Original Article

# Suicidal Ideation, Suicidal Plan and Suicidal Attempts Among Those with Major Depressive Disorder

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## Abstract

**Introduction: The aims of the study were to identify the prevalence and sociodemographic and clinical correlates of suicidal behaviours using data from a cross-sectional survey among those with major depressive disorder (MDD) in Singapore. Materials and Methods: The Singapore Mental Health Study (SMHS) was a cross-sectional epidemiological study that surveyed Singapore residents (Singapore citizens and permanent residents) aged 18 years and above. The assessment of mental disorders was established using version 3.0 of the Composite International Diagnostic Interview (CIDI 3.0). For the purposes of this study, suicidal behaviour was assessed by questions which were asked to respondents who answered positively to the screening questions in the CIDI 3.0 "Depression" module. Results: The prevalence of suicidal ideation, plan and attempt among those with lifetime MDD was 43.6%, 13.7% and 12.3%, respectively. We found that suicidal ideation, plan and attempt were significantly associated with ethnicity, education and income. The rate of those who had sought some professional help was higher among those with suicidal plan (71.7%) and attempt (72.3%) as compared to those with suicidal ideation (48.7%) and those with MDD but no suicidal behaviour (29%). Conclusion: Individuals with MDD and suicidal behaviour do differ from their non-suicidal counterparts as they have a different sociodemographic and clinical profile. There is a need for more research and a better understanding of this population which in turn could lead to the development and implementation of relevant interventions.**

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**Key words: Composite International Diagnostic Interview, Depression, Prevalence, Singapore Mental Health Study, Suicidal behaviour**

## Introduction

The World Health Organization (WHO) estimates that every year, almost a million people die from suicide — a mortality rate of 16 per 100,000, or 1 death every 40 seconds.[1] WHO also posits that in some countries, suicide is one of the three leading causes of death among those aged 15 to 44 years, and the second leading cause of death among 10 to 24 year olds. Mental disorders are strongly associated with completed suicides, with studies mainly from Western populations showing that approximately 9 out of every 10 individuals appear to have had a psychiatric disorder at the time of their death.[2]

Studies suggest that "suicidal behaviours" occur on a continuum of severity that progresses from less serious and more prevalent behaviours to less prevalent but more harmful and devastating behaviours.[3-5] While at one end of the continuum are behaviours such as ideation without specific plans, these may progress in some individuals to a plan, and, for a very small proportion of persons at the other end of the continuum, to a completed suicide attempt with high lethality.[3] Nock et al[6] examined data across 17 countries as part of the WHO World Mental Health Surveys and established the lifetime prevalence of suicidal ideation, plan, and attempt in the overall sample to be 9.2%, 3.1% and 2.7%, respectively. The risk of each suicidal behaviour was found to be significantly associated with being female,

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in a younger age group, having fewer years of education, and never being married. They also established that presence of any mental disorder was significantly associated with the risk of suicidal behaviours, with the most robust relationship being for mood and impulse-control disorders.

Depression is a chronic mental illness, which is highly prevalent, with a high risk of recurrence if treated inadequately and it is one of the most important mental disorders in terms of public health impact.[7,8] Prevalence of suicide among those with major depressive disorder (MDD) is considerable and suicide remains one of the most worrisome outcomes of depression. The association between suicidal behaviour and MDD is well known.[9,10] Majority of studies have established the prevalence and risk factors of suicidal behaviour among those with MDD in clinical settings while very few studies have reported the prevalence of suicidal behaviour or its risk factors among those with MDD in population surveys.[11]

Studies examining risk for suicidal ideation in depression have identified the following risk factors: severity of depression,[12,13] comorbid alcohol abuse and dependence,[12] comorbid anxiety disorder,[14] comorbid personality disorder,[13] younger age,[15] female gender,[14] unemployment,[12] poor social support and past suicide attempts.[16] Conner et al in their study on patients with MDD aged 50 years and above found that suicidal planning was associated with living alone, older age, lower scores on Physical Self-Maintenance Scale, and higher cognitive functioning.[17] A study by the Office of Applied Studies (OAS) reported that males were more likely than females to have made a suicide plan and adults aged 55 or older with past year major depressive episode were less likely than their counterparts in other age groups to have made a suicide plan.[18] Risk factors for suicidal attempts among those with depression are similar and include suicide attempts in the past,[19] younger age,[20] severe depression and early age of onset of depression,[20,21] marital discord,[22] comorbid personality disorder,[23] comorbid alcohol abuse or dependence and comorbid physical illness.[21,24,25]

Singapore is a highly urbanised and affluent city-state country with a multiracial population in South East Asia. The suicide rate in Singapore has remained relatively stable, and has been reported as 9.8 and 13.0 per 100,000 over the last 5 decades and it was higher among the elderly, men, and among Chinese and Indians.[26,27] While several studies have analysed completed suicides and established risk factors in Singapore,[28] few have examined suicidal behaviours among those with MDD in a population setting.

The aims of the current study were to identify the prevalence and sociodemographic and clinical correlates of suicidal behaviours using data from a cross-sectional survey among those with MDD in Singapore. We hypothesised that respondents diagnosed with MDD and reporting suicidal behaviour would differ significantly from those with MDD who do not report suicidal behaviour.

## Methodology

### *Sample*

The Singapore Mental Health Study (SMHS) was a cross-sectional epidemiological study that surveyed Singapore residents (Singapore citizens and permanent residents) aged 18 years and above. Disproportionate stratified sampling (by age groups and ethnicity) was used where the 3 main ethnic groups (Chinese, Malays and Indians) were sampled in an equivalent proportion of about 30% each. Individuals aged 50 and older were also oversampled. The data was adjusted accordingly, to represent the Singapore population based on the 2007 population data. Face-to-face interviews were completed with 6616 respondents from December 2009 to December 2010. The survey response rate was 75.9%. The study was approved by the ethics committee (National Healthcare Group, Domain Specific Review Board) and all participants and parents/guardians of those aged below 21 years gave written informed consent for participating in the study. The detailed methodology of the study has been described in a prior article.[29]

### *Assessments*

The assessment of mental disorders was established using version 3.0 of the World Mental Health Composite International Diagnostic Interview (CIDI 3.0).[30] Diagnostic modules for lifetime and 12-month prevalence of affective disorders, including MDD and bipolar disorder; anxiety disorders, including generalised anxiety disorder (GAD) and obsessive compulsive disorder (OCD); alcohol use disorders i.e. alcohol abuse and alcohol dependence, were included in the survey. CIDI 3.0 organic exclusion rules as well as diagnostic hierarchy rules were applied to generate the final diagnoses.

For the purposes of this study, "suicidal behaviours" included the participants' reports of: (1) suicidal ideation (thoughts about suicide); (2) suicidal plans or intent; and (3) suicide attempts. It was assessed by the following questions which were asked to respondents who answered positively to the screening questions in the CIDI 3.0 "Depression" module:

- Did you think about committing suicide? – Suicidal Ideation
- Did you make a suicide plan? – Suicidal Plan
- Did you make a suicide attempt? – Suicidal Attempt

Help-seeking behaviour was determined using the services section of the CIDI. The key question asked from all respondents was, "Did you ever in your lifetime go to

see any of the professionals on this list for problems with your emotions, nerves, mental health or your use of alcohol or drugs?" A list of treatment providers was then presented to the participant.

The interview also gathered information on a range of chronic physical conditions. We used a modified version of the CIDI checklist of chronic medical disorders for this purpose and respondents were asked to report any of the disorders listed in the checklist. The list comprised 15 chronic medical disorders which were reclassified into 8 types of physical disorders: (1) respiratory disorders (asthma, chronic lung disease such as chronic bronchitis or emphysema), (2) diabetes, (3) hypertension and high blood pressure, (4) chronic pain (arthritis or rheumatism, back problems including disk or spine, migraine headaches), (5) cancer, (6) neurological disorders (epilepsy, convulsion, Parkinson's disease), (7) cardiovascular disorders (stroke or major paralysis, heart attack, coronary heart disease, angina, congestive heart failure or other heart disease), and (8) ulcer and chronic inflamed bowel (stomach ulcer, chronic inflamed bowel, enteritis, or colitis).[31] All other sociodemographic data such as age, gender, ethnicity, marital status, education, employment status, income and smoking status were collected using structured questionnaires. Nicotine dependence was established using the 6-item Modified Fagerstrom Test for Nicotine Dependence.[32]

### *Statistical Analysis*

All estimates were weighted to adjust for oversampling and post-stratified for age and ethnicity distributions between the survey sample and the Singapore resident population in 2007. Mean and standard deviations or median (if normality was not satisfied) were calculated for continuous variables, and frequencies and percentages for categorical variables. A series of logistic regression models were used to estimate odd ratios (ORs) and 95% confidence intervals (CI) using the three suicidal behaviours (ideation, plan and attempt) as the main outcome variables and sociodemographic factors, mental disorders and chronic physical conditions as predictors. Standard errors (SE) and significance tests were estimated using the Taylor series linearisation method. Multivariate significance was evaluated using Wald $x^2$ tests based on design corrected coefficient variance-covariance matrices. Statistical significance was evaluated at the <0.05 level using two-sided tests. All statistical analyses were carried out using the Statistical Analysis Software (SAS) System version 9.2.

## Results

Table 1 shows the sociodemographic distribution of respondents with DSM-IV lifetime major depressive disorder in the SMHS study. The prevalence of suicidal ideation, plan and attempt among those with lifetime MDD was 43.6%, 13.7% and 12.3%, respectively. Among those with suicidal ideation, about 31.5% and 28.2% had made a plan and an attempt respectively. Majority of respondents with suicidal ideation and plan had made an attempt (68.3%) (Table 2). The mean age of onset of MDD among those with suicidal ideation, plan and attempt was 26.4, 28.7 and 25.8, respectively. We found that suicidal ideation, plan and attempt were significantly associated with ethnicity,

Table 1. Sociodemographic Characteristics of Respondents with DSM-IV Lifetime Major Depressive Disorder in the SMHS Study (n = 417)

| | n | Weighted % | SE |
|---|---|---|---|
| Age group | | | |
| 18 – 34 | 203 | 46.6 | 0.0 |
| 35 – 49 | 136 | 31.7 | 0.0 |
| 50 – 64 | 68 | 14.3 | 0.0 |
| 65+ | 10 | 7.3 | 0.0 |
| Ethnicity | | | |
| Chinese | 114 | 73.3 | 0.0 |
| Malay | 109 | 9.6 | 0.0 |
| Indian | 162 | 11.6 | 0.0 |
| Others | 32 | 5.5 | 0.0 |
| Gender | | | |
| Male | 170 | 36.1 | 3.4 |
| Female | 247 | 63.9 | 3.4 |
| Marital status | | | |
| Single | 137 | 31.7 | 2.9 |
| Married | 227 | 49 | 3.6 |
| Divorced/ separated | 43 | 13.7 | 2.4 |
| Widowed | 9 | 5.6 | 1.6 |
| Education | | | |
| Primary | 47 | 11.8 | 2.2 |
| Secondary | 111 | 24.3 | 3 |
| Tertiary | 259 | 63.9 | 3.2 |
| Employment | | | |
| Employed | 303 | 72.1 | 3 |
| Unemployed | 65 | 20.3 | 2.7 |
| Economically inactive | 31 | 7.6 | 1.9 |
| Income | | | |
| Below $20,000 | 204 | 48.7 | 3.3 |
| $20,000 – $49,999 | 136 | 33.1 | 3.2 |
| >$50,000 and above | 60 | 18.2 | 2.8 |

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th edition; SE: Standard error; SMHS: Singapore Mental Health Study

education and income; Malays and Indians were significantly less likely than Chinese to have a suicidal ideation or plan. Malays were also less likely to have a suicidal attempt than those of Chinese ethnicity. Those who were divorced/separated were significantly more likely to report suicidal attempts than those who were single. As compared to those with tertiary education, those with a primary education were significantly more likely to have suicidal ideation, plan and attempt. Those with higher annual income ($50,000 and above) were significantly less likely to report any form of suicidal behaviours than those with lower annual income (below $20,000). Among those with suicidal ideation, only higher annual income remained significantly related to suicidal plan (Table 3).

Table 4 shows the association between mental disorders, chronic physical conditions and suicidal behaviours. After adjusting for sociodemographic factors in the multiple logistic regression, alcohol abuse and dependence were significantly associated with suicidal plan and attempt. GAD was significantly associated with suicidal ideation, while nicotine dependence was associated with suicidal plan. The presence of any chronic physical condition, and specifically having a respiratory condition, was significantly associated with suicidal plan. Among those with suicidal ideation, nicotine dependence was significantly related to suicidal plan, while hypertension was significantly related to suicidal attempt.

The details on sources of help sought among those with suicidal ideation, plan and attempt are provided in Table 5. The most frequent source of help as indicated by those with suicidal behaviours was a "psychiatrist". The rate of those who had sought some professional help was higher among those with suicidal plan (71.7%) and attempt (72.3%) as compared to those with suicidal ideation (48.7%) and those with MDD but no suicidal behaviour (29%). It was interesting to note that 15.7% of those with suicidal attempt had called a hotline for help versus only 1.6% with MDD but no reported suicidal behaviour.

## Discussion

The prevalence of suicidal behaviour among those with MDD was considerable in our population with the prevalence of ideation, plan and attempt among those with lifetime MDD being 43.6%, 13.7% and 12.3%, respectively.

We found that suicidal behaviour was significantly associated with ethnicity. Malays and Indians were significantly less likely than Chinese to have a suicidal ideation or plan. Malays were also less likely to have a suicidal attempt than Chinese. Our findings are similar to those reported by Chan et al[33] among depressed inpatients in Malaysia. The authors reported that those of Chinese origin had a higher risk of suicidal attempts as compared to those of Malay and Indian ethnicity. Sociocultural factors may provide a possible explanation for our findings. Ethnicity and religion are closely interrelated in Singapore as in Malaysia: almost all the Malays in Singapore are Muslims. Religious affiliation may be protective against suicide, both at the individual and societal level, and as observed in studies, religious salience may be a protective factor against suicidal behaviour and this may be more pronounced for Muslims compared to others.[33,34] Our finding that Indians have a lower risk of suicidal ideation and plans as compared to Chinese is somewhat surprising as an earlier study in this population showed that the risk of MDD was higher in Indians as compared to those of Chinese ethnicity.[35] Further research on suicidal behaviour and sociocultural factors is needed to understand these differences further.

Marital status was significantly associated with suicidal behaviour; those who were divorced/separated were significantly more likely to report suicidal attempts than those who were single. While our findings are different from that reported by Hawton et al[36] who did not find any association of marital status with suicidal attempts, they are similar to that reported by Chan et al,[33] who found that suicidal attempts were higher among those who had experienced marital separation. Marital separation, conflict and quarrels are significant stressors and may act as significant precipitants of suicidal attempts.[37]

Our findings that respondents with higher annual incomes had a significantly lower risk of suicidal behaviours than those with lower annual incomes replicate previous research in the field.[38,39] Our study also found that as compared to those with tertiary education, those with a primary education were significantly more likely to have suicidal ideation, plan and attempt. Lower education and income levels are both "individual-level disadvantages" which reflect a person's socioeconomic position that may influence suicidal behaviour. It has been suggested that low socioeconomic position may restrict the access of the individual to material, psychosocial, or institutional resources thus limiting an individual's development of self control or strategies for managing stressful situations, seeking support and help, or it may lead to differential exposure to risk factors such as negative life events (divorce, unemployment and financial loss) thus predisposing them to adverse outcomes.[40]

Comorbid mental disorders especially alcohol abuse and dependence were significantly associated with suicidal plan and attempt. Several studies have shown that suicidal behaviour is very common among subjects with co-occurring depression and alcohol use disorders.[20,24] The mechanisms underlying this relationship are yet to be elucidated. Conner and Duberstein[41] proposed a model to explain the elevated risk of suicide among alcohol dependent subjects. This model includes aggression/impulsivity, negative affect,

Table 2. Prevalence of Suicidal Behaviours

| | All MDD Cases | | | Non-suicidal Behaviour | | | Ideation | | | Plan | | | Attempt | | | Plan Among Ideators | | | Attempt Among Ideators | | | Attempt Among Ideators with a Suicide Plan | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | SE | n | % | SE | n | % | SE | n | % | SE | n | % | SE | n | % | SE | n | % | SE | n | % | SE |
| Total | 417 | 100 | 0 | 281 | 56.4 | 3.6 | 136 | 43.6 | 3.6 | 37 | 13.7 | 2.7 | 40 | 12.3 | 2.6 | 37 | 31.5 | 5.4 | 40 | 28.2 | 5.5 | 24 | 68.3 | 11.4 |
| Male | 170 | 36.1 | 3.4 | 122 | 63.7 | 5.9 | 48 | 36.3 | 5.9 | 17 | 14.3 | 4.7 | 15 | 12.3 | 4.5 | 17 | 39.5 | 10.5 | 15 | 33.9 | 10.4 | 11 | 79.5 | 13.2 |
| Female | 247 | 63.9 | 3.4 | 159 | 47.7 | 4.6 | 88 | 47.7 | 4.6 | 20 | 13.4 | 3.5 | 25 | 12.3 | 3.3 | 20 | 28.1 | 6.7 | 25 | 25.8 | 6.5 | 13 | 61.5 | 15.7 |

MDD: Major depressive disorder; SE: Standard error

Table 3. Sociodemographic Correlates of Suicidal Behaviours

| Variables | Ideation | | | Plan | | | Attempt | | | Plan Among Ideators | | | Attempt Among Ideators | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value |
| Age group | | | | | | | | | | | | | | | |
| 18 – 34 | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| 35 – 49 | 0.5 | 0.2 – 1.3 | 0.162 | 0.8 | 0.2 – 2.9 | 0.796 | 0.5 | 0.1 – 2.2 | 0.387 | 2.5 | 0.5 – 12.5 | 0.256 | 0.8 | 0.1 – 4.4 | 0.770 |
| 50 – 64 | 1.1 | 0.4 – 3.2 | 0.850 | 0.7 | 0.1 – 4.0 | 0.682 | 1.2 | 0.1 – 10.3 | 0.896 | 0.8 | 0.1 – 4.2 | 0.786 | 1.2 | 0.2 – 7.2 | 0.824 |
| 65+ | 0.2 | 0.01 – 7.6 | 0.416 | 0.2 | 0.01 – 3.9 | 0.263 | 0.2 | 0.01 – 4.3 | 0.307 | - | - | - | 1.9 | 0.1 – 51.0 | 0.691 |
| Ethnicity | | | | | | | | | | | | | | | |
| Chinese | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| Malay | 0.2 | 0.1 – 0.4 | <.0001 | 0.1 | 0.03 – 0.5 | 0.003 | 0.1 | 0.02 – 0.5 | 0.005 | 1.0 | 0.1 – 6.4 | 0.959 | 1.1 | 0.2 – 7.2 | 0.941 |
| Indian | 0.3 | 0.2 – 0.7 | 0.001 | 0.2 | 0.1 – 0.7 | 0.008 | 0.4 | 0.1 – 1.2 | 0.096 | 0.7 | 0.1 – 3.5 | 0.660 | 2.0 | 0.5 – 7.4 | 0.318 |
| Others | 0.5 | 0.2 – 1.5 | 0.217 | - | - | - | - | - | - | - | - | - | - | - | - |
| Gender | | | | | | | | | | | | | | | |
| Male | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| Female | 1.4 | 0.7 – 2.9 | 0.355 | 0.8 | 0.2 – 2.8 | 0.744 | 1.3 | 0.4 – 4.2 | 0.644 | 0.5 | 0.1 – 1.8 | 0.267 | 0.6 | 0.1 – 2.1 | 0.381 |

CI: Confidence interval; OR: Odds ratio; Ref: Reference category

*Derived from multiple logistic regression model adjusted for demographic variables (i.e. age, gender, ethnicity, marital status, education, employment and income).

Table 3. Sociodemographic Correlates of Suicidal Behaviours (Con't)

| Variables | Ideation | | | Plan | | | Attempt | | | Plan Among Ideators | | | Attempt Among Ideators | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value | OR* | 95% CI | *P* Value |
| Marital status | | | | | | | | | | | | | | | |
| Single | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| Married | 1.4 | 0.6 – 2.9 | 0.451 | 3.6 | 0.7 – 18.2 | 0.119 | 2.1 | 0.4 – 10.3 | 0.374 | 4.8 | 0.9 – 24.8 | 0.061 | 2.9 | 0.7 – 12.5 | 0.147 |
| Divorced/ separated | 2.8 | 0.8 – 9.6 | 0.108 | 3.7 | 0.5 – 27.3 | 0.198 | 8.3 | 1.1 – 61.1 | 0.037 | 2.1 | 0.2 – 22.1 | 0.547 | 3.4 | 0.5 – 22.4 | 0.210 |
| Widowed | 6.5 | 0.1 – 283.2 | 0.333 | 22.4 | 0.5 – 996.8 | 0.109 | 4.1 | 0.1 – 142.0 | 0.440 | - | - | - | 0.2 | 0.01 – 5.4 | 0.348 |
| Education | | | | | | | | | | | | | | | |
| Primary | 3.9 | 1.4 – 10.5 | 0.007 | 4.6 | 1.3 – 16.8 | 0.019 | 13.7 | 2.9 – 65.1 | 0.001 | 0.8 | 0.1 – 5.6 | 0.859 | 4.9 | 0.9 – 27.0 | 0.067 |
| Secondary | 0.7 | 0.3 – 1.6 | 0.410 | 0.5 | 0.1 – 1.8 | 0.260 | 0.5 | 0.1 – 2.1 | 0.322 | 0.8 | 0.2 – 3.2 | 0.794 | 0.5 | 0.1 – 2.7 | 0.439 |
| Tertiary | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| Employment | | | | | | | | | | | | | | | |
| Employed | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| Unemployed | 0.7 | 0.2 – 2.1 | 0.488 | 1.9 | 0.4 – 8.9 | 0.437 | 2.9 | 0.6 – 13.9 | 0.173 | 4.4 | 0.5 – 37.8 | 0.175 | 6.2 | 0.6 – 60.6 | 0.116 |
| Economically inactive | 0.8 | 0.2 – 2.8 | 0.707 | 1.5 | 0.4 – 6.7 | 0.573 | 1.4 | 0.2 – 10.0 | 0.748 | 3.3 | 0.5 – 23.7 | 0.229 | 2.5 | 0.2 – 26.7 | 0.440 |
| Income | | | | | | | | | | | | | | | |
| Below $20,000 | | Ref. | | | Ref. | | | Ref. | | | Ref. | | | Ref. | |
| $20,000 – $49,999 | 0.6 | 0.2 – 1.3 | 0.202 | 0.2 | 0.04 – 1.3 | 0.087 | 1.3 | 0.3 – 6.4 | 0.740 | 0.3 | 0.1 – 1.5 | 0.134 | 2.7 | 0.7 – 11.0 | 0.159 |
| >$50,000 and above | 0.3 | 0.1 – 0.8 | 0.022 | 0.03 | 0.003 – 0.2 | 0.001 | 0.1 | 0.01 – 0.6 | 0.016 | 0.04 | 0.004 – 0.4 | 0.005 | 0.1 | 0.02 – 1.1 | 0.062 |

CI: Confidence interval; OR: Odds ratio; Ref: Reference category

*Derived from multiple logistic regression model adjusted for demographic variables (i.e. age, gender, ethnicity, marital status, education, employment and income).

Table 4. Correlates of Lifetime Mental Disorders and Chronic Physical Conditions with Suicidal Behaviours

| | Ideation | | | Plan | | | Attempt | | | Plan Among Ideators | | | Attempt Among Ideators | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **OR** | **95% CI** | **P Value** | **OR** | **95% CI** | ***P* Value** | **OR** | **95% CI** | ***P* Value** | **OR** | **95% CI** | ***P* Value** | **OR** | **95% CI** | ***P* Value** |
| Lifetime DSM-IV disorders | | | | | | | | | | | | | | | |
| GAD | 3.7 | 1.1 – 12.3 | 0.032 | 2.3 | 0.4 – 14.0 | 0.361 | 1.7 | 0.3 – 10.2 | 0.540 | 0.3 | 0.03 – 3.5 | 0.352 | 1.01 | 0.1 – 7.2 | 0.993 |
| OCD | 0.8 | 0.2 – 2.5 | 0.662 | 2.3 | 0.6 – 9.2 | 0.248 | 1.3 | 0.3 – 6.3 | 0.754 | 5.8 | 0.8 – 41.4 | 0.081 | 4.7 | 0.6 – 34.1 | 0.129 |
| Alcohol abuse | 2.6 | 0.9 – 7.5 | 0.079 | 22.7 | 3.6 – 142.9 | 0.001 | 12.1 | 1.9 – 75.5 | 0.008 | 2.4 | 0.2 – 29.7 | 0.506 | 2.1 | 0.3 – 17.4 | 0.494 |
| Alcohol Dependence | 3.7 | 0.9 – 15.4 | 0.074 | 11.9 | 1.4 – 104.9 | 0.025 | 16.7 | 2.0 – 136.2 | 0.009 | 11.0 | 0.5 – 261.2 | 0.138 | 6.9 | 0.3 – 169.9 | 0.242 |
| Nicotine Dependence | 2.0 | 0.5 – 8.2 | 0.333 | 10.7 | 1.2 – 98.3 | 0.036 | 3.0 | 0.3 – 30.1 | 0.343 | 26.5 | 1.1 – 658.1 | 0.045 | 5.3 | 0.5 – 61.2 | 0.184 |
| Any mental disorder | 1.7 | 0.8 – 3.6 | 0.18 | 6.6 | 1.9 – 23.0 | 0.003 | 3.1 | 0.9 – 10.6 | 0.069 | 3.2 | 0.8 – 13.2 | 0.115 | 3.1 | 0.8 – 12.3 | 0.114 |
| Lifetime chronic physical conditions | | | | | | | | | | | | | | | |
| Respiratory conditions | 1.1 | 0.5 – 2.5 | 0.874 | 4.5 | 1.1 – 18.4 | 0.039 | 3.1 | 0.8 – 11.5 | 0.097 | 3.4 | 0.3 – 37.0 | 0.312 | 4.9 | 0.97 – 25.1 | 0.055 |
| Diabetes | 0.8 | 0.2 – 3.4 | 0.802 | 2.1 | 0.3 – 14.7 | 0.442 | 2.8 | 0.6 – 13.2 | 0.198 | | | | 25.3 | 0.8 – 763.1 | 0.063 |
| Hypertension | 0.9 | 0.3 – 2.6 | 0.911 | 0.6 | 0.1 – 3.1 | 0.545 | 4.0 | 0.8 – 18.7 | 0.082 | 4.4 | 0.8 – 24.9 | 0.090 | 11.8 | 1.6 – 87.0 | 0.016 |
| Chronic pain | 0.8 | 0.4 – 1.7 | 0.608 | 1.4 | 0.4 – 4.8 | 0.601 | 0.9 | 0.3 – 2.9 | 0.816 | 1.7 | 0.4 – 6.7 | 0.473 | 1.6 | 0.5 – 5.7 | 0.457 |
| Cancer | | | | | | | | | | 2.5 | 0.5 – 12.5 | 0.256 | 0.8 | 0.1 – 4.4 | 0.770 |
| Neurological conditions | 1.0 | 0.1 – 7.1 | 0.961 | 2.3 | 0.2 – 33.2 | 0.529 | 1.1 | 0.1 – 25.1 | 0.944 | 5.6 | 0.3 – 110.0 | 0.259 | 1.4 | 0.1 – 25.9 | 0.810 |
| Cardiovascular | 0.7 | 0.1 – 3.9 | 0.698 | 0.6 | 0.1 – 4.3 | 0.609 | 1.0 | 0.2 – 5.8 | 0.993 | 0.3 | 0.01 – 11.8 | 0.519 | 3.9 | 0.3 – 60.6 | 0.332 |
| Ulcer | 1.2 | 0.2 – 9.0 | 0.846 | 0.6 | 0.03 – 12.6 | 0.766 | 0.7 | 0.03 – 16.9 | 0.800 | | | | 0.3 | 0.01 – 14.5 | 0.510 |
| Any chronic physical condition | 0.9 | 0.5 – 1.8 | 0.812 | 4.2 | 1.1 – 15.5 | 0.032 | 2.2 | 0.7 – 7.3 | 0.197 | 6.9 | 1.7 – 27.6 | 0.007 | 3.2 | 0.9 – 10.9 | 0.064 |

CI: Confidence interval; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th edition; GAD: Generalised anxiety disorder; OCD: Obsessive compulsive disorder; OR: Odds ratio

Table 5. Services Used Among Those With Suicidal Behaviours

| | MDD with No Reported Suicidal Behaviour (n = 281) | | Ideation (n = 136) | | Plan (n = 37) | | Attempt (n = 40) | |
|---|---|---|---|---|---|---|---|---|
| **Professional** | **%** | **SE** | **%** | **SE** | **%** | **SE** | **%** | **SE** |
| Any professional | 29.0 | 3.9 | 48.7 | 5.8 | 71.7 | 9.0 | 72.3 | 9.2 |
| Psychiatrist | 7.4 | 2.3 | 25.2 | 5.3 | 42.6 | 11.4 | 58.0 | 10.3 |
| Counselor | 8.1 | 1.9 | 14.0 | 4.3 | 19.2 | 9.8 | 7.3 | 4.8 |
| Religious/spiritual healer | 2.7 | 1.2 | 10.6 | 3.9 | 14.9 | 9.2 | 3.1 | 1.5 |
| GP | 13.8 | 3.2 | 7.3 | 2.5 | 3.0 | 1.4 | 1.8 | 1.1 |
| Psychologist | 5.8 | 2.2 | 5.8 | 2.5 | 5.8 | 4.2 | 7.8 | 4.8 |
| Social worker | 2.9 | 1.3 | 9.1 | 3.7 | 21.6 | 10.0 | 24.8 | 10.7 |
| Use a hotline | 1.6 | 1.2 | 9.4 | 3.4 | 14.1 | 7.4 | 15.7 | 8.3 |
| Other mental health professional | 2.5 | 1.6 | 0.2 | 0.2 | 0.6 | 0.7 | - | - |
| Medical doctor* | 0.4 | 0.2 | 0.4 | 0.3 | - | - | 0.7 | 0.7 |
| Nurse | 0.3 | 0.2 | 0.4 | 0.3 | - | - | 0.6 | 0.6 |
| Healer | 2.7 | 1.6 | 0.6 | 0.5 | - | - | - | - |

GP: General practitioner; MDD: Major depressive disorder; SE: Standard error
*Refers to doctors with specialisation in fields other than psychiatry; does not include GPs.

and hopelessness as key predisposing factors, and major depressive episodes and stressful life events, particularly interpersonal difficulties, as key precipitating factors for suicide. Episodes of major depression are proposed to mediate the relationship between negative affect (and hopelessness) and suicidal behaviour among those with alcoholism. The authors also suggest that it is likely that depression affects the association between interpersonal difficulties and suicidal behaviour among alcoholics. This model could also partly explain the higher risk conferred by comorbid alcohol use for suicidal behaviours among those with MDD in our study.

GAD was significantly associated with suicidal ideation, while nicotine dependence was associated with suicidal plan. Our finding of an association between GAD and suicidal ideation is somewhat unique, and there is only one study reporting a similar finding (in an outpatient population with MDD).[42] Studies have identified both smoking and nicotine dependence as risk factors for suicidal behaviour.[43-45] Different theories have been described to explain this relation such as smoking being a non-causal marker or smoking being a psychological or physical toxin. A biological theory suggests that chronic nicotine use is associated with diminished levels of serotonin[46] and monoamine oxidase (MAO)[47] compared with unexposed populations. Low levels of serotonin and MAO activity have been linked with suicidal behaviour.[48,49] Our findings must be interpreted cautiously as this study established current prevalence of nicotine dependence while suicidal behaviour was based on a lifetime history.

Our finding of the association between chronic physical conditions and specifically having a respiratory condition and suicidal plan is somewhat similar to that reported by Goodwin et al.[50] The authors found that pulmonary disease with or without comorbid depression was associated with a statistically significant increased likelihood of suicidal ideation. However, those with comorbid depression and pulmonary disease had a higher risk of suicidal ideation. The mechanism of the association between respiratory disease, major depression, and suicidal behaviours is not known. The authors have suggested that "the pain, physical suffering or the limited lifestyle associated with specific physical illnesses such as asthma and chronic obstructive pulmonary disease (COPD) is severe enough to result in suicidal behaviour". Studies conducted among the local population, i.e. among patients with chronic obstructive pulmonary disease in Singapore, have concluded that comorbid depressive symptoms are common in patients with COPD and are associated with poorer survival, longer hospitalisation stay, persistent smoking, increased symptom burden, and poorer physical and social functioning.[51] These factors may be a plausible explanation for our findings. Alternatively, it may be that there are common genetic or environmental factors (or both) that are related to depression, respiratory disease and suicidal ideation, which independently predict their co-occurrence. Future research is needed to determine the nature of this link.

The rate of those who had sought some professional help was considerably higher among those with MDD and suicidal behaviour as compared to those without suicidal behaviour. These findings can be explained by Andersen's behavioural model of health services in that an increased level of evaluated need is associated with an increased likelihood of help-seeking behaviour.[52] Individuals with

suicidal behaviours were significantly more likely than those with MDD without suicidal behaviours to seek help, suggesting that suicidal behaviours are important factors associated with help-seeking behaviour over and above the presence of mental disorders. Furthermore, individuals who had suicidal plans/attempts were even more likely than those with suicidal ideation to seek help—suggesting increasing need with the severity of the suicidal behaviour. The most frequent source of help as indicated by those with suicidal behaviours was a psychiatrist. A likely explanation for this may be that those with suicidal behaviours may interpret the ideas/plans as a clear and serious indicator of psychological distress, and are therefore more likely to seek treatment from psychiatrists. It is possible that those with attempts similarly were either self/family referred to a psychiatric facility given the seriousness of the problem. It is however, important to note that counsellors, religious and spiritual healers as well as hotlines have also been identified as sources of help seeking thus reiterating the need for care providers from different backgrounds to work in an integrated manner to support those with suicidal behaviours and avoid escalation to a completed suicide.

The strengths of our study are that it is a nationwide survey of a representative population which has lesser likelihood of sampling errors like Berkson's bias compared to those studies that examined "suicidal behaviours" in help-seeking clinical samples. It is one of the first studies in the extant literature that has examined suicidal behaviour among those with MDD in a multiethnic Asian sample. We used a structured diagnostic instrument with face-to-face interviews, and psychiatric diagnoses were made according to the DSM-IV criteria. Lastly, our response rate of 75.9% ensures reasonable generalisability of our results. There are some limitations to our study—suicide-related variables were collected with a single question; we did not assess the lethality of suicide attempts or the number of suicidal attempts and thus, were unable to compare those with single versus multiple attempts. We assessed "suicidal behaviours" only among those with MDD, however current research suggests that "suicidal behaviours" may occur independently of depressive symptoms. A stress diathesis model proposed by Mann et al[53] suggests that the risk for suicidal acts is determined not merely by a psychiatric illness (the stressor) but also by a diathesis. This diathesis may be reflected in a tendency to experience more suicidal ideation and to be more impulsive and, therefore, to be more likely to act on suicidal feelings. Another theory suggests that suicidal individuals are experiencing unbearable psychological pain (psychache) or suffering and that suicide may be, at least in part, an attempt to escape from the suffering.[54] Thus, the prevalence of "suicidal behaviours" in our study is not indicative of "suicidal behaviours" among the general population of Singapore. The data on suicidal behaviours was based on respondents' self-report and there could be an element of recall bias and under-reporting especially since suicidal behaviour is a sensitive topic. Lastly, we did not establish the prevalence of personality disorders which are a significant risk factor for suicidal behaviour.

## Conclusion

Individuals with MDD and suicidal behaviour do differ from their non-suicidal counterparts as they have a different sociodemographic and clinical profile. There is a need for more research and a better understanding of this population which in turn could lead to the development and implementation of relevant interventions.

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