events such as interpersonal relationship problems, loss of loved ones, and economic crisis prior to, or at, the index date. Social support was divided into good or excellent, moderate, and little or very little.

Clinical factors included were ICD-10 groups categorizing participants into those with mild-to-moderate depression (coded F32.0, 32.1, 33.0, 33.1), severe depression (coded F32.2, 33.2), or psychosis (coded F32.3, 33.3). Duration of MDD treatment was defined as year(s) from MDD treatment initiation to the index date. Previous admission (yes/no) was psychiatric hospitalization before the index time. Number of previous suicide attempt(s) and previous suicidal ideation (yes/no) were retrieved. Psychiatric symptoms presented at the index time were hallucination, hearing voices, or other psychotic symptoms. Psychotic comorbidity was taken from recorded ICD-10 codes and grouped into alcohol/substance dependence, or others. Somatic illness was any chronic diseases. Smoking, alcohol use, and any substance abuse were behaviors at the index time.

Medication prescriptions redeemed were categorized by their mechanism of action and evidence of association with suicide attempts. Antidepressants were grouped as norepinephrine (NE) and/or serotonin reuptake inhibitors (SRIs), such as amitriptyline, nortriptyline, venlafaxine, and selective serotonin reuptake inhibitors (SSRIs), such as fluoxetine and fluvoxamine. Antipsychotics (yes/no) included zuclopenthixol decanoate, haloperidol,

clozapine, risperidone, and olanzapine. Anxiolytics consisted of benzodiazepine, and other anxiolytics, including chlordiazepoxide. Pharmacists asked participants/relatives questions around their medication-taking behavior before the index time in order to assess adherence to psychiatric medication. Adherence was classified as “good or excellent,” meaning “always took medication or rarely missed any dose,” while “intermittently and poorly adhere” meant “took medication off and on, or did not take medication at least a week before an index date.”

Other factors included were family history of mental disorders, and family history for attempted or completed suicide, method(s) used for suicide attempts, and numbers of admission days. Two institutional review boards, at The Faculty of Medicine at Chiang Mai University, and Suanprung Psychiatric Hospital, approved the study protocol.

## Statistical analyses

Data were analyzed in two steps. In the first of these, sociodemographic and clinical indicators related to suicide attempts were investigated using univariable logistic regression. Those giving  $P < 0.10$  were selected for the second step. The set of characteristics independently related to suicide attempts were finally determined using multivariable stepwise logistic regression. Missing values for risk factors were handled by a multiple imputation method (MI) using logistic regression.<sup>18</sup> The cut-off points of variables were determined by clinical significance, and statistical significance using the prediction probability by the receiver operating characteristic curve (ROC) value. Statistical significance level was set at 0.05.

Sample size calculation was based on proportions of suicide attempts and non-attempts among those with MDD taken from previous studies.<sup>5,8,19</sup> Two different proportions, that is, 58.2% of suicide attempters receiving antipsychotics and 39.8% of nonattempters receiving antipsychotics, were used.<sup>19</sup> The total number of participants with MDD admitted with suicide attempts during the study period was 186, so the required number of controls was calculated. Four controls per case, or 744 people, were enough to ensure a power of 90% and 0.05 type I error. When adding 20% of people to compensate for missing data, 893 controls were needed. We used STATA® 11.0 (StataCorp LP; College Station, TX) to perform all statistical analyses.

## Results

Among the 1100 individuals with MDD included in the final analysis, 186 (16.9%) attempted suicide. Of these, 151 (81.6%) used one method, 24 (13.0%) used two

methods, and eight (4.2%) used more than two methods. Drug overdose was the most common method used in 145 (78.0%) people, followed by hanging ( $n = 123$ ; 66.1%), cutting with a knife or sharp object ( $n = 66$ ; 35.5%), swallowing pesticide ( $n = 60$ ; 32.2%), jumping from a high place ( $n = 21$ ; 11.3%), jumping into water ( $n = 10$ ; 5.4%), and using firearms ( $n = 3$ ; 1.6%).

According to univariable analysis, those who attempted suicide were more likely to be male, younger, single, have a lower level of education, be unemployed, have no children, have less social support, and be experiencing stressful life events (Table 1).

They also presented with psychosis, alcohol/substance dependence, less duration of MDD (<1 years), previous psychiatric hospitalization, had psychotic symptoms at the index time, had a family history for attempted or completed suicide, had previously attempted suicide, had previously had suicidal ideation, were not adherent to medication, and had been prescribed antipsychotics. Antidepressants had a protective effect against suicide attempts (Table 2).

Factors related to suicide attempts were stressful life events (adjusted odds ratio [OR], 2.32; 95% confidence interval [CI]: 1.27–4.24), alcohol use (adjusted OR, 2.08; 95% CI: 1.29–3.34), intermittent or poor psychiatric medication adherence (adjusted OR, 2.25; 95% CI: 1.44–3.51), up to two previous suicide attempts (adjusted OR, 3.64; 95% CI: 2.32–5.71), more than two previous suicide attempts (adjusted OR, 11.47; 95% CI: 5.73–22.95), and prescribed antipsychotics (adjusted OR, 3.84; 95% CI: 2.48–5.95). Risk factors that were inversely related to suicide attempts were increasing years of MDD treatment; one to five years (adjusted OR, 0.22; 95% CI: 0.11–0.44), over five years (adjusted OR, 0.44; 95% CI: 0.23–0.86), and antidepressant prescribed (norepinephrine [NE] and/or serotonin-reuptake inhibitors [SRIs]) (adjusted OR, 0.28; 95% CI: 0.10–0.78) (Table 3). The final model explained 85.8% of the probability of suicide attempts, based on the area under the ROC curve.

## Discussion

The present study revealed seven sociodemographic and clinical factors that were statistically significantly associated with suicide attempts among individuals with MDD.

Stressful life events posed a twofold increase in risk of suicide attempts in our study. Stressful life events, particularly family or interpersonal relationship problems, have been documented in another study conducted in Thailand that examined the relationship with suicide attempts.<sup>6,11</sup> It was found that stressful life events triggered an elevation in

**Table 1** Sociodemographic factors of patients with MDD classified by suicide attempts

Sociodemographic factors	Suicide attempts		Crude OR (95% CI)	P-value
	Yes (n = 186)	No (n = 914)		
Sex				0.037
Male	72 (20.3)	282 (79.7)	1.00	
Female	114 (15.3)	632 (84.7)	0.71 (0.51–0.98)	
Age (years)				
13–29	44 (24.0)	139 (76.0)	1.00	
30–39	50 (23.5)	163 (76.5)	0.97 (0.61–1.54)	0.894
40–49	45 (17.0)	220 (83.0)	0.65 (0.40–1.03)	0.067
50–59	28 (9.7)	261 (90.3)	0.34 (0.20–0.57)	<0.001
≥60	17 (12.4)	120 (87.6)	0.48 (0.24–0.82)	0.010
Education				
No or primary school	89 (15.6)	481 (84.4)	1.00	
Junior to high school	57 (24.2)	178 (75.7)	1.73 (1.19–2.51)	0.004
Diploma	13 (18.6)	57 (81.4)	1.23 (0.65–2.35)	0.524
Bachelor or higher	13 (6.9)	176 (93.1)	0.40 (0.22–0.73)	0.003
Marital status				0.028
Single	51 (20.7)	195 (79.3)	1.00	
Married	101 (15.1)	567 (84.9)	0.68 (0.47–0.99)	0.044
Widowed/divorced or others	33 (19.5)	136 (80.5)	0.93 (0.57–1.51)	0.764
Occupation				
Government or private employee	77 (16.8)	381 (83.2)	1.00	
Laborer	40 (16.0)	210 (84.0)	0.94 (0.62–1.43)	0.781
Housewife/student	25 (10.5)	214 (89.5)	0.58 (0.36–0.94)	0.026
Unemployed	41 (29.5)	98 (70.5)	2.07 (1.33–3.21)	0.001
Religion				
Buddhism	171 (16.6)	857 (83.4)	1.00	
Others	8 (16.7)	40 (83.3)	1.00 (0.46–2.18)	0.995
Number of children				
None	32 (32.3)	67 (67.7)	1.00	
1–2	51 (15.4)	281 (84.6)	0.38 (0.23–0.64)	<0.001
>2	16 (15.1)	90 (84.9)	0.37 (0.1–0.73)	0.004
Living alone				
No	161 (17.0)	786 (83.0)	1.00	
Yes	12 (19.4)	50 (80.6)	1.17 (0.61–2.25)	0.634
Social support				
Good or excellent	88 (13.6)	560 (86.4)	1.00	
Moderate	52 (21.2)	193 (78.8)	1.71 (1.17–2.51)	0.005
Little or very little	24 (28.2)	61 (71.8)	2.50 (1.48–4.22)	0.001
Stressful life events				
No	24 (8.3)	267 (91.8)	1.00	
Yes	162 (20.0)	647 (80.0)	2.78 (1.77–4.38)	<0.001

**Note:** Numbers are n (%) or mean ± SD unless otherwise indicated.

**Abbreviations:** MDD, major depressive disorder; OR, odds ratio; CI, confidence interval; SD, standard deviation.

severity of depression and therefore an increased risk of suicide attempts. Coping skills to deal with stressful life events should be implemented on a routine basis to prevent these tragic acts.

Current use of alcohol was an independent factor associated with a two-fold increase in risk of suicide attempts in our study. Several studies have shown that alcohol use is common among those with depression who attempt suicide.<sup>3,6,10,11</sup> We found that 30.2% of those with MDD used alcohol, which

was comparable to the findings of another study conducted in Thailand in which this figure was 33%.<sup>20</sup> The explanation for this may be that alcohol causes lower central serotonergic functioning characterized by a propensity towards disinhibited behaviors, therefore increasing aggression and impulsivity and raising the risk of attempting suicide.

Several studies, as well as ours, have shown that previous suicide attempts are the strongest predictive factor of further attempts.<sup>5,7,12</sup> However, unlike other studies, we classified a

**Table 2** Clinical factors of patients with MDD classified by suicide attempts

Clinical factors	Suicide attempts		Crude OR (95% CI)	P-value
	Yes (n = 186)	No (n = 914)		
ICD-10				
Mild to moderate	17 (13.4)	110 (86.6)	1.00	
Severe	109 (14.7)	632 (85.3)	1.12 (0.64–1.93)	0.696
With psychosis	60 (25.8)	172 (74.1)	2.26 (1.25–4.07)	0.007
Somatic illnesses				
No	121 (20.2)	478 (79.8)	1.00	
Yes	57 (11.7)	432 (88.3)	0.52 (0.37–0.73)	<0.001
Psychotic comorbidity				
No	139 (14.4)	828 (85.6)	1.00	
Alcohol/substance dependence	19 (39.6)	29 (60.4)	3.90 (2.13–7.15)	<0.001
Others	9 (25.0)	27 (75.0)	1.99 (0.91–4.31)	0.083
Year(s) of treatment				
<1	152 (22.6)	520 (77.4)	1.00	
1–5	12 (5.0)	227 (95.0)	0.18 (0.1–0.33)	<0.001
>5	19 (11.2)	150 (88.0)	0.43 (0.26–0.72)	0.001
Previous admission				
No	136 (15.2)	761 (84.8)	1.00	
Yes	48 (27.1)	129 (72.9)	2.08 (1.43–3.04)	<0.001
Psychotic symptoms				
No	116 (14.0)	711 (86.0)	1.00	
Yes	59 (24.7)	180 (75.3)	2.00 (1.41–2.86)	<0.001
Mental disorders in family				0.065
No	130 (17.0)	636 (83.0)	1.00	
Yes	47 (15.3)	260 (84.7)	0.88 (0.61–1.27)	0.508
Suicidal history in family				
No	169 (16.3)	871 (83.7)	1.00	
Yes	14 (37.9)	23 (62.1)	3.14 (1.58–6.22)	0.001
Previous suicidal attempt				
None	68 (8.8)	703 (91.2)	1.00	
1–2 times	77 (31.3)	169 (68.7)	4.71 (3.26–6.80)	<0.001
>2 times	41 (58.6)	29 (41.4)	14.62 (8.54–25.00)	<0.001
Previous suicidal ideation				
No	57 (9.8)	524 (90.2)	1.00	
Yes	129 (25.4)	379 (74.6)	3.13 (2.23–4.39)	<0.001
Smoking				
No	141 (15.7)	755 (84.3)	1.00	
Yes	30 (20.5)	116 (79.5)	1.38 (0.89–2.15)	0.147
Alcohol use				
No	116 (13.5)	744 (86.5)	1.00	
Yes	55 (30.2)	127 (69.8)	2.78 (1.91–4.03)	<0.001
Any substance abuse				
No	158 (15.9)	832 (84.1)	1.00	
Yes	13 (25.0)	39 (75.0)	1.76 (0.92–3.36)	0.090
Medication adherence				
Good or excellent	50 (8.9)	511 (91.1)	1.00	
Intermittent or poor	136 (25.2)	403 (74.8)	3.45 (2.43–4.89)	<0.001
Antidepressants				
No	12 (18.5)	53 (81.5)	1.00	
NE/SRI	20 (9.2)	196 (90.8)	0.45 (0.21–0.98)	0.044
SSRI	541 (18.8)	665 (81.2)	1.02 (0.53–1.96)	0.946
Antipsychotics				
No	55 (8.6)	582 (91.4)	1.00	
Yes	131 (28.3)	332 (71.7)	4.18 (2.96–5.88)	<0.001

(Continued)

**Table 2** (Continued)

Clinical factors	Suicide attempts		Crude OR (95% CI)	P-value
	Yes (n = 186)	No (n = 914)		
Anxiolytics				
No	35 (13.5)	224 (86.5)	1.00	
Benzodiazepine	114 (18.4)	505 (81.6)	1.44 (0.96–2.18)	0.079
Others	16 (12.8)	109 (87.2)	0.94 (0.49–1.77)	0.847
Both	21 (21.6)	76 (78.4)	1.77 (0.97–3.22)	0.063

**Note:** Numbers are n (%) or mean  $\pm$  SD unless otherwise indicated.

**Abbreviations:** MDD, major depressive disorder; OR, odds ratio; CI, confidence interval; SD, standard deviation; NE, norepinephrine; SRI, serotonin reuptake inhibitor; SSRI, selective serotonin reuptake inhibitor.

continuous number of previous suicide attempts into three groups by intensity, according to degree of OR: none, up to two attempts (OR = 3.6), and more than two attempts (OR = 11.5). As the number of previous suicide attempts increased, the probability of future suicide attempts became substantially higher. Deliberation over more suicidal behaviors reflects greater disease severity and a greater lethality of suicide attempts.

Individuals who had received less than a year of MDD treatment were most vulnerable to suicide attempts. This finding corresponded to a previous study that showed that the

period in which risk of attempted suicide is highest is in the first 3 months after the onset of a major depressive episode.<sup>8</sup> In addition, a recent study revealed that most suicidal events occurred in the first 6 months after treatment initiation.<sup>21</sup> It is possible that the establishment of a sustained program of treatment in MDD can be delayed because of the slow onset of some antidepressant medications. This evidence highlighted the need to pay attention to, and be vigilant in, the monitoring of suicide risk in individuals with MDD, particularly during their first year of treatment.

Intermittent or poor adherence to psychiatric medication increased in those for whom more than two previous suicide attempts had been made. In previous studies, inadequacy or suboptimal treatment of depression is one of the reasons that have been given to explain suicide attempts.<sup>4,22</sup> Good medication adherence contributes to a reduction in suicide attempts by prolonging MDD remission. This finding underlines the importance of optimal maintenance antidepressant treatment as a suicide prevention strategy. Pharmacists should closely monitor and routinely assess the medication adherence of their patients.

In the present study, use of antidepressants was a protective factor against suicide attempts, especially NE/SRIs. The association between SSRIs and suicide attempts was statistically insignificant, but a tendency towards a protective effect was discovered. There has been controversy regarding the possible link between antidepressants and suicidal behaviors. A meta-analysis conducted using all available randomized trials of antidepressants found that the younger the individual, particularly adults aged under 25 years, the greater the risk of suicide attempts.<sup>23</sup> However, these findings should be cautiously interpreted due to various confounding factors in younger patients, that is, alcohol or illicit substance abuse, impulsivity, and aggressiveness. The inverse relationship of antidepressant use in our study was possibly due to an older MDD population, having an average age of 44.4 years, who obtained greater benefit from this treatment.

**Table 3** Logistic regression coefficient, adjusted OR and 95% CI of factors for suicide attempts in individuals with MDD

Factors	Adjusted OR (95% CI)	P-value
Stressful life events		
No	1.00	
Yes	2.32 (1.27–4.24)	0.006
Alcohol use		
No	1.00	
Yes	2.08 (1.29–3.34)	0.003
Year(s) of treatment		
<1	1.00	
1–5	0.22 (0.11–0.44)	<0.001
>5	0.44 (0.23–0.86)	0.016
Previous suicidal attempt		
None	1.00	
1–2 times	3.64 (2.32–5.71)	<0.001
>2 times	11.47 (5.73–22.95)	<0.001
Medication adherence		
Good or excellent	1.00	
Intermittent or poor	2.25 (1.44–3.51)	<0.001
Antidepressants		
No	1.00	
NE/SRI	0.28 (0.10–0.78)	0.015
SSRI	0.85 (0.36–1.99)	0.709
Antipsychotics		
No	1.00	
Yes	3.84 (2.48–5.95)	<0.001

**Abbreviations:** MDD, major depressive disorder; CI, confidence interval; OR, odds ratio; NE/SRI, norepinephrine and/or serotonin reuptake inhibitors; SSRI, selective serotonin reuptake inhibitors.

A greater risk of suicide attempts in patients prescribed with antipsychotics was demonstrated, although adherence and antidepressants used were controlled for. The ability to limit risks of suicidal behaviors among those with MDD who have been prescribed antipsychotics remains untested. Clozapine is the only antipsychotic reported to reduce risk of suicidal behaviors, but this is in those with schizophrenia.<sup>24</sup> We did an additional analysis for a relationship between clozapine use and suicide attempts and revealed no association ( $P = 0.563$ ). The positive relationship of antipsychotics may be confounded by indication and severity of MDD.

Factors such as education,<sup>6</sup> family history of suicide,<sup>14</sup> and social support and occupational functioning,<sup>3,5</sup> have been associated with suicide attempts in previous studies but not in our study. The inconsistency of these findings may be due to discrepancies in population, methodology, assessment tools, and statistical analyses. In addition, some factors were only significant in univariable analysis. Multicollinearity of one or more factors, such as social support and living status, suicidal ideation and previous suicide attempts, may be an explanation.

The present study has some limitations. Firstly, the generalizability of the results may be limited because the study was confined to a tertiary referral psychiatric hospital. Attempted suicide cases sent to a general hospital may be more severely injured. In contrast, those with less severe illness who were not referred to Suanprung Psychiatric Hospital may have used different methods or have a different course of illness. Secondly, retrospective data collection meant that some of the data were incomplete or missing completely. However, the MI analysis that was performed ensures the final model by giving the same results with a slightly different effect from the complete case analysis. Therefore, we reported results from a complete dataset. Thirdly, some clinical factors, such as hopelessness, impulsiveness, aggression, and hostility score, were not assessed at the study site by instruments used in other studies. Therefore, the ability to detect their potential as risk factors was limited. Finally, the temporal sequence of some variables may be ambiguous due to the nature of the study design, for example, the aforementioned relationship between prescribed medication and severity of disease. Individuals prescribed with more groups of medication had a higher proportion of suicide attempts: 10.0%, 11.2%, and 32.2% in one, two, and three groups of psychiatric medication prescribed, respectively.

In spite of these limitations, the present study provided potential risk factors for suicide attempts among individuals

with MDD, and, to our knowledge, this is the first study of its kind in the region in which it was conducted. In the future, prospective research should be undertaken to test for the validity of the factors proposed. Other useful studies recommended are those to assess risk factors predicting completed suicide or first suicide attempts in MDD.

## Conclusion

Suicide attempts were more likely to occur in individuals with MDD who had stressful life events, alcohol use, intermittent or poor medication adherence, previously attempted suicide, and had been prescribed antipsychotics, while increasing years of MDD treatment, and being prescribed antidepressants, particular NE and/or SRIs showed a protective effect. The findings may help in clinician identification of individuals with MDD who are at risk of suicide attempts and provide them close monitoring, timely assessment, and intensive treatments.

## Acknowledgments

This study was in part financially supported by The Faculty of Medicine and The Graduate School, Chiang Mai University.

## Disclosure

The authors report no conflicts of interest in this research.

## References

- Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990–2020: Global Burden of Disease Study. *Lancet*. 1997;349(9064):1498–1504.
- Simon RI, Hales RE, editors. *Suicide Risk: Assessing the Unpredictable*. 1st ed. Arlington, VA: American Psychiatric Publishing, Inc; 2006.
- Sokero TP, Melartin TK, Ryttsälä HJ, et al. Suicidal ideation and attempts among psychiatric patients with major depressive disorder. *J Clin Psychiatry*. 2003;64(9):1094–1100.
- Oquendo MA, Kamali M, Ellis SP, et al. Adequacy of antidepressant treatment after discharge and the occurrence of suicidal acts in major depression. *Am J Psychiatry*. 2002;159(10):1746–1751.
- Sokero TP, Melartin TK, Ryttsälä HJ, et al. Prospective study of risk factors for attempted suicide among patients with DSM-IV major depressive disorder. *Br J Psychiatry*. 2005;186:314–318.
- Suppapatiporn S. The predictors of suicidal attempt in depressed patients. Chulalongkorn University; 2002 [cited November 26, 2009]; Thesis (MSc) – Chulalongkorn University, 2002]. Available from: <http://cuir.car.chula.ac.th/dspace/handle/123456789/6093>.
- Holma KM, Melartin TK, Haukka J, Holma IA, Sokero TP, Isometsa ET. Incidence and predictors of suicide attempts in DSM-IV major depressive disorder: a five-year prospective study. *Am J Psychiatry*. 2010;167(7):801–808.
- Malone KM, Haas GL, Sweeney JA, Mann JJ. Major depression and the risk of attempted suicide. *J Affect Disord*. 1995;34(3):173–185.
- Malone KM, Waternaux C, Haas GL, Cooper TB, Li S, Mann JJ. Cigarette smoking, suicidal behavior, and serotonin function in major psychiatric disorders. *Am J Psychiatry*. 2003;160(4):773–779.

10. Sokero TP, Melartin TK, Ryttsälä HJ, Leskela US, Lestela-Mielonen PS, Isometsa ET. Prospective study of risk factors for attempted suicide among patients with DSM-IV major depressive disorder. *Br J Psychiatry*. 2005;186:314–318.
11. Chan LF, Maniam T, Shamsul AS. Suicide attempts among depressed inpatients with depressive disorder in a Malaysian sample. Psychosocial and clinical risk factors. *Crisis*. 2011;32(5):283–287.
12. Oquendo MA, Currier D, Mann JJ. Prospective studies of suicidal behavior in major depressive and bipolar disorders: what is the evidence for predictive risk factors? *Acta Psychiatr Scand*. 2006;114(3):151–158.
13. Van Gastel A, Schotte C, Maes M. The prediction of suicidal intent in depressed patients. *Acta Psychiatr Scand*. 1997;96(4):254–259.
14. Mann JJ, Waternaux C, Haas GL, Malone KM. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry*. 1999;156(2):181–189.
15. Perroud N, Baud P, Mouthon D, et al. Impulsivity, aggression and suicidal behavior in unipolar and bipolar disorders. *J Affect Disord*. 2011;134(1–3):112–118.
16. Department of Mental Health, Ministry of Public Health Thailand. Suicide Rates: Thailand (per 100,000 population) by provinces (top ten). Bangkok, Thailand 2011 [cited 2012 Feb 15]. Available from: <http://www.dmh.go.th/report/suicide/english/>. Accessed February 15, 2012.
17. Suanprung Psychiatric Hospital. Suanprung psychiatric hospital report number of patients between 2009 to 2011. Chiang Mai, Thailand 2011 [cited 2012 Feb 15]. Available from: [http://www.suanprung.go.th/eng/top\\_five.php](http://www.suanprung.go.th/eng/top_five.php). Accessed February 15, 2012.
18. Myers WR. Handling missing data in clinical trials: an overview. *Drug Inf J*. 2000;34:525–533.
19. Azorin J, Kaladjian A, Besnier N, et al. Suicidal behaviour in a French Cohort of major depressive patients: characteristics of attempters and nonattempters. *J Affect Disord*. 2010;123(1–3):87–94.
20. Suppavitiporn S. Comorbidity of alcohol dependence in suicidal depressed patients. *J Med Assoc Thai*. 2005;88 Suppl 4:S195–S199.
21. Schneeweiss S, Patrick AR, Solomon DH, et al. Variation in the risk of suicide attempts and completed suicides by antidepressant agent in adults: a propensity score-adjusted analysis of 9 years' data. *Arch Gen Psychiatry*. 2010;67(5):497–506.
22. Isacson G, Bergman U, Rich CL. Epidemiological data suggest antidepressants reduce suicide risk among depressives. *J Affect Disord*. 1996;41(1):1–8.
23. Stone M, Laughren T, Jones ML, et al. Risk of suicidality in clinical trials of antidepressants in adults: analysis of proprietary data submitted to US Food and Drug Administration. *BMJ*. 2009;339:b2880.
24. Baldessarini RJ, Pompili M, Tondo L. Suicide in bipolar disorder: risks and management. *CNS Spectr*. 2006;11(6):465–471.

## International Journal of General Medicine

### Publish your work in this journal

The International Journal of General Medicine is an international, peer-reviewed open-access journal that focuses on general and internal medicine, pathogenesis, epidemiology, diagnosis, monitoring and treatment protocols. The journal is characterized by the rapid reporting of reviews, original research and clinical studies across all disease areas.

Submit your manuscript here: <http://www.dovepress.com/international-journal-of-general-medicine-journal>

Dovepress

A key focus is the elucidation of disease processes and management protocols resulting in improved outcomes for the patient. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.