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Emergency Psychiatry in the General Hospital

The emergency room is the interface between community and health care institution. Whether through outreach or in-hospital service, the psychiatrist in the general hospital must have specialized skill and knowledge to attend the increased numbers of mentally ill, substance abusers, homeless individuals, and those with greater acuity and comorbidity than previously known. This Special Section will address those overlapping aspects of psychiatric, medicine, neurology, psychopharmacology, and psychology of essential interest to the psychiatrist who provides emergency consultation and treatment to the general hospital population.

Completed suicides and self-harm in Malaysia: a systematic review ☆

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ABSTRACT

Objective: Most of the research into suicide and self-harm has been conducted in the United States and Europe, yet the volume of research does not reflect the distribution of suicide globally, with Asia accounting for up to 60% of all suicides. The present study systematically reviews the literature to assess the prevalence and correlates of suicidal acts in Malaysia in Southeast Asia.
Methods: Five relevant databases were searched from inception up to February 2014, and a narrative synthesis of the results from the included studies was performed. Studies were eligible for inclusion if they were correlational survey research and archival/observational research describing self-harm and suicide. Outcomes included completed suicides and self-harm including suicide attempts and self-poisoning, suicide plans and suicidal ideation.
Results: In total, 39 studies met the inclusion criteria. The principal findings were that the prevalence of suicide in Malaysia is approximately 6–8 per 100,000 population per year and that there is an excess of suicide among men, people younger than 40 years and the Indian minority group. The past-month prevalence rates of suicidal ideation, plans and attempts are 1.7, 0.9% and 0.5%, respectively, whereas the past-year prevalence rates of suicidal ideation range between 6% and 8%.
Conclusions: The present research marks a first step towards understanding the prevalence and correlates of suicide and self-harm in Malaysia. However, the heterogeneity of the included studies was high. Further research into the antecedents, consequences and interventions for suicide and self-harm in the Malaysian context is required.

1. Introduction

Most of the research into suicide and self-harm has been conducted in the United States and Europe, yet the volume of research does not reflect the distribution of suicide globally, with Asia accounting for up to 60% of all suicides [1–3]. In the last decade, the allocation of RM 900 million (US $262 million) for the years 2006 to 2010 by the Malaysian government under the Ninth Plan has been an important step forward in improving services for mental health problems including suicide and self-harm in Malaysia [4]. As part of this, the National Suicide Registry Malaysia was established in 2007 to monitor suicides. As yet, a self-harm registry has not been established, which is a potentially important omission given that self-harm is the most powerful predictor of suicide [5].

Despite these efforts by the Malaysian government, however, the research literature into suicide and self-harm in Malaysia has been fragmented because it has tended to focus on certain types of self-harm among specific ethnic groups. This means that the prevalence of suicide and self-harm in Malaysia can only be accurately assessed by cross-checking multiple sources. The first major aim of the present review was, therefore, to try to provide a more accurate estimate of the prevalence of suicide and self-harm in Malaysia by drawing together the published research literature systematically.

The second aim was to identify correlates of suicide and self-harm in Malaysia. In Western countries, one consistent finding is that suicides among men outnumber suicides among women [6–10]. However, in other respects, the pattern of suicide and self-harm appears to differ between developed and developing countries [11]. For example, in developed countries, the suicide rate is high in the age group of 15 to 24 years, but it is highest among the elderly, with the divorced/widowed/

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separated at increased risk of suicide. In contrast, in developing countries like Malaysia, the highest suicide rate is found among the young (below 30 years) [12], and married women are at higher risk [11]. Consistent with this pattern of findings, in Malaysia (Kuala Lumpur specifically), self-harm is highest among women, people aged 16–24 years and people with an Indian background [12,13]. However, further research is needed to elucidate the role of demographic correlates including gender and age on suicide rates in Malaysia.

Moreover, the means of suicide and self-harm have been found to differ between developed and developing countries. In developed countries, the drugs with which people choose to overdose are relatively nontoxic drugs such as analgesics, tranquilizers and antidepressants [14]. In contrast, toxic agricultural poisons are more widely available in developing countries and hence are widely employed in suicidal behaviors [15].

The present systematic review seeks to draw together the disparate literature in order to establish the prevalence and correlates of suicide and self-harm in Malaysia.

2. Method

The presentation of this systematic review conforms to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [16].

2.1. Eligibility criteria

Studies were included if they fulfilled three criteria:

1. Data collected in Malaysia.
2. Paper written in English or Malay.
3. Described episodes of suicide and/or self-harm in Malaysia.

Editorials, reviews and gray literature were excluded.

2.2. Data sources and search strategy

Studies on suicide and self-harm in Malaysia were identified after a comprehensive search of five electronic databases: PsycINFO (1806–February 2013), MEDLINE (1966–October 2014), CINAHL (1982–October 2014), SCOPUS (1966–October 2014) and Web of Knowledge (1900–October 2014). Key words used in the search were performed in the format: (suicid* OR self-harm* OR parasuicid* OR attempted suicid* OR self-poison* OR self-injur*) AND (Malaysia). The use of generic key words was performed in order to capture as many published papers as possible.

2.3. Study selection and data extraction

The screening of articles was conducted in two stages. The first stage of screening involved reviewing the titles and abstracts of all articles identified from the electronic databases. From these, a list was drawn up of papers for potential inclusion. The second stage of screening involved retrieving the full text of articles that were selected after the first stage of screening. The data from these were extracted directly into tables in four categories: prevalence rates, associated factors, methods of suicide and the reason for the act.

2.4. Appraisal of methodological quality

Methodological quality of the included studies was assessed using criteria adapted from guidance on the assessment of observational studies [17] and the Quality Assessment Tool for Quantitative Studies [18]. Four criteria were deemed essential for assessing the quality of the review. Each study was awarded one point for each criterion met. We did not exclude studies on the basis of their methodological quality [19,20]. These four key criteria were: (a) methodological design (prospective/case control = 1 retrospective/cross-sectional = 0), (b) response rate (70% and over = 1, <70% or not reported = 0), (c) screening tool for self-harm (psychometrically validated clinical records/clinical interview/self-report = 1; other/not reported = 0) and (4) control for confounding factors in the analysis (controlled = 1, not controlled/not reported = 0).

2.5. Data synthesis

The large heterogeneity of the studies included in this review precluded the use of formal meta-analysis to pool the results of different studies. Therefore, a narrative synthesis was performed. The primary outcome of this review was the prevalence of completed suicides and self-harm in Malaysia. Moreover, in order to obtain a better understanding of the problem of suicide and self-harm in Malaysia, we explored the role of demographic characteristics, risk and protective factors for suicide and self-harm, and methods and motives for suicide and self-harm.

3. Results

3.1. Description of the study selection

The initial searches identified 258 studies (see PRISMA flow diagram in Fig. 1). These studies were assessed based on the abstract alone, and of these, 242 articles were excluded because of the duplication of papers and the setting being other than Malaysia. Of 53 papers retrieved for full-text review, 14 full-text papers were excluded because the results did not describe prevalence rates or the predictors and types of suicide and self-harm. This process left 39 studies that fulfilled the eligibility criteria, and it was from these that data were extracted.

3.2. Study characteristics

Fourteen studies had retrospective designs, 8/39 were prospective, 3/39 were case–control, and 14/39 were cross-sectional studies. The majority of studies were based in hospitals, of which 27/39 used

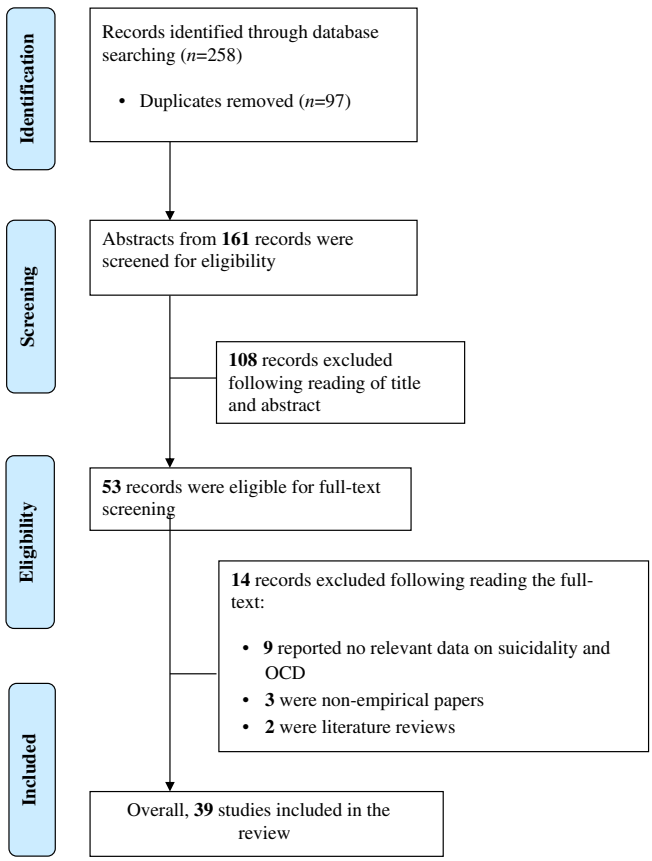

Fig. 1. Flow diagram of the studies in the review.

Table 1
Prevalence of suicide and self-harm.

Study	Aims	Methodology	Respondent details	Findings
Teoh [21]	Rates of suicide in Kuala Lumpur	Retrospective. Coroner's files of Kuala Lumpur from 1965 to 1970 were retrieved.	264 cases: 174 males and 90 females.	Rate of suicide in West Malaysia in 1970 was 1.1 per 100,000 for Malays, 8.1 per 100,000 for Chinese and 23.3 per 100,000 for Indians; giving a total rate of 6.3 per 100,000.
Maniam [23]	To validate the rates of suicide in Malaysia.	Retrospective. Data on causes of death and population composition for the years 1966 to 1990 were assessed.	n/r	Suicide rate in Malaysia was 6.1 per 100, 000 between 1966 and 1974 but dropped drastically to 1.6 per 100, 000 between 1975 and 1990. The reduction in suicide rates was due to a systematic misclassification of medically certified suicides as deaths due to undetermined violent deaths. Taking the misclassification into account, the corrected suicide rate for West Malaysia is estimated to be 8–13 per 100,000 since 1982.
Hayati et al. [22]	Rate and pattern of completed suicides seen in Kuala Lumpur General Hospital.	Retrospective. Postmortem cases by the Forensic Department from 1st January until 31st December 1999 were screened.	Of the 1249 cases, 76 cases were identified as suicide cases. Mean age of 43 years, and 52% were Chinese	The suicide rate in Kuala Lumpur was estimated at 7.4 per 100,000 populations.
National Suicide Registry Malaysia [5]	To capture data on completed suicides.	Retrospective. Data were collected via interviews with family members, significant others or police, and a review of medical reports or other official documents.	Data collected on the 11 states included 290 cases	The registry captured 1.28 suicides per 100, 000 populations of certified deaths for the year.
Sinniah et al. [58]	Rates of suicide in Cameron Highlands.	Retrospective. Data on suicides and parasuicides from the year 1995 to 2005 were collected from Cameron Highlands Hospital record.	n/r	The suicide rate has declined greatly to about 15 per 100,000 compared to 60 per 100,000 in the 1970s and 1980s. There was also a similar drop in attempted suicide cases.
Maniam et al. [25]	To identify high-risk groups for a focused suicide prevention program in Malaysia	Cross-sectional. A nationally representative sample of adults aged 16 years and above identified as part of a national epidemiological survey of morbidity conducted in 2006	A total of was 20,552 participants stratified by random sampling from the sampling frame provided by the Department of Statistics Malaysia.	The overall prevalence of suicidal ideation in the past year was 6.3%, $n=1288$ across 20,552 responders.
Ahmad et al. [26]	To identify the prevalence and risk and protective factors associated with suicidal ideation among Malaysian adolescents	Cross-sectional using data from the 2012 Malaysia Global School-based Student Health Survey (GSHS).	25,174 adolescents were randomly selected from 234 government secondary schools in Malaysia	The prevalence of suicidal ideation in the past year was 7.9%.
Ali et al. [24]	To estimate the prevalence and predictors of completed suicides in Malaysia	Retrospective. Analysis of National Suicide Registry of Malaysia from January 2009 to December 2009.	n/r	The overall suicide rate for 2009 was 1.18 per 100,000 population ($n=328$).
Maniam et al. [12]	To determine the prevalence of suicidal behavior (ideation, plans and attempts) in a nationally representative sample of Malays.	Cross-sectional. A nationally representative sample of adults aged 16 years and above identified as part of a national epidemiological survey of morbidity conducted in 2011	A total of was 19,309 participants stratified by random sampling from the sampling frame provided by the Department of Statistics Malaysia.	The prevalence estimates for suicide ideation, plans and attempts in the past month were 1.7%, 0.9% and 0.5%, respectively.

n/r=not reported.

hospital admissions and records, 6/39 were based on the autopsy reports from the forensic department, 4/39 were based on large community surveys (e.g., National Health and Morbidity Survey), and 2/39 used data drawn from the National Statistics Department and National Suicide Registry (Table 1).

Twenty studies were carried out in Kuala Lumpur; 7/39 in Penang State; 2/39 in Pahang State; 6/39 were national studies; and 4/39 were conducted in Sabah, Sarawak and Selangor States. The earliest study was published in 1972, and the latest was in 2012.

The methodological quality of the included studies was generally low. Only half of the included studies (20/39) met at least three of the four quality criteria. We did not observe any major differences between studies with higher quality scores (3–4) and studies with lower quality scores (1–2) in terms of rates and correlates of completed suicides and self-harm.

3.3. Prevalence of suicide and self-harm

Teoh [21] estimated that the rate of suicide in West Malaysia was 6.3 suicides per 100,000 population in 1970 and had remained fairly constant at approximately 7 suicides per 100,000 population between 1965 and 1970 (Table 2). However, the rates differ markedly between the different ethnic groups, from 1.1 suicides per 100,000 Malays, 8.1 suicides per 100,000 Chinese and 23.3 suicides per 100,000 Indians. These figures correspond with Hayati et al. who screened postmortems at the Forensic Pathology Department of the Kuala Lumpur Hospital between 1st January and 31st December 1999. Hayati et al. [22] found that 76 out of 1249 postmortems were suicides, a suicide rate of 7.4 per 100,000, with rates of 2.6, 8.6 and 21.1 suicides per 100,000 for Malays, Chinese and Indians, respectively.

Maniam [23] reports that, officially, the suicide rate fell from 6.1 suicides per 100,000 in the period 1966–1974 to 1.6 suicides per 100,000 during the period 1975–1990. However, there was a corresponding increase in "deaths due to undetermined violence," and it was estimated that the corrected rate for West Malaysia was 8–13 suicides per 100,000 since 1982.

The National Suicide Registry Malaysia, established in 2007, estimated a prevalence of 1.3 suicides per 100,000 of the population [5]. More recent estimates of completed suicides for 2009 showed a rate of 1.18 per 100,000 of the population [24]. However, it is worth noting that the National Suicide Registry Malaysia data rely on medically certified suicides and that approximately 50% of all deaths in Malaysia are not medically certified [23].

Three recent large community surveys examined the prevalence of self-harm in Malaysia. Two of these studies were based on analyzing data from the 2006 and 2011 National Health and Morbidity Surveys. Maniam et al. [25] examined the prevalence of suicidal ideation in the past year among Malays aged 16 years; the results showed that the overall prevalence of suicidal ideation was 6.3%. The second study by Maniam et al. [12] focused on the same age group but examined a wider range of suicidal behaviors including suicide attempts, plans and ideation in the past month. The estimated prevalence for suicide ideation, plans and attempts in the past month was 1.7%, 0.9% and 0.5%, respectively. The third study was based on adolescents (12–17 years), drawing on data from the 2012 Malaysia Global School-based Student Health Survey. A 7.9% prevalence of past-year suicidal ideation was found among Malay adolescents aged 12–17 years [26].

3.4. Demographic characteristics

Men were more likely than women to die by suicide, with young men (15–44 years) at highest risk (Table 2). In contrast, women were more likely than men to self-harm, with young women (14–40 years) accounting for the majority of cases.

3.5. Risk factors for suicide and self-harm

Table 3 presents the risk factors for suicide in Malaysia. A consistent picture emerges, namely, that 60%–76% of suicides are men and people aged 40 and younger. For example, Bhupinder and Kumara [27] found that men accounted for 70% of suicide deaths and that suicides tended to occur among younger people (26–35 years). Moreover, Nadesan [28] examined cases of suicide in the Kuala Lumpur Hospital from 1995 to 1998 and reported associations between suicide and being of Indian ethnic origin, male, aged 21 to 40 years, married and diagnosed with a psychiatric illness (Table 3). In contrast with Nadesan [28], however, Bhupinder and Kumara [27] found suicide to be more common among Chinese than Indian people, but when corrected for size of population, the Indian ethnic group has a four times greater suicide risk than the others [9,24].

Correlates of self-harm are reported in Table 3. Again, a consistent pattern emerges, with self-harm being associated with being female, aged younger than 40, of lower socioeconomic status and of Indian ethnic origin. For example, Orr and Pu [29] reported that people admitted to the General Hospital of Kuala Lumpur for self-harm were most commonly women of Indian ethnicity aged 20 to 30 years, with low socioeconomic status and minimal education. This pattern of findings is also reported in several other studies [24,30–32].

3.6. Protective factors in suicide and self-harm

Three studies examined factors that protected against self-harm. Kannan et al. [33] carried out a cross-sectional survey of all patients admitted to a major hospital and found that coping skills, religious beliefs and responsibility to the family were stronger in patients who did not self-harm than in those who had a self-harm history. Zuraida and Ahmad [34] examined the relationship between religiosity and suicidal ideation in clinically depressed patients. Respondents higher in religiosity had significantly lower suicide ideation scores compared to those who chose family or health as the most important domain in life. Ahmad et al. examined risk and protective factors for suicidal ideation in a large nationally representative sample of secondary school students. Students who reported having close friends and married parents were less likely to engage in suicidal ideation [26]. Further research is required to investigate protective factors in self-harm more fully.

3.7. Methods of suicide and self-harm

The majority of studies show that self-poisoning is the most common means by which suicide is attempted (Table 4). The most common agents were agricultural poisons (e.g., insecticide), followed by tranquilizers, hypnotics, detergents and methyl salicylate liniment. Indian patients had the highest self-poisoning rate compared to other major ethnic groups [35–37]. However, the National Suicide Registry Malaysia (2009) reports a different pattern of findings, which showed that hanging was more frequent than poisoning. This discrepancy might reflect regional variations. For example, hanging was the most common means of suicide in Kuala Lumpur [22], whereas agricultural poisons are more often used in rural regions [38]. Moreover, the construction of high-rise buildings in Kuala Lumpur may have contributed to the increasing number of people committing suicide by jumping from heights, with more recent reports finding that jumping from heights is the most common method, followed by hanging and drowning [39].

3.8. Reported motives for suicide and self-harm

Interpersonal difficulties, such as marital quarrels or other family conflicts, are the most commonly reported reasons for suicide and self-harm [38], accounting for 33% of the suicides in the University Hospital, Kuala Lumpur [40] (Table 5). However, these independent studies differ from the National Suicide Registry Malaysia [5], which reports that financial and job problems were the most frequently reported factors among suicidal people. Hamidin and Maniam [41] found that the six most commonly reported threatening life events prior to a suicide attempt were personal illness issues, family illness or bereavement issues, interpersonal issues, work issues and other life event issues. Interpersonal issues (e.g., serious problem with a close friend, neighbor or relative; breaking off a steady relationship; and a separation due to marital difficulties) were significantly associated with suicide attempts, contributing to 94% of total cases. Self-harm was more closely associated with problems in interpersonal relationships, particularly chronic domestic strife such as marital problems, conflicts with elders or family discord [36,42–44]. Furthermore, a diagnosis of major depression, anxiety, substance use and epilepsy worsened risk for self-harm [12,24,25,45–48]. Similarly, in adolescents, precipitating factors for suicidal ideation included depression, anxiety, stress, substance use, being bullied and being abused at home, either physically or verbally [26,49].

4. Discussion

The present systematic review draws together the fragmented literature on prevalence, correlates and reasons for suicide and self-harm in Malaysia. The principal findings were that (a) the suicide rate in Malaysia is approximately 6–8 suicides per 100,000 per year; (b) suicide and self-harm are associated with being younger than 40, being male and being from the Indian ethnic group; and (c) there seem to be emerging trends in the means of suicide and self-harm

Table 2
Characteristics of studies.

Study	Data collection period	*N*	Gender		Age group
			Male	Female	
Suicide					
Teoh [21]					
Maniam [23,38]	Oct 1973–Sep 1984	100	61.1%	38.9%	<30
Nadesan [28]	Aug 1995–Jul 1998	114	51.2%	48.8%	21–40
Hayati et al. [22]	Jan 1999–Dec 1999	76	72.4%	27.6%	21–30
Bhupinder & Kumara [27]	1995–2004	635	70.0%	30.0%	15–34
Teo et al. [32]	Jan 2001–Dec 2005	43	81.0%	19.0%	31–40
Murty et al. [59]	2000–2004	251	65.0%	35.0%	21–30
NSRM [5]	2008	290	75.5%	24.5%	20–29
Bhupinder et al. [39]	2007–2009	138	75.0%	25.0%	40–44
Ali et al. [24]	Jan 2009–Dec 2009	328	68%	32%	14–94
Self-harm					
Simons & Sarbadhikary [60]	Jun 1967–Jan 1969	94	38.0%	62.0%	20–24
Murugesan & Yeoh [42]	Jan 1977–Nov 1977	96	25.0%	75.0%	15–24
Haq & Buhrich [36]	1976	140	26.0%	74.0%	15–31
Yeoh [37]	1981	74	35.0%	65.0%	16–25
Orr & Pu [29,43]	1982	271	22.1%	77.9%	20–29
Maniam [23,38]	Oct 1973–Sep 1984	134	39.6%	60.4%	<30
Habil et al. [30]	1989	306	33.4%	66.6%	20–39
Zuirada [44]	n/r	60	13%	87%	14–65
Chee et al. [31]	1999–2001	137	33.6%	66.4%	16–20
Fathelrahman et al. [61]	Sep 2003–Feb 2004	100	30.0%	70.0%	20–29
Zain [40]	Jan 1967–Dec 1987	41	28.5%	71.5%	16–30
Sorketti & Zuraida [62]	Jan 2000–Feb 2004	77	26.0%	74.0%	n/r
Zuirada [34]	n/r	51	31.0%	69.0%	n/r
Teo et al. [32]	Jan 2001–Dec 2005	189	28.0%	72.0%	14–30
Fathelrahman et al. [35]	2000–2004	320	29.7%	70.3%	<45
Sinniah et al. [58]	1995–2005	n/r	n/r	n/r	n/r
Kannan et al. [33]	Dec 2006–Apr 2007	42	7.1%	92.9%	21–40
Zyoud et al. [63]	Jan 2006–Dec 2008	177	15.8%	84.2%	20–30
Hamidin & Maniam [41]	2004	50	22.0%	78.0%	17–53
Khan et al. [64]	Jan 2002–Dec 2007	298	57.0%	43.0%	15–84
Chan et al. [65]	May 2007–Oct 2008	75	44.0%	56.0%	18–76
Chan et al. [49]	2008–2009	6786	47.5%	52.5%	17–18
Jeon et al. [45]	2008–2011	547	35.6%	64.4%	18–65
Maniam et al. [25]	2006	20,552	45.9%	54.1%	<16
Yee et al. [48]	Mar 2009–Sept 2010	121	50.4%	49.6%	<18
Ahmad et al. [26]	Feb 2012–Apr 2012	25 174	49.6%	50.4%	12–17
Lim et al. [46]	2008–2011	547	35.6%	64.4%	18–65
Maniam et al. [12]	2011	19309	n/r	n/r	<16
Rani et al. [47]	Feb 2013–Aug 2013	160	51.3%	48.7%	<14

n/r = not reported.

that might be related to the move from a rural to an industrial economy. The following discussion focuses on the conceptual and practical issues that have emerged.

The estimated rates of completed suicides reflect the trend across the majority of studies included in this review. It is worth noting that this rate was substantially higher compared to the equivalent rates reported by the National Suicide Registry Malaysia (6–8 as opposed to 1.2 suicides per 100,000, respectively). However, the National Suicide Registry Malaysia has a serious limitation that potentially explains these inconsistent findings. It relies on medically certified suicides, yet approximately 50% of all deaths in Malaysia are not medically certified [23,24]. Thus, the National Suicide Registry Malaysia fails to account for a large proportion of completed suicides due to the low rates of medical certification of deaths in Malaysia. Moreover, even the suicide rate reported in the present study would rank Malaysia lower than most other countries for whom the World Health Organization have data including neighboring countries such as India, China and Australia [50]. Furthermore, we believe that the suicide rate may be an underestimate based on four rationales [13]. First, patients treated at private clinics or private hospitals are not included in the figures [51]. Second, people who make a suicide attempt or who harm themselves do not always seek medical attention. Third, the data may also represent an underestimate due to the classification of potential cases of suicide as "violent death from undetermined cause" [23]. This is particularly important in a country with a Muslim majority for whom attempted suicide is a serious breach of the faith [29]. Fourth, the Muslim faith requires that bodies are buried within 24 h, which means that the police may have to release the body without postmortem examination.

Nevertheless, the present pattern of findings corroborates those found in neighboring (e.g., India, China and Australia) and other developing countries, with a higher suicide rate among men than women (with the exemption of China in which suicide rates for women are higher) [6–10] and a higher suicide rate among the young [11]. Thus, the present findings concur with the broader picture of suicide and self-harm among nations described as economically "developing."

Concurrently, though, there was an overrepresentation of Indians among those who died by suicide and who engaged in self-harm in Malaysia, which is worthy of further investigation [13]. This finding might be mediated by religious and sociocultural factors. For example, given that Indians in Malaysia are largely Hindu, it is plausible that this overrepresentation might be partly explained by the fact that the Hindu religion has traditionally sanctioned certain forms of suicide [13,15,25].

Table 3
Risk factors for suicide and self-harm.

Study	Aims	Methodology	Respondent details	Findings
Simons & Sarbadhikary [60]	The demographic, psychosocial and hospitalization-related factors of suicide attempters.	Retrospective. Medical records of patients admitted to the University of Malaya Medical Centre Psychiatric Unit from June 1967 to January 1969 were examined.	94 admissions. Malay (14%), Chinese (52%), Indian (23%). male (38%), female (62%). Mean age 27.8, median 24.	More often female. English educated. Had completed some education but not form VI or had technical education only. Diagnosed with behavior disorder or neurosis. Readmitted more often than other patients.
Murugesan & Yeoh [42]	To describe the characteristics of those who attempted suicide.	Prospective. Cases of attempted suicide admitted to Klang General Hospital from the period of 23rd January to 13th November 1977 were interviewed.	96 attempts, with Indians contributing 66% of the total cases. Female cases are 3 times more frequent than male. Age group of 15 to 24 years.	Being younger, female, of single status and from the lower socioeconomic classes were among the factors identified.
Orr &Pu [29]	Demographic characteristics of parasuicide cases.	Descriptive. Cases of attempted suicide seen at the Psychiatric Clinic, General Hospital, Kuala Lumpur in 1982.	271 cases recorded.	Age group of 20 to 30 years. From a lower socioeconomic class. Minimal education, Indian ethnic group. Self-poisoning was the common method used (92.6%). One half intended to die at the time of the suicide.
Habil et al. [30]	Sociodemographic data on attempted suicide and methods used among attempted suicides in Kuala Lumpur.	Prospective. Cases of attempted suicide admitted to the University Hospital in 1989 were interviewed.	A total of 296 patients identified, with 197 females and 99 males.	Indians predominated, especially common in young persons and females. Majority of cases were below 39 years (84.1%) from low socioeconomic groups. Highest among unmarried (49%). Having interpersonal relationship problems.
Nadesan (1999)	To determine pattern of suicide.	Retrospective. All autopsies conducted at the Department of Pathology, University Hospital of Kuala Lumpur over the 3-year period from 1 August 1995 to 31 July 1998 were reviewed.	A total of 84 cases of suicides, comprising 39 females and 45 males, were studied.	Indians constituted 48.8% of all cases. Age group of 21 to 40 years.
Chee et al. [31]	Demographic characteristics of patients admitted with deliberate self-harm to Sarawak General Hospital.	Prospective and retrospective. Cases of deliberate self-harm admitted to Sarawak General Hospital from January to December 2001 were interviewed, and case notes of patients admitted in 1999 and 2000 were reviewed.	137 cases admitted in 2001, 111 and 82 in 1999 and 2000, respectively.	More females, with a ratio of 2:1. Dominant among Chinese. Young age: less than 30 years old.
Bhupinder& Kumara [27]	Demographic characteristics of completed suicides in Penang Hospital for the period 1995 to 2004.	Retrospective. Data from post mortem records in the Department of Forensic Medicine, Penang General Hospital (PGH) were analyzed.	A total of 635 cases were analyzed.	Common among males (70%). Age group 15–34 years. Chinese contributed the most (55%).
Fathelrahman et al. [61]	Risk factors associated with adult admissions to PGH due to chemical poisoning and/or drug overdose.	A case–control study. Cases of chemical poisoning or drug overdose admitted to the Accident & Emergency Department from September 2003 to February 2004 were matched to control other illness admissions samples.	100 cases identified. 14.5–84 years old. Chinese (34%) Indian (34%) Malay (28%) Other (4%)	Chinese & Indian. Self-employed & those working in private sectors. Living in rental house. Higher total family income. Boy/girlfriend relationships problems, marital problems & family problems. Previous histories of psychiatric, parasuicides, self-harm or self-poisoning.
Teo et al. [32]	To determine the pattern of parasuicide and suicide.	Retrospective. Cases of parasuicide admissions and suicide cases in Hospital Sungai Bakap from January 2001 to December 2005 were reviewed.	A total of 189 cases of parasuicide and 43 suicide cases were analyzed.	72% of the parasuicide cases were female, with Indians constituting 64% of the total cases, and the age group of 18–30 years predominant. Suicide cases were associated with being male and Chinese, the peaks being in the age groups of 31–40 years and above 60 years.
Murty et al. [59]	Suicide and ethnicity in the University Malaya Medical Center.	Retrospective. The autopsy records over a 5-year period from January 2000 to December 2004 were examined.	A total of 251 suicide cases reported, 164 (65%) male and 87 (35%) female.	Age group of 21 to 30. Chinese ethnic group had the highest representation (47.8%).

National Suicide Registry Malaysia [5]	To capture data on completed suicides.	Retrospective. Data were collected via interviews with family members, significant others or police and review of medical report or other official documents.	Data collected across the 11 states, on 290 cases.	In contrast with studies in the West, risk factors for suicide in Malaysia do not include history of previous attempt, family history of suicide or history of mental illness. But there is an association between suicide and history of physical illness, substance use and life events prior to suicide.
Zyoud et al. [63]	To determine the risk factors and life stressors that are prevalent among the acetaminophen deliberate self-poisoning	Cross-sectional. Data were collected from hospital admissions over a 3-year period from 1 January 2006 to 31 December 2008 for the primary diagnosis of acetaminophen overdose.	177 incidences of deliberate self-poisoning, 149 female and 28 male.	The risk factors were more significantly associated with males and direct association between chronic alcohol intake and suicidal behavior.
Chan et al. [65]	To describe the interactions of clinical and psychosocial risk factors influencing suicide attempts in depressed patients.	Cross-sectional. Psychiatric inpatients aged 18–76 years, treated for depressive disorder from May 2007 to October 2008, were recruited.	75 inpatients with depressive disorders (56% female and 44% male).	The independent predictors were Chinese race, being a newly diagnosed case of a depressive disorder, religion, recent life-event changes, suicidal ideation and alcohol use disorder.
Khan et al. [64]	To highlight the factors associated with suicidal behavior among patients with depressive disorders.	Retrospective. All registered patients' medical records from January 2002 to December 2007 at the Psychiatric Outpatient Department were reviewed.	A total of 298 cases that had a confirmed diagnosis of depression were included. 99 patients reported having suicidal thoughts.	Chinese females were found at higher risk of suicidal ideation, as were smokers and alcohol users, those aged 50 and over, adolescents and youths aged 15–24 years. Evaluation of the patients' medical records highlighted four possible risk factors for suicidal ideation: comorbid medical complications, social problems, smoking and alcohol use.
Zuirada [44]	To examine social support and its association with demographics and psychiatric diagnoses among suicide attempters	Cross-sectional. Conducted among suicide attempters admitted in the University Malaya Medical Centre.	60 patients who had attempted suicide and were consecutively admitted to the University Malaya Medical Centre	The vast majority of suicide attempters were women (87%) and were more likely to be between 20 and 25 years old. Nearly half of suicide attempters were Indians and were more likely to be Hindus. Among married women, 65% faced marital problems/discord which led them to attempt suicide. Women had less total social interaction score compared to the men.
Chan et al. [49]	To examine the association between sexual abuse, substance abuse and sociodemographic factors with suicidal ideation, plans and deliberate self-harm	Cross-sectional. Malaysian high-school leavers aged 17–18 years who were randomly selected from a national computerized database	A total of 6786 adolescents in 9 camps in Selangor.	Female gender, history of sexual abuse and illicit drugs were associated with suicidal ideation, suicidal plans and deliberate self-harm. Alcohol was associated with deliberate self-harm.
Jeon et al. [45]	To investigate the link between melancholic features and suicidal behavior in Asian patients with major depressive disorder (MDD)	Multinational cross-sectional. Thirteen study sites were established across 6 Asian countries, including China, Korea, Malaysia, Singapore, Taiwan, and Thailand.	A total of 547 outpatients with MDD participated in the study.	Melancholic features and hostility were positively associated with moderate to high suicidality risk in MDD patients. Ethnicity had a significant impact on the results: suicidal risk was higher in Koreans and Chinese compared to Thai, Indian and Malaysia.
Maniam et al. [25]	To identify high-risk groups for a focused suicide prevention program in Malaysia	Cross-sectional. A nationally representative sample of adults aged 16 years and above identified as part of a national epidemiological survey of morbidity conducted in 2006	A total of was 20,552 participants stratified by random sampling from the sampling frame provided by the Department of Statistics Malaysia.	Indians (particularly Hindus) and Chinese reported were at higher risk for suicidal ideation. Other predictors of suicidal ideation were being single and having depression, social dysfunction and anxiety.
Yee et al. [48]	To determine the prevalence of alcohol-use disorder and associated correlates among bipolar patients in a university hospital in Malaysia	Cross-sectional. All patients who attended the psychiatric unit (outpatient and inpatient) in a teaching hospital in Kuala Lumpur, Malaysia	130 bipolar inpatients and outpatients of a psychiatric unit recruited by universal sampling	Bipolar patients with alcohol use disorder were significantly more likely to report suicide attempts compared to bipolar patients without alcohol use disorder.
Ahmad et al. [26]	To identify the risk and protective factors associated with suicidal ideation among Malaysian adolescents	Cross-sectional using data from the 2012 Malaysia GSHS.	25,174 adolescents were randomly selected from 234 government secondary schools in Malaysia	Suicidal ideation was positively associated with depression, anxiety, stress, substance use, being bullied and being abused at home, either physically or verbally. Suicidal ideation was significantly higher among females and among the Indians and Chinese. Having close friends and having married parents were strongly protective against suicidal ideation.

(continued on next page)

Table 3 *(continued)*

Study	Aims	Methodology	Respondent details	Findings
Ali et al. [24]	To estimate the prevalence and predictors of completed suicides in Malaysia	Retrospective. Analysis of National Suicide Registry of Malaysia from January 2009 to December 2009.	n/r	Suicide cases were likely to be men than women(2.9:1). Indians had the highest suicide rate of 3.67 per 100,000.
Lim et al. [46]	To evaluate the factors associated with suicidality in patients with MDD from 6 Asian countries including China, Malaysia, Singapore, South Korea, Thailand and Taiwan.	Cross-sectional multinational. Study sites in 6 studies were used including China, Malaysia, Singapore, South Korea, Thailand and Taiwan.	547 outpatients with MDD among which 90 were from Malaysia (n= 90) recruited from clinical sites in each country.	Patients with MMD from Malaysia were the least likely to be classified as being at high risk for suicidality (8.9%) compared to all other countries (ranging from 10.7% in Thailand to 42.6% in South Korea).
Maniam et al. [12]	To determine the prevalence of suicidal behavior (ideation, plans and attempts) and its correlates in a nationally representative sample of Malays.	Cross-sectional. A nationally representative sample of adults aged 16 years and above identified as part of a national epidemiological survey of morbidity conducted in 2011	A total of was 19,309 participants stratified by random sampling from the sampling frame provided by the Department of Statistics Malaysia.	Younger people (16–24 years) and Indians had higher risk for suicidal ideation, plans and attempts. Women also reported higher rates of suicidal ideation compared to men. MDD, generalized anxiety disorder and alcoholism were associated with increased risk for suicidal behavior.
Rani et al. [47]	To ascertain the prevalence of suicidal ideation in epilepsy patients.	Case–control. The study was conducted in the UKM Medical Centre, a tertiary teaching hospital in Kuala Lumpur, Malaysia, from February to August 2013.	80 epilepsy patients and 80 controls aged over 14 years.	Epilepsy patients were 9.68 times more likely to have suicidal ideation compared to controls) (33.75% vs. 5%).

n/r = not reported.

In addition, an increased rate of suicide has been evidenced in Indian women, which has been mainly attributed to the common practice of arranged marriages, the pressure to sustain abusive marriages and dowry demands [52]. Such stressors may contribute to feelings of entrapment which are established correlates of suicide risk in developed countries [53]. Evidence for the sociocultural factors (such as poor status of Indian women in Malaysia) that might underlie the heightened suicide and self-harm rates in Indian ethic groups of Malaysia is absent [13]. Thus, further research into causes of differences between ethnic groups in the underpinnings of suicide and self-harm is required in Malaysia.

Suicidal behavior in Malaysia is associated with interpersonal problems. This finding is consistent with the extant literature that suggests that interpersonal conflict is a strong generic predictor of suicide. A review of the psychological autopsy studies found that interpersonal conflict affected the risk for suicide in a dose–response manner [54]. Additionally, a study conducted among an isolated Asian indigenous population also found that interpersonal conflict is an important risk factor for suicide [55]. On these grounds, a valuable direction for future research would be to focus on designing and delivering suicide prevention programs tailored to resolve interpersonal conflict. Alternatively, the finding that interpersonal conflict is an important risk factor for suicide may be explained in the context of the numerous societal changes driven by the country's aspiration to become a developed country by the year 2020. Urbanization has led people into a state of "anomie," which Durkheim [56] refers to as the situation where the accustomed relationship between an individual and their society is suddenly shattered. It would be valuable to monitor trends in suicide and self-harm and to investigate the possible link between increasing urbanization and suicidal behavior.

Self-poisoning was the most common method of suicide and self-harm used by Malaysians. In developed countries, the drugs with which people choose to overdose are relatively nontoxic drugs such as analgesics, tranquilizers and antidepressants [14]. The present research showed that the substances most commonly used for self-poisoning were the more readily available agricultural poisons (e.g., insecticide, weedicide), which again is consistent with findings from other emerging economies, such as India [15]. In terms of methods used by different ethnic groups, hanging has been reported to be the method most frequently employed by the Chinese, jumping by the Malays and poisoning by the Indians, among the Kuala Lumpur population [22]. Yeoh [37] observed that the use of insecticide and weedicide poisoning was predominant among the Indians. The high frequency of self-poisoning among those from the Indian minority can at least partly be attributed to the fact that Indians are frequently employed on rubber plantations, where arsenic and formic acid are readily available [36].

This review was conducted and reported according to PRISMA guidelines [16], but a number of limitations should be considered while interpreting the current findings. First, the heterogeneity of the studies included in the review was large. We endeavored to account for this limitation by undertaking a narrative synthesis (as opposed to meta-analysis which requires more homogenous outcomes) that focused not only on the prevalence of suicide and self-harm but also on demographic correlates, risk and protective factors and methods and motives of suicide and self-harm. Second, gray literature was excluded from this review. While this decision may have introduced study selection bias, it was made on the basis of evidence suggesting that the quality of research contained in the gray literature is lower or more difficult to appraise in contrast with research contained in journal articles [57]. Therefore, we are confident that our comprehensive searches have captured all highest-quality empirical studies examining completed suicides and self-harm in Malaysia and that the present systematic review is a valid summary of the literature in this research area. A third

Table 4
Means of suicide and self-harm.

Study	Aims	Methodology	Respondent details	Findings
Murugesan & Yeoh [42]	To describe the characteristics of those who attempted suicide.	Prospective. Cases of attempted suicide admitted to Klang General Hospital from the period of 23rd January to 13th November 1977 were interviewed.	96 attempts. Age group of 15 to 24 years.	99% reported self-poisoning, and the commonest agent used was insecticide.
Haq & Buhrich [36]	To determine the reasons and methods chosen for the suicide attempt.	Prospective. Cases of parasuicides admitted to Psychiatry Department in the year 1976.	140 cases identified.	Self-poisoners (86%) are admitted relatively more frequently than patients with self-inflicted injuries and are more common among the Indians.
Yeon [45]	To describe the characteristics of those who attempted suicide in PGH.	Prospective. Patients admitted to the hospital with suspected or confirmed suicidal attempts interviewed within 48 h of their admission.	74 patients identified.	Self-poisoning was the commonest method used (65%), followed by hanging, wrist or neck slashing, stabbing and jumping from heights.
Maniam [23,38]	Demographic characteristics, reasons for and methods used for suicide and parasuicide in a Hill Resort in Malaysia.	Retrospective. Data for suicide were taken from the Register of Suicides and Parasuicides in Cameron Highlands Hospital and the Police Register of Sudden Deaths.	95 cases of suicide and 134 of parasuicide that occurred between October 1973 and September 1984 were identified.	About 94% of suicides and 66% of parasuicides were by ingestion of agricultural poisons.
Habil et al. [30]	Sociodemographic data of attempted suicide and methods used for attempted suicide in Kuala Lumpur.	Prospective. Cases of attempted suicide admitted to the University Hospital in 1989 were interviewed.	197 females, 99 males.	Self-poisoning, either with prescribed drugs or with other chemical agents, was the method most commonly used (86%).
Hayati et al. [22]	Investigate the pattern of completed suicides seen in Kuala Lumpur General Hospital.	Retrospective. Postmortem cases by the Forensic Department from 1st January until 31st December 1999 were screened.	Of the 1249 cases, 76 cases were identified as suicide cases.	The most popular method was poisoning (39%), followed by hanging (34%) and jumping from heights (22%).
Fathelrahman et al. [35]	Factors associated with deliberate self-poisoning.	Prospective. Deliberate self-poisoning cases admitted to PGH during the years 2002–2004 were studied.	A total of 320 cases of self-poisoning recorded.	Indian patients were more likely to use household products (47.9%), whereas Malay (22.2%) and Chinese (48.5%) patients were more likely to take drug overdoses.
Murty et al. [59]	Rates of suicide in the University of Malaya Medical Center.	Retrospective. The autopsy records over a 5-year period from January 2000 to December 2004 were examined.	A total of 251 suicide cases reported.	Hanging accounted for the highest proportion of cases (43%). Jumping was the commonest method used by the Chinese (49/120; 41%), and hanging was the commonest method among the Indians (49/87; 7.2%).
National Suicide Registry Malaysia [5]	To capture data on completed suicides.	Retrospective. Data were collected via interviews with family members, significant others or police and review of medical reports or other official documents.	Data collected in 11 states were 290 cases.	The most preferred method was hanging (56.6%), exposure to pesticide (13.4%) and jumping from high places (11.4%).
Fathelrahman et al. [35]	Risk factors associated with adult admissions to PGH due to chemical poisoning and/or drug overdose.	A case–control study. Cases of chemical poisoning or drug overdose admitted to the Accident & Emergency Department from September 2003 to February 2004 were matched to control other illness admissions samples.	100 cases identified. 14.5–84 years old.	Ingestion involving drugs found in poisoning (62%), household products (26%) and pesticides (6%). The most frequently implicated agents were paracetamol (21%), benzodiazepines (10%) and Clorox (10%).
Bhupinder et al. [39]	Investigation on methods used for completed suicides.	Prospective cohort study. Suicide deaths on autopsy database from 2007 to 2009 were analyzed according to the methods used, age groups, ethnicity, nationality, day and month of suicides and location of suicides.	138 suicidal deaths. The age groups of 35–39, 40–44 and 55–59 were at high risk.	The common methods were jumping from heights (47.1%), followed by hanging (34.1%) and drowning (10.9%).

limitation is that the majority of the studies included in this review have been conducted in urban settings. Although this is an inherent limitation of the literature on suicide and self-harm in Malaysia, the present findings, particularly concerning the rates of completed suicides and self-harm, might not generalize to rural settings. Fourth, the methodological quality of the included studies was low. Despite this, we observed no differences in the pattern of findings across studies with higher and studies with lower overall ratings of methodological quality. Future studies using sound methodologies are encouraged to compare the rates and correlates of completed suicides and self-harm in urban and rural settings of Malaysia.

In sum, this systematic review is the starting point for further research into suicide and self-harm in Malaysia specifically and Asia more broadly. More extensive studies need to be conducted using both clinical and nonclinical samples to establish more accurate estimates of suicidal behavior.

Table 5
Reasons for suicide and self-harm.

Study	Aims	Methodology	Respondent details	Findings
Murugesan & Yeoh [42]	To describe the characteristics of those who attempted suicide.	Prospective. Cases of attempted suicide admitted to Klang General Hospital were interviewed.	96 attempts. Age group of 15 to 24 years.	The most frequently expressed reason was chronic domestic strife and love affairs.
Haq & Buhrich [36]	To identify ethnic differences between races and determine the reasons and methods chosen for the suicide attempt.	Prospective. Cases of parasuicides admitted to Psychiatry Department in the year 1976.	140 cases identified. Married (38%), Never married (56%), Low income (81%),	70% of single females gave the primary reason of having been jilted. Others were having marital problems (25%), were having family problems (16%) and were psychotic (13%).
Yeoh [37]	To describe the characteristics of those who attempted suicide in PGH.	Prospective. Patients admitted to the hospital with suspected or confirmed suicide attempts interviewed within 48 h of their admission.	74 patients identified, 48 females and 26 males. Age group of 16 to 25	Conflict with elders, health reasons, marital conflict and love disappointment were among the reasons recorded.
Orr [29]	Examine the primary reasons for attempted suicide.	Prospective. Data were compiled from a questionnaire filled out by the author during patient assessment.	271 patients recorded.	The primary reasons given by single patients were family problems (34.8%) and love problems (30.4%), while among the married patients, marital problems contributed the most (55.1%).
Maniam [38]	Demographic characteristics, reasons for and methods used for suicide and parasuicide in a Hill Resort in Malaysia.	Retrospective. Data for suicide were taken from the Register in Cameron Highlands Hospital and the Police Register of Sudden Deaths.	Ninety-five cases of suicide that occurred were Indians. Age group of 20–24 years.	Marital quarrels or other family conflicts constituted the most common factors in suicides (21/48; 43.8%) and 67.1% (64/95) for parasuicides. Love problems constituted the next most common factor in both.
Zain [40]	To compare inpatient suicides at two hospitals.	Retrospective. Suicide cases occurring in hospital identified from the register at hospitals' medical record offices in UHKL and HBUK.	18 and 23 cases identified in the 2 hospitals, respectively. Mainly young Chinese males from the lower social economic group.	Major interpersonal problems and physical illness were the main reasons recorded.
Hamidin & Maniam [41]	To compare the prevalence of life events among parasuicide patients.	Case–control. A convenient sampling method was conducted in Hospital Kuala Lumpur for a period of 3½ months.	50 patients admitted after an episode of parasuicide.	A significant excess of interpersonal problems (94%) that included serious problems with a close friend, neighbor/relative, breakup of a steady relationship and separation due to marital difficulties.

Appendix A

References included in the review.

Ahmad, N., Cheong, S. M., Ibrahim, N., & Rosman, A. (2014). Suicidal ideation among Malaysian adolescents. *Asia Pac J Public Health*, *26*, 63S-9S.

Ali, N. H., Zainun, K. A., Bahar, N., Haniff, J., Hamid, A. M., Bujang, M. A. H., Mahmood, M. S., & Grp, N. S. (2014). Pattern of suicides in 2009: data from the National Suicide Registry Malaysia. *Asia-Pacific Psychiatry*, *6*, 217–25.

Bhupinder, S., Kumara, T. K., & Syed, A. M. (2010). Completed suicides in the district of TimurLaut, Penang Island — a preliminary investigation of 3 years' (2007–2009) prospective data. *Medical Journal of Malaysia*, *65*, 123–126.

Bhupinder, S., & Kumara, T. (2006). A ten-year retrospective study of completed suicides in Penang Hospital for the period 1995–2004. *The Malaysian Journal of Forensic Pathology and Science*, *1*, 98–109.

Chan, L. F., Maniam, T., & Shamsul, A. S. (2011), Suicide attempts among depressed in-patients with depressive disorders in a Malaysian sample: psychosocial and clinical risk factors. *Crisis*, *32*, 283–287.

Chan, L. F., Maniam, T., Saini, S. M., Shah, S. A., Loh, S. F., Sinniah, A., Idris, Z. H., Rus, S. C., Nudin, S. S. a. H., & Tan, S. M. K. (2013). Sexual abuse and substance abuse increase risk of suicidal behavior in Malaysian youth. *Asia-Pacific Psychiatry*, *5*, 123–26.

Chee, K. Y., Alias, N. M., & Taha, A. B. (2003). Deliberate self-harm at Sarawak general hospital. *International Medical Journal*, *10*, 277–82.

Fathelrahman, A. I., Ab Rahman, A. F., Mohd Zain, Z., & Tengku, M. A. (2006). Factors associated with adult poisoning in northern Malaysia: a case–control study. *Human and Experimental Toxicology*, *25*, 167–173.

Fathelrahman, A. I., AbRahman, A. F., Pharm, D., & MohdZain, Z. (2008). Self-poisoning by drugs and chemicals: variations in demographics, associated factors and final outcomes. *General Hospital Psychiatry*, *30*, 467–470.

Habil, M. H., Ganesvaran, T., & Agnes, L. S. (1992). Attempted suicide in Kuala Lumpur. Asia Pacific Journal of Public Health, 6, 5–7.

Hamidin, A., & Maniam, T. (2011). Life events and parasuicides in Hospital Kuala Lumpur, Malaysia. *Malaysian Journal of Medicine and Health Sciences*, *7*, 45–52.

Haq, S. M., & Buhrich, N. (1980). Parasuicides and their determinants in a multiracial society. Singapore Medical Journal, *21*,648-651.

Hayati, A. N., Salina, A. A., Abdullah, A. A., Eusni, R. T., & Mansar, A. H. (2004). The pattern of completed suicides seen in Kuala Lumpur General Hospital 1999. *Medical Journal of Malaysia*, *59*,190-198.

Jeon, H. J., Peng, D., Chua, H. C., Srisurapanont, M., Fava, M., Bae, J.-N., Chang, S. M., & Hong, J. P. (2013). Melancholic features and hostility are associated with suicidality risk in Asian patients with major depressive disorder. *Journal of Affective Disorders*, *148*, 368–74.

Kannan, K., Pillai, S. K., Gill, J. S., Hui, K. O., & Swami, V. (2010). Religious beliefs, coping skills and responsibility to family as factors

protecting against deliberate self-harm. *South African Journal of Psychiatry*, *16*, 138–146.

Khan, T. M., Sulaiman, S. A. S., & Hassali, M. A. (2012). Factors associated with suicidal behavior among depressed patients in Penang, Malaysia. *Archives of Science*, *8*, 697–703.

Lim, A. Y., Lee, A. R., Hatim, A., Tian-Mei, S., Liu, C. Y., Jeon, H. J., Udomratn, P., Bautista, D., Chan, E., Liu, S. I., Chua, H. C., Hong, J. P., & Md, R. A. N. (2014). Clinical and sociodemographic correlates of suicidality in patients with major depressive disorder from six Asian countries. *BMC Psychiatry*, *14*, 37.

Maniam, T. (1988). Suicide and parasuicide in a hill resort in Malaysia. *British Journal of Psychiatry*, *153*, 222–225.

Maniam, T. (1995). Suicide and undetermined violent death in Malaysia, 1966–1990. Evidence for the misclassification of suicide statistics. *Asia Pacific Journal of Public Health*, *8*, 181–185.

Maniam, T., Chinna, K., Lim, C. H., Kadir, A. B., Nurashikin, I., Salina, A. A., & Mariapun, J. (2013). Suicide prevention program for at-risk groups: pointers from an epidemiological study. *Preventive Medicine*, *57*, S45-S46.

Maniam, T., Marhani, M., Firdaus, M., Kadir, A. B., Mazni, M. J., Azizul, A., Salina, A. A., Fadzillah, A. R., Nurashikin, I., Ang, K. T., Jasvindar, K., & Noor Ani, A. (2014). Risk factors for suicidal ideation, plans and attempts in Malaysia — results of an epidemiological survey. *Compr Psychiatry*, *55 Suppl 1*, S121-5.

Murty, O. P., Cheh, L. B., Bakit, P. A., Hui, F. J., Ibrahim, Z., & Jusoh, N. (2008). Suicide and ethnicity in Malaysia. *The American Journal of Forensic Medicine and Pathology*, *29*, 19–22.

Murugesan, G., & Yeoh, O. H. (1978). Demographic and psychiatric aspects of attempted suicides — ninety-six attempts. *Medical Journal of Malaysia*, *33*, 102–112.

Nadesan, K. (1999). Patterns of suicide: a review of autopsies conducted at the University Hospital, Kuala Lumpur. *Malaysian Journal of Pathology*, *21*, 95–99.

National Suicide Registry Malaysia (2009). National Suicide Registry Malaysia (NSRM) annual report for 2008. Kuala Lumpur, Malaysia.

Orr, J. W. (1985). Parasuicides in Kuala Lumpur: reasons for the attempt. *Singapore Medical Journal*, *26*, 253–258.

Orr, J. W., & Pu, T. N. (1985). Parasuicides in Kuala Lumpur: a descriptive study. *Singapore Medical Journal*, *26*,161-170.

Rani, R. A., Razali, R., Hod, R., Mohamad, K., Rani, S. A. M., Yahya, W. N. N. W., Sahathevan, R., Remli, R., Law, Z. K., Ibrahim, N. M., & Tan, H. J. (2014). Suicidal ideation amongst epilepsy patients in a tertiary centre. *Neurology Asia*, *19*, 129–36.

Simons, R., & Sarbadhikary, D. (1972). Suicide attempters admitted to the University of Malaya medical center psychiatric unit. *International Journal of Social Psychiatry*, *18*, 97–103.

Sinniah, A., Maniam, T., & Scott, V. (2009). Report on the changes in the trend of suicidal behaviour in Cameron Highlands Malaysia. *ASEAN Journal of Psychiatry*, *10*, 1–3.

Sorketti, E. A., & Zuraida, N. Z. (2007). Motives and psychosocial stressors in parasuicides: comparison of self-poisoners and self-cutters. *Malaysian Journal of Psychiatry*, *16*, 36–40.

Teo, G. S., Teh, T. L., & Lim, J. H. (2008). Parasuicide and suicide: demographic features and changing trend among cases in Hospital Sungai Bakap 2001–2005. *Malaysian Journal of Psychiatry EJournal*, *17*, 3–12.

Teoh, J. (1974). An analysis of completed suicides by psychological post-mortem. *Annals of the Academy of Medicine*, *3*, 117–123.

Yee, H. A., Loh, H. S., & Ng, C. G. (2013). The prevalence and correlates of alcohol use disorder amongst bipolar patients in a hospital setting, Malaysia. *International Journal of Psychiatry in Clinical Practice*, *17*, 292–97.

Yeoh, O. H. (1981). Attempted suicides in Penang — preliminary observations. *Medical Journal of Malaysia*, *36*, 39–46.

Zain, A. M. (1991). Profile of in-patient suicides in two hospitals in Malaysia. *Medical Journal of Malaysia*, *46*,171-76.

Zuraida, N. Z. (2000). A study of social network of suicide attempters in University Malaya Medical Centre, Kuala Lumpur. *Malaysian Journal of Psychiatry September*, *8*, 3–10.

Zuraida, N. Z., & Ahmad, H. S. (2007). Religiosity and suicide ideation in clinically depressed patients. *Malaysian Journal of Psychiatry*, *16*, 12–15.

Zyoud, S. H., Awang, R., Sulaiman, S. A. S., & Al-Jabi, S. W. (2010). A cross-sectional observation of the factors associated with deliberate self-poisoning with acetaminophen: impact of gender differences and psychiatric intervention. *Human Psychopharmacology: Clinical and Experimental Journal*, *25*, 500–508.

Appendix B

Table A1
Quality assessment of studies included in the review.

Author and year	Research design?	Response rate higher than 70%?	Control for confounders in the analyses?	Objective and reliable measure of completed suicides and self-harm?	Overall quality score
Ahmad 2014	Cross-sectional=0	Yes=1	Yes=1	Questionnaire developed for the purposes of the study=0	2
Ali 2014	Retrospective=1	Yes=1	No=0	Review of autopsy records/interviews with family members=1	3
Bhupinder 2010	Prospective =1	Yes=1	No=0	Based on data from the Death Registry System=1	3
Bhupinder 2006	Retrospective=1	Yes=1	No=0	Based on data from the Death Registry System=1	3
Chan 2013	Cross-sectional=0	Yes=1	Yes=1	Questionnaire developed for the purposes of the study=0	2
Chan 2011	Cross-sectional=0	Yes=1	Yes=1	Scale for Suicidal Ideation (SSI)=1	3
Chee 2003	Prospective/retrospective=1	Yes=1	No=0	Hospital admission for self-harm=1	3
Fatherlahman 2006	Case–control study=1	No=0	Yes=1	Hospital admission for drug/food poisoning =0 (accidental was not completely excluded)	2
Fatherlahman 2008	Prospective/retrospective cohort=1	Yes=1	Yes=1	Deliberate self-poison with a drug overdose or chemical poison confirmed by psychiatric assessment =1	4
Habil 1992	Cross-sectional=0	n/r=0	No=0	Hospital admission for self-harm (no more details)=0	0
Hamidin 2011	Case–control=1	Yes=1	No=0	Hospital admission for parasuicide based on clinical assessments=1	3
Haq 1980	Prospective=1	Yes=1	No=0	Hospital admission for parasuicide based on psychiatric assessments=1	3
Hayati 2004	Retrospective=1	Yes=1	No=0	Diagnosis of a psychologist, psychiatric notes=1	3
Jeon 2013	Cross-sectional=0	Yes=1	Yes=1	MINI suicidality module=1	3
Kannan 2010	Cross-sectional=0	n/r=0	Yes=1	Hospital admission with an episode of self-harm (no more details)= 0	1
Khan 2012	Retrospective=1	Yes=1	Yes=1	Reviews of patient records (definitions of suicidal behaviors are provided)=1	4
Lim 2014	Cross-sectional=0	Yes=1	Yes=1	MINI suicidality module=1	3
Maniam 2013	Cross-sectional=0	n/r=0	Yes=1	General Health Questionnaire, GHQ-28=1	2
Maniam 2014	Cross-sectional=0	Yes=1	Yes=1	Items on suicidality from the WHO SUPRE-MISS questionnaire=1	3
Maniam 1995	Retrospective=1	Yes=1	No=0	WHO ICD classification criteria=1	3
Maniam 1988	Retrospective=1	Yes=1	No=0	Review of register (hospital and police but unclear process) data=0	2
Murti 2006	Retrospective=1	Yes=1	No=0	Review of autopsy records=1	3
Murugesan 1978	Prospective=1	Yes=1	No=0	Hospital records (unclear process=0	2
Nadesan 1999	Retrospective=1	Yes=1	No=0	Review of autopsy records=1	3
National Suicide Registry Malaysia	Retrospective=1	Yes=1	No=0	Review of autopsy records/interviews with family members=1	3
Orr 1985a	Prospective=1	No=0	No	Unclear classification of parasuicide=0	1
Orr 1985a	Prospective=1	No=0	No	Unclear classification of parasuicide=0	1
Rani 2014	Case control=1	n/r=0	Yes=0	Columbia Suicide Severity Rating Scale=1	2
Simons 1972	Retrospective=1	Yes=1	No=0	Review of medical records (no details about criteria)=0	2
Sinniah 2009	Retrospective=1	Yes=1	No=0	WHO ICD classification criteria=1	3
Sokreti 2007	Cross-sectional=0	Yes=1	No=0	Hospital admission for self-harm (additional interviews)=1	2
Teo 2008	Retrospective=1	Yes=1	No=0	Review of medical records (based on clinical diagnosis)=1	2
Teoh 1974	Retrospective=1	Yes=1	No=0	Review of medical records (based on clinical diagnosis)=1	2
Yee 2013	Cross-sectional=0	Yes=1	Yes=1	ASI-Lite − Clinical Factors=1	3
Yeoh 1981	Prospective=1	Yes=1	No=0	Hospital admission for self-harm (additional interviews)=1	3
Zain 1991	Retrospective=1	Yes=1	No=0	Records from two long-stay hospitals: post-modern register; medical records=1	3
Zuraida 2000	Cross-sectional=0	Yes=1	No=0	Hospital admission for suicide attempts (additional interviews)=1	2
Zuraida 2007	Cross-sectional=0	n/r=0	No=0	Scale for Suicide Ideation (SSI)=1	1
Zyoud 2010	Cross-sectional=0	Yes=1	No=0	Deliberate self-poisoning based on the psychiatrist assessment =1	2

n/r=not reported.

References

[1] Beautrais AL. Suicide in Asia. Crisis 2006;27:55–7.
[2] Yip PSF. Suicide in Asia: causes and prevention. Hong Kong: Hong Kong University Press; 2008.
[3] O'Connor RC, Platt S, Gordon J. Achievements and challenges in suicidology: conclusions and future directions. In: O'Connor RC, Platt S, Gordon J, editors. International handbook of suicide prevention: research, policy & practice. Chichester: Wiley; 2011.
[4] Ninth Malaysian plan. Kuala Lumpur: Percetakan Nasional Malaysia Berhad; 2006.
[5] NSRM. National Suicide Registry Malaysia (NSRM) annual report for 2008 Kuala Lumpur, Malaysia; 2009.
[6] Caldwell TM, Jorm AF, Dear KB. Suicide and mental health in rural, remote and metropolitan areas in Australia. Med J Aust 2004;181:S10–4.
[7] Kerkhof AJFM. Attempted suicide: patterns and trends. In: Hawton K, van Heeringen K, editors. International handbook of suicide and attempted suicide. Chichester, England: John Wiley & Sons Ltd; 2000. p. 49–64.
[8] Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, Lee S. Suicide and suicidal behavior. Epidemiol Rev 2008;30:133–54.
[9] Skogman K, Alsen M, Ojehagen A. Sex differences in risk factors for suicide after attempted suicide-a follow-up study of 1052 suicide attempters. Soc Psychiatry Psychiatr Epidemiol 2004;39:113–20.
[10] Suokas J, Suominen K, Isometsa E, Ostamo A, Lonnqvist J. Long-term risk factors for suicide mortality after attempted suicide — findings of a 14-year follow-up study. Acta Psychiatr Scand 2001;104:117–21.
[11] Vijayakumar L. Suicide prevention: the urgent need in developing countries. World Psychiatry 2004;3:158–9.
[12] Maniam T, Marhani M, Firdaus M, Kadir AB, Mazni MJ, Azizul A, et al. Risk factors for suicidal ideation, plans and attempts in Malaysia — results of an epidemiological survey. Compr Psychiatry 2014;55(Suppl. 1):S121–5.
[13] Armitage CJ, Abdul Rahim W, Rowe R, O'Connor RC. Trends in self-harm in Kuala Lumpur, 2005–2011. Arch Suicide Res in press 2014 [in press].
[14] Gunnell D, Eddleston M. Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. Int J Epidemiol 2003;32:902–9.
[15] Adityanjee DR. Suicide attempts and suicides in India: cross-cultural aspects. Int J Soc Psychiatry 1986;32:64–73.
[16] Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ 2009;339:b2535.
[17] Centre for Reviews and Dissemination University of York Systematic Reviews. http://www.york.ac.uk/inst/crd/pdf/Systematic_Reviews.pdf; 2009. [CRD's guidance for undertaking reviews in health care].
[18] Thomas BH, Ciliska D, Dobbins M, Micucci S. A process for systematically reviewing the literature: providing the research evidence for public health nursing interventions. Worldviews Evid Based Nurs 2004;1:176–84.
[19] Blakemore A, Dickens C, Guthrie E, Bower P, Kontopantelis E, Afzal C, et al. Depression and anxiety predict health-related quality of life in chronic obstructive pulmonary disease: systematic review and meta-analysis. Int J Chron Obstruct 2014;9:501–12.
[20] Panagioti M, Gooding PA, Tarrier N. A meta-analysis of the association between posttraumatic stress disorder and suicidality: the role of comorbid depression. Compr Psychiatry 2012;53:915–30.
[21] Teoh J. An analysis of completed suicides by psychological post-mortem. Ann Acad Med 1974;3:117–23.
[22] Hayati AN, Salina AA, Abdullah AA, Eusni RT, Mansar AH. The pattern of completed suicides seen in Kuala Lumpur General Hospital 1999. Med J Malaysia 2004;59:190–8.
[23] Maniam T. Suicide and undetermined violent deaths in Malaysia, 1966–1990: evidence for the misclassification of suicide statistics. Asia Pac J Public Health 1995;8:181–5.
[24] Ali NH, Zainun KA, Bahar N, Haniff J, Hamid AM, Bujang MAH, et al. Pattern of suicides in 2009: data from the National Suicide Registry Malaysia. Asia Pac Psychiatry 2014;6:217–25.
[25] Maniam T, Chinna K, Lim CH, Kadir AB, Nurashikin I, Salina AA, et al. Suicide prevention program for at-risk groups: pointers from an epidemiological study. Prev Med 2013;57:S45–6.
[26] Ahmad N, Cheong SM, Ibrahim N, Rosman A. Suicidal ideation among Malaysian adolescents. Asia Pac J Public Health 2014;26:63S–9S.
[27] Bhupinder S, Kumara T. A ten-year retrospective study of completed suicides in Penang Hospital for the period 1995–2004. Malays J Forensic Pathol Sci 2006;1:98–109.
[28] Nadesan K. Pattern of suicide: a review of autopsies conducted at the University Hospital, Kuala Lumpur. Malays J Pathol 1999;21:95–9.
[29] Orr JW, Pu TN. Parasuicides in Kuala Lumpur. A descriptive study. Singap Med J 1985;26:161–70.
[30] Habil MH, Ganesvaran T, Agnes LS. Attempted suicide in Kuala Lumpur. Asia Pac J Public Health 1992;6:5–7.
[31] Chee KY, Alias NM, Taha AB. Deliberate self-harm at Sarawak general hospital. Int Med J 2003;10:277–82.
[32] Teo GS, Teh TL, Lim JH. Parasuicide and suicide: demographic features and changing trend among cases in Hospital Sungai Bakap 2001–2005. Malays J Psychiatry EJ 2008;17:3–12.
[33] Kannan K, Pillai SK, Gill JS, Hui KO, Swami V. Religious beliefs, coping skills and responsibility to family as factors protecting against deliberate self-harm. S Afr J Psychiatry 2010;16:138–46.
[34] Zuraida NZ, Ahmad HS. Religiosity and suicide ideation in clinically depressed patients. Malays J Psychiatry EJ 2007;16:12–5.
[35] Fathelrahman AI, Ab Rahman AF, Mohd Zain Z. Self-poisoning by drugs and chemicals: variations in demographics, associated factors and final outcomes. Gen Hosp Psychiatry 2008;30:467–70.
[36] Haq SM, Buhrich N. Parasuicides and their determinants in a multiracial society. Singapore Med J 1980;21:648–51.
[37] Yeoh OH. Attempted suicides in Penang — preliminary observations. Med J Malaysia 1981;36:39–46.
[38] Maniam T. Suicide and parasuicide in a hill resort in Malaysia. Br J Psychiatry 1988;153:222–5.
[39] Bhupinder S, Kumara TK, Syed AM. Completed suicides in the district of Timur Laut, Penang Island — a preliminary investigation of 3 years (2007–2009) prospective data. Med J Malaysia 2010;65:123–6.
[40] Zain AM. Profile of in-patient suicides in two hospitals in Malaysia. Med J Malaysia 1991;46:171–6.
[41] Hamidin A, Maniam T. Life events and parasuicides in Hospital Kuala Lumpur, Malaysia. Malays J Med Health Sci 2011;7:45–52.
[42] Murugesan G, Hock YO. Demographic and psychiatric aspects of attempted suicides — ninety-six attempts. Med J Malaysia 1978;33:102–12.
[43] Orr JW. Parasuicides in Kuala Lumpur reasons for the attempt. Singap Med J 1985;26:253–8.
[44] Zuraida NZ. A study of social network of suicide attempters in University Malaya Medical Centre, Kuala Lumpur. Malays J Psychiatry 2000;8:3–10.
[45] Jeon HJ, Peng D, Chua HC, Srisurapanont M, Fava M, Bae J-N, et al. Melancholic features and hostility are associated with suicidality risk in Asian patients with major depressive disorder. J Affect Disord 2013;148:368–74.
[46] Lim AY, Lee AR, Hatim A, Tian-Mei S, Liu CY, Jeon HJ, et al. Clinical and sociodemographic correlates of suicidality in patients with major depressive disorder from six Asian countries. BMC Psychiatry 2014;14:37.
[47] Rani RA, Razali R, Hod R, Mohamad K, Rani SAM, Yahya WNNW, et al. Suicidal ideation amongst epilepsy patients in a tertiary centre. Neurol Asia 2014;19:129–36.
[48] Yee HA, Loh HS, Ng CG. The prevalence and correlates of alcohol use disorder amongst bipolar patients in a hospital setting, Malaysia. Int J Psychiatry Clin 2013;17:292–7.
[49] Chan LF, Maniam T, Saini SM, Shah SA, Loh SF, Sinniah A, et al. Sexual abuse and substance abuse increase risk of suicidal behavior in Malaysian youth. Asia Pac Psychiatry 2013;5:123–6.
[50] Organization WH. Suicide rates per 100,000 by country, year and sex; 2011.
[51] Ong S, Yeoh KL. Suicidal behaviour in Kuala Lumpur. In: Kok LP, Tseng W, editors. Suicidal behaviour in the Asia-Pacific region Singapore. Singapore University Press; 1992. p. 144–75.
[52] Radhakrishnan R, Andrade C. Suicide: an Indian perspective. Indian J Psychiatry 2012;54:304–19.
[53] O'Connor RC, Smyth R, Ferguson E, Ryan C, Williams JM. Psychological processes and repeat suicidal behavior: a four-year prospective study. J Consult Clin Psychol 2013;81:1137–43.
[54] Foster T. Adverse life events proximal to adult suicide: a synthesis of findings from psychological autopsy studies. Arch Suicide Res 2011;15:1–15.
[55] Jollant F, Malafosse A, Docto R, Macdonald C. A pocket of very high suicide rates in a non-violent, egalitarian and cooperative population of South-East Asia. Psychol Med 2014;44:2323–9.
[56] Durkheim E. Suicide: a study in sociology. London: The Free Press; 1951.
[57] McAuley L, Pham B, Tugwell P, Moher D. Does the inclusion of grey literature influence estimates of intervention effectiveness reported in meta-analyses? Lancet 2000;356:1228–31.
[58] Sinniah A, Maniam T, Scott V. Report on the changes in the trend of suicidal behaviour in Cameron Highlands Malaysia. ASEAN J Psychiatry 2009;10:1–3.
[59] Murty OP, Cheh LB, Bakit PA, Hui FJ, Ibrahim ZB, Jusoh NB. Suicide and ethnicity in Malaysia. Am J Forensic Med Pathol 2008;29:19–22.
[60] Simons RC, Sarbadhikary D. Suicide attempters admitted to the University of Malaya Medical Center Psychiatric Unit. Int J Soc Psychiatry 1972;18:97–103.
[61] Fathelrahman AI, Ab Rahman AF, Zain ZM, Tengku MA. Factors associated with adult poisoning in northern Malaysia: a case–control study. Hum Exp Toxicol 2006;25:167–73.
[62] Sorketti EA, Zuraida NZ. Motives and psychosocial stressors in parasuicides: comparison of self-poisoners and self-cutters. Malays J Psychiatry 2007;16:36–40.
[63] Zyoud SH, Awang R, Sulaiman SA, Al-Jabi SW. A cross-sectional observation of the factors associated with deliberate self-poisoning with acetaminophen: impact of gender differences and psychiatric intervention. Hum Psychopharmacol 2010;25:500–8.
[64] Khan TM, Sulaiman SAS, Hassali MA. Factors associated with suicidal behaviour among depressed patients in Penang, Malaysia. Arch Med Sci 2012;8:697–703.
[65] 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;32:283–7.