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EPIDEMIOLOGY, RISK AND PROTECTIVE FACTORS OF SELF-IMMOLATION; A STUDY FROM IRAN

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ABSTRACT

Background: Suicide by self-burning (self-immolation) is one of the suicide methods that is far more common in low-middle income countries than in high-income ones. Iran is one of the countries that has a high rate of self-immolation. Women are the main victims as the reports show. In this study we aim to find the epidemiology, risk and protective factors of self-immolation.

Methods: Initially, we analyzed two national databases to identify the epidemiological aspects of self-immolation including demographic, geographic, cultural, economic and health-related characteristics of fatal self-immolation cases that may vary across regions of Iran (sub-study I). Subsequently, we conducted two case-control studies in regard to attempted self-immolation. One titled *Preliminary study* with 60 participants (30 cases and 30 controls), and the other entitled *Main study* with 151 cases and 302 controls dedicated to identifying the risks and protective factors of self-immolation (sub-study II-IV).

Results: Results show that the total rate of suicide by all methods in Iran was 6.42 per 100,000, of which 1.74 per 100,000 (27%) were self-immolation. Seventy one percent of the self-immolators were female and the mean age was 29 years. The geographical features of self-immolation indicate that self-immolation rates are higher in the border provinces of the country, in the rural areas, and in the provinces that were most intensively affected by the postwar socioeconomic consequences, as well as Kurdish people. Results from our studies show that adjustment disorders, opium dependence, major depression, and an individual history of suicide attempts were risk factors. In the married subgroup, marital conflict and addiction of spouse and in unmarried subgroup, problems with parents, parents' death and parents' addiction were identified as risk factors. Moreover, "receiving consultation services" and "anxiety about school/university performance" played protective roles against self-immolation.

Regarding identification of potential factors for future prevention interventions, descriptive analyses revealed that the means of self-immolation in more than 93% of patients was kerosene. Imitational self-immolation was showed in most of self-immolation cases (more than 60%). The majority of participants (both cases and control) had not used any "consulting services" to solve or manage their problems or enhance their problem-solving abilities. Moreover, unplanned (impulsive) self-immolation was detected in 80% of all self-immolation patients

Conclusion: Overall, in this study we found that self-immolation is an important public health issue in particular regions in Iran. Our results also suggest that self-immolation is a compound phenomenon with multiple potential causes. Our results have implications for interventions that aim at screening, identification, and education of individuals who are at-risk for self-immolation to reduce the rate of self-immolation in the study area.

Key Words: Suicide; Self-immolation; Case-control study; Risk factors; Protective factors; Iran

LIST OF PUBLICATIONS AND MANUSCRIPTS*

- I. Ahmadi A, Mohammadi R, Stavrinou D, Almasi A, Schwebel DC. Self-immolation in Iran. *J Burn Care Res.* 2008 June;29(3):451-460.
- II. Ahmadi A, Mohammadi R, Schwebel DC, Khazaie H, Yeganeh N, Almasi A. Demographic risk factors of self-immolation: a case-control study. *Burns.* 2009 Jun;35(4):580-6.
- III. Ahmadi A, Mohammadi R, Schwebel DC, Yeganeh N, Soroush A, Bazargan-Hejazi S. Familial risk factors for self-immolation: a case-control study. *J Womens Health (Larchmt).* 2009 Jul;18(7):1025-31.
- IV. Ahmadi A, Mohammadi R, Schwebel DC, Yeganeh N, Hassanzadeh M, Bazargan-Hejazi S. Psychiatric disorders (Axis I and Axis II) and self-immolation: a case-control study from Iran. *J Forensic Sci.* 2010 Mar 1;55(2):447-50.
- V. Ahmadi A, Mohammadi R, Almasi A, Sadeghi-Bazargani; Ahmadi A., Bazargan-Hejazi S, Svanström L. Quantitative risk and protective factors of self-immolation: a population based case-control study from Iran. Submitted

* APPENDIX-III outlines the relations of sub-studies, phases, papers and designs in this study

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LIST OF ABBREVIATIONS *

AD	Adjustment Disorders
ALEV	Adverse Life Events Variables
BMI	Body Mass Index
DV	Demographic Variables
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders (fourth edition, text revision) (see Appendix-I)
FV	Familial Variables
GAD	Generalized Anxiety Disorder
OCD	Obsessive-Compulsion Disorder
PTSD	Posttraumatic Stress Disorder
KUMS	Kermanshah University of Medical Sciences
SES	Socio-Economic Status or Socio-Economic Level (see Appendix-I)
TBSA	Total Body Surface Area
WHO	World Health Organization
YLL	Years of Life Lost

* Also see Appendix-I for some definitions in this study

1 BACKGROUND

1.1 GLOBAL PREVALENCE OF SUICIDE AND SELF-IMMOLATION

Suicide continues to be a major public health hazard worldwide with health and social implications. Reports from World Health Organization (WHO) indicate that, in 2002, worldwide, approximately 877,000 people lost their lives through suicide, representing 1.5% of the burden of disease, or more than 20 million disabilities. Based on this trend, it is estimated that by 2020 this number will increase to 1.53 million deaths from suicide, and will indicate 10 to 20 times more suicide attempts, representing on average a loss of one life per 20 seconds, and one suicide attempt every 1-2 seconds [1-3]. Suicide by self-burning (self-immolation) is one of the suicide methods that is more common in low-middle income countries than in high-income ones. Iran is one of the countries with the highest rate of self-immolation [4-16].

1.2 PREVALENCE OF SUICIDE AND SELF-IMMOLATION IN IRAN

Iran, a Middle-Eastern country, is located in the southwestern part of Asia. It includes 28 provinces and has a population of about 70 million people (2007). Iran has a low rate of suicide in comparison to other countries in the world (~ 6 per 100,000), but it is among the countries with the highest rates of self-immolation (~ 2 per 100,000) [9]. Self-immolation is preventable, [17] yet it is quite common in some parts of Iran. For example, between 1996 and 2003, Eilam, a province in the western region of Iran, was reported to have one of the highest rates of self-burning in the world (71% of all suicides) [16]. In Kermanshah, another province in the western region of Iran, where this study was conducted, the rate of self-burning is about 7 per 100,000 [9]. An earlier study conducted in the same region (i.e., Kermanshah) revealed that about 41% of all suicides were via self-burning. Of these, 81% were women, and the male: female ratio was 1:4.3 [10].

1.3 SELF-IMMOLATION AND FEMALES IN IRAN

Females are the main victims of deliberate self-burning in Iran. About 70% to 96% of all self-immolation admissions in burn centers of Iran are women. After breast cancer and natural disasters, self-immolation is the third leading cause of Years of Life Lost (YLL) among women, due to premature death [8-15].

1.4 POTENTIAL RISK FACTORS FOR SELF-IMMOLATION

Much of what we know about self-immolation, its prevalence, and potential risk factors comes from earlier cross-sectional or surveillance studies. According to these descriptive studies, risk factors for self-immolation cluster around socio-demographic characteristics, psychological predispositions, psychiatric disorders, and adverse life events [5]. The following sections provide a summary of these and demonstrate that the relevant risk factors for self-immolation across high to low income countries are different [4].

1.4.1 Socioeconomic status and self-immolation

Literature on self-immolation highlights the fact that different socioeconomic risk factors affect the rate of self-immolation in different societies [18]. Higher income countries report a higher male to female gender ratio among the self-immolation cases [19]. But, Iran, along with other Eastern Mediterranean countries as well as countries in Southwest Asia including Afghanistan, India, Sri Lanka, shares the highest rate of

suicide by self immolation among their young adults; approximately 20% in India [20-21]; 34% in Sri Lanka [22], and 4% in Afghanistan [23]. Data from low-middle-income countries including Iran also demonstrate a higher prevalence of self-immolation in that segment of their population who are marginalized and experience economic adversity and poverty [24-27], have low education [28], and have easy access to lethal means to carry out suicidal intention [29].

1.4.2 Family factors and self-immolation

Familial determinants of self-immolation, sometimes referred to as 'micro-level' determinants, include attributes that have been identified by descriptive studies as risk factors for self-burning including parents' marital conflict, low socioeconomic level, and conflict with parents, [30, 31]. The role of marital conflict especially recurs in most studies [5]. Studies of suicides in general, also have identified familial factors such as reporting parents' death, addiction history in parents, spouse addiction, mental disorders history in parents, suicide history in family, and divorce of parents, as the strongest contributory factors for suicide [32-42]. The role of these risk factors, however, has not been thoroughly explored in the self-immolation studies. The majority of the existing studies report the profile of those impacted. Thus, this study by using the methodological strength of case-control design is designed to investigate the extent to which familial risk factors will increase the likelihood of self-immolation. Identifications of these factors have potential for advancing our knowledge of prevention strategies and reducing the personal, social, and economic burden of self-immolation.

1.4.3 Psychiatric disorders and self-immolation

There is ample empirical evidence pointing out the higher rate of psychiatric disorders including diagnoses of major depression, schizophrenia, bipolar disorder, and substance use, in suicide; both attempted and fatal cases [43-47]. But reports of such data for self-immolation are less common in both high and low to middle income countries. Nevertheless, the available data point to the importance of these psychiatric disorders in presentation of self-immolation [18, 23, 48-52]. This data also clearly distinguishes between the types of psychiatric disorders that are reported as risk factors for self-immolation in higher income countries and those more prevalent in middle to lower income countries. The profile of psychiatric disorders in relation to self-immolation in higher income countries suggests a link between self-immolation and depressive disorders, psychoses, alcohol and other drug addictions in the etiology of self-immolation [53-55]. Whereas in middle/low-income countries the relationship between adjustment disorders and self-immolation is stronger [5, 20].

According to DSM-IV categorizations, adjustment disorders characterize emotional response to a stressful event such as a medical illness, financial issues, or a relationship problem. Adjustment disorder symptoms involve anxious or depressive affects and sometimes conduct disturbances. There are six subtypes of adjustment disorders, varying according to their predominant affective presentation. Of these subtypes "Adjustment Disorder with Depressed Mood" has been closely associated with suicide ideation and suicide attempts, as well as suicide completions, independently or in combination with depressive mood, impulsivity, and substance abuse [36, 47, 56-61]. Although limited, findings of earlier descriptive studies from Iran also suggest that adjustment disorders are prevalent psychiatric predisposing factors among self-immolators [5, 20]. In the current study we examine the association between mental disorder and self-immolation using axis-I and axis-II of DSM IV-TR [62].

1.4.4 Adverse life events

Among the risk factors for self-immolation, the role of adverse life-event is rather unclear. Results from suicide literature, in general, suggest an association between this variable and suicide attempts [63-67]. Events such as unplanned pregnancy, homelessness, financial troubles, relationship problems, and marriage break-up, academic problems, work anxiety, history of suicide attempts, and diagnosis of a malignant disease are among the adverse life events that have predicted suicide events in previous studies. In a case-control study with 108 adult suicide attempters and 108 controls, Palacio and colleagues reported those who had a family history of suicides, who were in the middle of a major depressive episode, or expressed suicidal ideations, had a higher risk of suicide [36]. In Zhang et al.'s study [35] adverse events that were associated with attempted suicide were hopelessness, negative life-events, and a family history of suicide. Way and colleagues revealed that inmate-to-inmate conflict, fear, physical illness, recent disciplinary action, and adverse life-events were the common stressors preceding suicide [63]. In a more recent study, Krysinska and Lester conducted a meta-analysis of 50 suicide related articles [68]. They found that PTSD was a risk factor for a higher incidence of past or present suicidality. As mentioned above, the break-up of a marital relationship also can increase the risk of suicide as indicated in Masocco et al. They reported that divorced/separated women, divorced/separated men, and widowed men, relatively, had a higher risk for suicide [69]. A similar association between suicide and marital status was reported by Griffiths and colleagues. [70] In another study, Barber and colleagues indicated that a vast majority of the suicidal callers to a telephone help line were those who were dissatisfied with their intimate relationship [71, 72].

As referenced above, only a few of these studies have used case-control design, almost none have used samples from developing countries [48-50], and none have studied self-immolation. These findings reinforce the need to improve our understanding of the interrelationships between adverse life events and self-immolation.

1.5 SELF-IMMOLATION PREVENTION AND THE ROLE OF THE CASE-CONTROL STUDY

Our review of literature reveals that of the existing self-immolation studies in developing countries (20-28), the majority are epidemiological studies and very few have implemented case-control design to highlight risk factors of self-immolation. However, use of small sample size and the inconsistency in their methods and designs prevent one from making reliable inferences from their findings. Moreover, there is a knowledge gap in self-immolation literature in Iran in reference to use of case-control design with the purpose of identifying the risks and protective factors for self-immolation. In this study, we attempt to find protective and risk factors of self-immolation in Iran, using case-control design, to offer possible preventive strategies. Our study is the first case-control study conducted in low-middle income countries to review risk and protective factors associated with deliberate self-burning.

As highlighted by the aforementioned data, self-immolation preventions should be considered as a national health priority in Iran.

Prevention of suicide has always been of main concern for public health officials. To this end, better understanding of the risk factors and the ways in which they operate and correlate can suggest ways to intervene and reduce its incidence. Suggested public health approach or suicide prevention includes five phases [17]:

- | | |
|-------------------------------|---|
| [1] Surveillance | [2] Identification of risk and protective factors |
| [3] Intervention development, | [4] Intervention implementation |
| [5] Intervention evaluation | |

2 RESEARCH QUESTIONS, HYPOTHESES, AIMS

Suicide literature is extensive in identifying the connecting links between psycho-socio-cultural factors that trigger suicide and thereafter suggesting the components of an effective prevention program. However, there is a paucity of research on self-immolation in the literature that is carried out with scientific rigor and a large sample size. Overall, the goal of this study is to identify relevant efficient point(s) of intervention for self-immolation prevention.

2.1 RESEARCH QUESTION

This study was conducted to describe the profile of self-immolation in Iran, and to obtain better understanding of the local determinants of self-immolation in Kermanshah for preventive purposes. Therefore, the following research questions were addressed:

1. What is the epidemiology of self-immolation in Iran?
2. What are the demographic risk and protective factors of self-immolation?
3. What are the familial risk and protective factors for self-immolation?
4. Which psychiatric disorders play a role as risk and protective factors for self-immolation?
5. Which adverse life-events play a role as risk and protective factors for self-immolation?
6. What are the other potential factors for prevention interventions?

2.2 RESEARCH HYPOTHESES

The study hypotheses were developed; based on the review of existing suicide and self-immolation literature and they include:

1. Compared to the control group, patients in the case group were more likely to report problems related to familial factors, experiencing adverse life events, and having DSM IV-TR, Axis I & II diagnoses.
2. We also hypothesized that participants in the control group compared to the case group were more likely to report use of protective factors.

2.3 SPECIFIC AIMS

Specifically we aimed to:

1. To determine the epidemiology of self-immolation in Iran
2. To identify risk and protective factors of self-immolation in Kermanshah
3. Propose culturally relevant prevention strategies

3 MATERIAL AND METHODS

To deliver our aims, we conducted three studies (also see Appendix-III):

1. One epidemiological study to obtain a better picture of the rate and characteristics of self-immolation across Iran.
2. The *preliminary study* to establish experience and competence in design, method and selection of potential risk and protective variables.
3. Lastly, the *main study* to identify risk and proactive factors for self-immolation in a larger local sample.

The overall goal was to determine the epidemiology of self-immolation in Iran and particularly identify the risk and protective factors of self-immolation in Kermanshah. The summary of study designs and methods of these studies are described in the next few sections.

3.1 SUB-STUDY I: THE EPIDEMIOLOGY OF SELF-IMMOLATION IN IRAN

Our first study was a retrospective cross-sectional study to report the epidemiology of self-immolation in Iran. In this study, two national self-inflicted databases i.e., Iran's Mortality Database, and the Mien of Health in Iran [8, 12] were examined to obtain a better understanding of the demographic, geographic, cultural, economic, and health-related aspects of self-immolation across different regions in Iran.

3.1.1 Statistical analysis of sub-study I

We conducted the data analysis in three steps. First, we used descriptive statistics to depict the overall characteristics of the sample. Second, odds ratios and X^2 tests were computed to compare study variables between suicide cases from self-immolation and those engaged in other methods of suicide. Third, odds ratios, X^2 tests, Z tests, and t-tests were computed to compare the measured variables between provinces with varying rates of self-immolation to the single province with no self-immolation. The study provinces were divided into four groups, based on the rates of self-immolation:

- a) "Low," with a rate of 0.1 to 1 self-immolations per 100,000 persons,
- b) "Medium," with a rate of 1 to 3,
- c) "High," with a rate of 3 to 7, and
- d) "Very high," with rates equal or greater than 7. There was one province with no self-immolation (Zanjan); this province was used as a reference region for analyses. Zanjan is located in the center of Iran, and is an industrially and economically developed province. It has a population of approximately 1 million people (1.4% of Iran population) (Figure 1).

3.2 SUB-STUDY II-IV: RISK AND PROTECTIVE FACTORS

To identify the risk factors for self-immolation, we conducted two sub-studies, referred henceforth as "*preliminary study*" and "*main study*". The specifics of these studies are outlined below:

3.2.1 Preliminary study

The first study or *Preliminary study* was a case-control study with 60 participants. Based on previous research indicating a prevalence of 42.1% for adjustment disorder in

self-immolation patients, and 1.54% in Kermanshah[20,73], a priori power calculations indicated that 25 patients were needed in each group to detect a difference in outcome between the groups at 90% power and a 5% significance level. Thirty patients who arrived at the regional Burn Centre (Imam Khomeini hospital in Kermanshah, a province of Iran) due to deliberate self-burning were enrolled into the case group. Cases were compared with 30 controls and matched by gender, age, and living areas. Matching strategy allows us to improve our estimation of the effect of exposure between case and control groups. It also protects against a condition where the distributions of the confounders are different in cases and controls [72]. We selected age, gender, and locality as the matching variables for this study because their confounding role in descriptive suicide and self-immolation literature is well known [35].

3.2.2 Main study

In the second study or the *Main study*, we increased the number of cases to 151 in case and number of controls to 302 to increase the power of study. Based on a previous report indicating a prevalence of 4.7% for anxiety disorders in self-immolation patients, and 4.58% in Kermanshah [20, 73], a priori power calculations indicated that 450 participants (150 cases and 300 controls) were needed in each group to detect a difference in outcome between the groups at 90% power and a 5% significance level. The control group was selected from the same community from which the cases were selected and was matched by age and gender.

3.2.2.1 Inclusion and exclusion criteria:

To be eligible to participate in this project (both *preliminary* and *main studies*), participants had to be self-immolation attempts patients visiting the Burn Center to receive care. Participating patients were either self-selected or corroborated by a witness. Patients also had to be in a stable mental condition and sign and/or imply consent to participate in the study. Patients were excluded from the study if their suicide attempts were suspicious (non in *preliminary* study and seven patients in *main study*)(i.e., they denied suicidal intent and they had no corroborating witnesses). In addition, patients who were not mentally stable and those who didn't sign/imply informed consent were excluded from the study.

3.2.2.2 The study instrument and data collection:

A clinical psychologist interviewed all self-immolation patients in the first 24 hours of their admission to the burn center, to complete demographic (11 items), familial history (11 items), and adverse life events questionnaires (15 items). The patients also were screened for clinical and personality disorders using Axis-I (29 items) and II (12 items) (See Table 1 and Appendix-II). Each interview took approximately two and half hours. In rare cases where the clinical situation didn't permit a single session, the interview was divided in two or three visits. Information on patients who were too ill to be interviewed because of severe burns, >90% of TBSA(three patients in *preliminary* study and twenty nine patients in *main study*) was collected with helps from a close family member (spouse or parent). At the conclusion of each interview, the clinical psychologist assigned DSM-IV diagnoses on both Axis-I and Axis-II. The SCID and other measures were administered orally because some of the participants had low level of writing literacy. The validity of psychiatric diagnosis was ensured by a second clinical psychologist and a psychiatrist, on an as-needed basis.

Most items in the Adverse Life-Events questionnaire were standard items for such measures. Items range from unplanned pregnancy to having inability and malignant disease. We also included two additional items that had been not evaluated in previous suicide studies but play an important role in Iran’s socio-cultural milieu; infertility and arranged marriage [35, 46, 47, 65]. Response categories for all items included “Yes = 1”, and “No = 0”.

Table 1. Study Measures and Variables	
<p><u>Demographic Variables</u></p> <ul style="list-style-type: none"> • Family size • Marital status • Marriage age • Having children • Number of children • Body Mass Index (BMI) • Employment • Birth order • Early school dropout • Educational status • Parents/guardians’ employment status <p><u>Familial Variables</u></p> <ul style="list-style-type: none"> • History of suicide in family • Divorce of parents • Having problem with parents • Death of parents • Having history of mental disorders in parents • Addiction of parents • Marital conflict between parents • Marital conflict with spouse • Conflict with other member of family • Addiction of spouse • Socio-Economic Status of family <p><u>DSM-IV-TR Diagnoses</u></p> <ul style="list-style-type: none"> • Delirium • Dementia • Drug abuse or dependency (such as Nicotine, Opium, Heroin, Alcohol, Marijuana) • Ever used illicit drugs other than marijuana • Schizophrenia • Schizophreniform • Schizoaffective • Delusional • Major depression • Mania • Hypo-manic • Dysthymia • Cyclothymia • Agoraphobia • Special phobia • Social phobia • Obsessive-Compulsion Disorder • PTSD • Generalized Anxiety Disorder • Somatization • Conversion Hypochondriasis 	<ul style="list-style-type: none"> • Body Dysmorphic • Pain disorders • Dissociative amnesia • Sexual dysfunction • Gender Identity • Anorexia Nervosa • Insomnia • Hypersomnia • Narcolepsy • Sleep disorder related to respiration • Sleep rhythm disorder • Nightmares • Sleep terror disorder • Intermittent explosive disorder • Kleptomania • Pyromania • Adjustment disorders <p><u>Personality Disorders</u></p> <ul style="list-style-type: none"> • Paranoid • Schizoid • Schizotypal • Antisocial • Borderline • Histrionic • Narcissistic • Avoidant • Dependent • Obsessive-Compulsive • Passive-Aggressive • Depressive <p><u>Adverse Life Events Variables</u></p> <ul style="list-style-type: none"> • Unplanned pregnancy • Abortion • Infertility • Homelessness • Financial hardship • Problems with friends • A relationship break-up (with boyfriend/girlfriend or spouse) • School or university failure • Anxiety about school/university performance • Problems at work • Compulsory (arranged or forced) marriage • Individual history of suicide attempts • Individual history of mental disorders • Having disability • Malignant disease

3.2.2.3 *The ethical concerns for human subject participation:*

Suicide is considered taboo in many cultures [1-18]. Therefore, in order to emphasize the voluntary nature of the participation and minimize potential risk of breaching the confidentiality and privacy of the participants and the data, we took the following safety precautions.

A. Potential participants were told that their participation was voluntary.

B. Potential participants were told that to protect their privacy the interview would take place in a private room. They were also informed that the interview would take approximately two and half hours and would include questions about their personal or family experiences of adverse life events, mental health/disorders, and suicide attempts, as well as demographic characteristics.

C. We also pointed out to the participants that to protect their confidentiality, we were using an anonymous questionnaire. Furthermore, we kept all electronic study data in a password-protected computer in the office of the main study investigator. Copies of signed consent forms along with the coding ID sheets were kept in a different filing cabinet to further, protect participants' confidentiality.

E. We gave potential participants an ample amount of time to ask any questions or talk to their relatives or family members about participation in the study. Subsequently, the participants signed or implied consent for participation.

3.2.2.4 *The study instrument validity and reliability*

The study questionnaire consisted of two main parts; 1) Structured Diagnostic Interview for DSM-IV (SCID) Persian Version: the validity and reliability of this questionnaire has been documented in Iranian population [74-76], and 2) items measuring demographic, familial, and adverse life events. For test-retest reliability assessment, three interviews, each 14 days apart, were administered to 10 subjects using demographic, familial, and adverse life events items in the questionnaire. The Spearman correlation coefficient (quantitative measure of the test-retest reliability) was used to assess the correlation coefficient between sets of responses. The agreement of demographic, familial, life events items in test and retests were satisfactory to good (ranging from 0.89 to 0.98). Content validity of this questionnaire was approved by eight key informants (Epidemiologist, Psychologists and Psychiatrists).

3.2.3 Statistical analysis of sub-study II-IV

Using descriptive statistics (Frequency, Percentages, Mean and Standard Deviation), Charts, and Tables, we illustrated the overall characteristics of study participants including both cases and controls. Next, we examined bivariate associations between exposure variables and self-immolation to answer two questions: 1) is there any relationship between each predictor variable and self-immolation; 2) how strong is the relationship? For this purpose we used Chi squared and Fisher's exact tests and Odds Ratios. We did not use logistic regression in the *Preliminary study* due to having a small sample size, but we used this technique to estimate the independent association between predictor variables and outcome variable (self-immolation) in the *Main study*. We used a p-value ≤ 0.10 to identify significant trends and a p-value ≤ 0.05 to identify significant differences.

4 RESULTS

4.1 Sub-study I: Epidemiology of self-immolation in Iran (Paper-I)

In Iran, suicide ranks as the fifth-leading cause of YLL and self-immolation is the third leading cause of YLL among women, after disasters and breast cancer [8]. According to our data, a total of 4,267 (6.42 per 100,000) suicides by all methods were reported (2003-2004) in Iran, with 1,156 (1.74 per 100,000 or 27%) of those being cases of self-immolation. The YLL by self-immolation in Iran was 35,306 years and for all suicide methods was 126,782 years. Table 2 outlines estimated fatal self-inflicted injuries by methods for Iran. A map of self-immolation rates in Iran is provided in Figure 1. Most of self-immolation victims were concentrated in the four provinces of Eilam, Kermanshah, Bushehr and Golestan (self-immolation rate: 8.7, 7.0, 4.1, and 3.4, per 100.000 person year, respectively) (Figure 1 and Table 2).

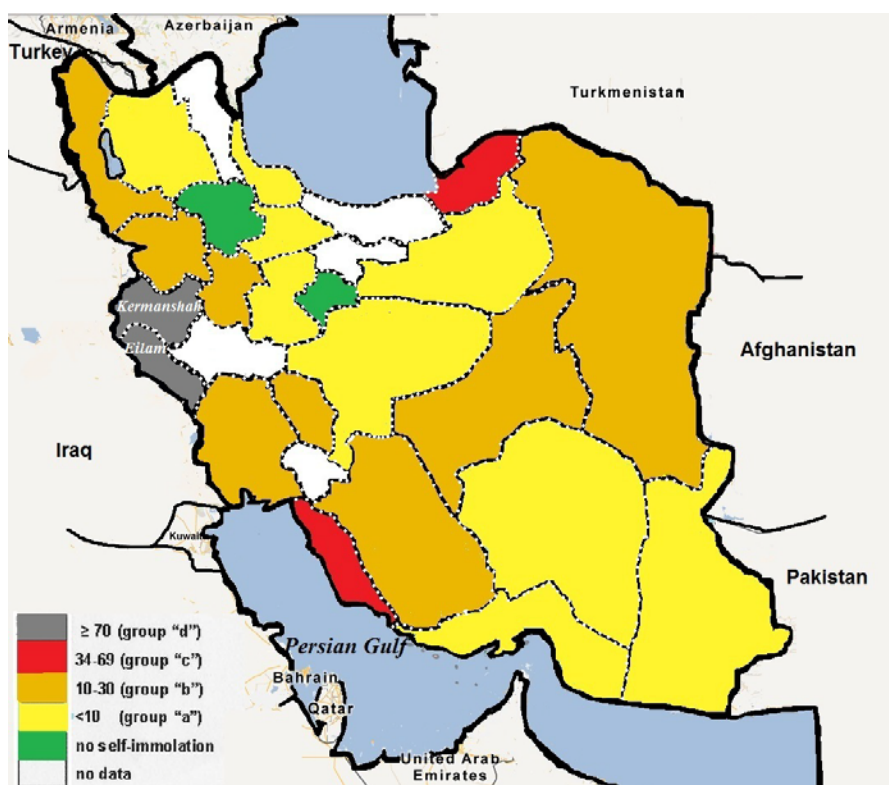


Figure. Map of self-immolation rates in Iran (per 10000 most recent years available as of 2003–2004).

	%	No.	Per 100.000	YLL
Hanging	34.2	1460	43,106	2.20
Self-immolation	27.1	1156	35,306	1.74
Poisoning	18.8	802	22,737	1.21
Drug abusing or opium	4.6	197	5,428	0.30
Gunshot	3.4	146	4,707	0.22
Other	11.9	507	15498	0.78

YLL, Years of Life Lose

The mean age of the cases was 29 years. Geographical features of self-immolation indicate that the self-immolation rate was higher in rural areas and in border provinces. Provinces that were involved more intensively in postwar problems feature higher rates of self-immolation. People of Kurdish ethnicity were more likely to engage in self-immolation. When comparing between provinces of Iran, unemployment was a risk factor for self-immolation, while mental disorders and lack of access to healthcare and treatment facilities did not play an important role for increasing the rate of self-immolation.

4.2 Sub-study II: Demographic risk and protective factors (Papers II & V)

According to Table 3, there were more females, married people, and housewives in the case groups than in the control groups. The majority of cases had primary school education.

As presented in Tables 4 & 5, at the bivariate level, of the demographic variables in both *preliminary* and *main study*, having children, employment, birth order, and educational status were associated with self-immolation ($p \leq 0.1$).

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	case	control
Gender; N (%)				
Male	37(24)	74(24)	4 (13)	4 (13)
Female	114(76)	228(76)	26(87)	26(87)
Living area; N (%)				
Urban	83(55)	166(55)	6(20)	6(20)
Rural	68(45)	136(45)	24(80)	24(80)
Marital state; N (%)				
Single	63(42)	162(53)	12 (40)	10(33)
Married	78(51)	127(42)	17(57)	19(64)
Widow	4(3)	8(3)	-	-
Divorced	6(4)	5(2)	1(3)	1(3)
Occupational state; N (%)				
Housewives	104(69)	165(55)	23(77)	24(80)
Unemployed	15(10)	31(10)	0(0)	2(7)
Employee-unskilled worker	10(7)	17(5)	2(7)	0(0)
Employee-skilled worker	8(5)	9(3)	3(9)	2(7)
Employee-specialist worker	0(0)	5(2)	0(0)	1(3)
Student	12(8)	75(25)	2(7)	0(0)
Others	2(1)	0(0)	0(0)	1(3)
Birth order; N (%)				
First children	32(21)	61(20)	5(17)	2(7)
Middle children	107(71)	177(59)	21(70)	26(86)
Last children	12(8)	64(21)	4(13)	2(7)
Family Size; N (%)				
<5	46(31)	115(38)	8(27)	6(20)
>6	105(69)	187(62)	22(73)	24(80)
Education state; N (%)				
Illiterate	24(16)	22(7)	7(24)	9(30)
Primary school	47(31)	102(34)	12(40)	13(44)
Secondary school	42(28)	48(16)	4(13)	1(3)
High school graduate	34(23)	61(20)	5(17)	6(20)

Table 3. Demographic data for the "main study" and "preliminary study"				
Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	case	control
Pre-university	2(1)	24(8)	1(3)	0(0)
University	2(1)	45(15)	1(3)	1(3)
Parents/guardians' employment status; N (%)				
Unemployed	21(14)	26(7)	3(9)	2(7)
Employee-unskilled worker	50(33)	103(34)	11(37)	10(33)
Employee-skilled worker	71(47)	132(44)	14(47)	16(53)
Employee-specialist worker	8(5)	39(13)	2(7)	2(7)
TBSA† Mean (SD)	62 (25)	-	60(23)	-
Marriage age; Mean (SD)	20(3)	20(3)	20.5(3)	19.3(3)

Table 4. Test of association between self-immolation and the demographic risk factors across cases and controls; Results of "preliminary study" (cases n =30; controls n=30).				
	x²	p-value	Odds Ratio	95% CI
Family size	0.37	0.54	0.69	0.21–2.30
Marital status	0.29	0.59	0.75	0.27-2.15
Marriage age*	1.37	0.24	0.26	0.03-2.79
Having children*	3.76	0.08	0.13	0.01-1.20
Number of children*	0.28	0.87	0.87	0.16-4.58
Body Mass Index (BMI)	0.01	1.00	1.00	0.26-3.89
Employment	1.00	0.32	0.51	0.13-1.95
Birth order	2.46	0.10	2.79	0.75-10.33
Early school leaver	0.01	1.00	1.00	0.30-3.31
Educational status	0.01	1.00	1.00	0.30-3.31
Parents/guardians' employment status	0.27	0.60	1.31	0.47-3.65
* In married people				
# In people that have children				

Table 5. Differences between self-immolation and demographic variables (cases n =151; controls n=302)				
	x²	p-value	Odds Ratio	95% CI
Family size	2.55	0.11	1.40	0.93-2.13
Marital status	3.75	0.053	1.47	.99-2.18
Marriage age*	1.24	0.27	3.21	0.37-27.99
Having children*	3.76	0.08	0.13	0.01-1.20
Number of children#	0.78	0.38	0.75	0.40-1.43
Employment	9.19	0.002	2.01	1.27-3.17
Birth order	6.46	0.011	0.582	0.38-.89
Early school leaver	3.24	0.072	1.43	0.97-2.12
Educational status	13.79	<0.0001	2.25	1.46-3.47
Parents/guardians' employment status	3.04	0.08	1.72	0.93-3.16
* In married people				
# In people that have children				

4.3 Sub-study III: Familial risk factors for self-immolation(Papers III & V)

The descriptive data of familial variables in the *Main study* and *Preliminary study* are outlined in Table 6. According to this table, cases reported a higher percentage of history of suicide in family (*main study*), having problem with parents, having parents with a history of mental disorders and addiction. Cases also reported higher percentage of marital conflict with the spouse, and were in the lower level of socio-economic status.

The results of chi-square and Fisher's exact tests to determine the association between outcome variable (self-immolation) and the familial risk factors across cases and controls in *Preliminary study* and *Main study* are outlined in Tables 7 and 8, respectively. Of the eleven familial-related risk factors, all but two were associated with self-immolation. They include the socio-economic level of the family', 'death of parents', 'addiction of parents', 'history of mental disorders in parents', 'having problem with parents', 'conflict with other members of family', 'addiction of spouse', 'history of suicide in the family', and 'marital conflict with spouse' ($p \leq 0.01$) (Table 8). In the subgroup of married participants (Table 10) marital conflict and spouse addiction and in the subgroup unmarried participants (Table 11), problem with parents, parents' death and parents' addiction were meaningful in logistic regression model analysis. We were unable to find any other meaningful associations between other variables in the study and the outcome variable.

Table 6. Familial data of "main study" and "preliminary study"

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	case	control
History of suicide in family; N (%)				
Yes	57(38)	69 (23)	9 (30)	13 (43)
No	94(62)	233(77)	21 (70)	17 (57)
Divorce of parents; N (%) #				
Yes	4(6)	4(2)	1 (8)	1 (10)
No	69(94)	171 (98)	11 (91)	9 (90)
Having problem with parents; N (%) #				
Yes	43(58)	45(26)	7 (58)	3 (30)
No	30(42)	130(74)	5 (42)	7 (70)
Death of parents; N (%) #				
Yes	16(22)	18(10)	2 (17)	3 (30)
No	57(78)	157(90)	10 (83)	7 (70)
Having parents with history of mental disorders in; N (%) #				
Yes	15(20)	14(8)	3 (25)	1 (10)
No	58(80)	161(92)	9 (75)	9(90)
Addiction of parents; N (%) #				
Yes	34(47)	40(23)	2 (17)	2 (20)
No	39(53)	135(77)	10(83)	8 (80)
Marital conflict between parents; N (%) #				
Yes	21(29)	32(18)	3 (25)	3(30)
No	52(71)	143(82)	9 (75)	7 (70)
Marital conflict with spouse; N (%)*				
Yes	67(86)	29(23)	13(72)	5(25)
No	11(14)	97(77)	5(27)	15(75)
Conflict with other member of family; N (%)				
Yes	57(38)	56 (19)	20 (67)	5 (17)
No	94(62)	246(81)	10 (33)	25 (83)
Addiction of spouse; N (%) *				
Yes	57(73)	40(32)	6(33)	7(35)
No	21(27)	87(68)	12 (67)	13(65)
Socio-economic Status of family; N (%)				
Low	69(46)	74(25)	12 (40)	9 (30)
Middle	78(52)	212(70)	15 (50)	20 (67)
High	4(2)	16(5)	3 (10)	1 (3)

In unmarried participants; * In married people

Table 7. Differences between self-immolation and familial factors (cases = controls= 30)				
	χ^2	p-value	Odds Ratio	95% CI
History of suicide in family	1.50	0.28	0.56	0.19-1.62
Divorce of parents [#]	0.18	0.89	0.82	0.05-15.00
Having problem with parents [#]	1.78	0.18	2.27	0.55-19.25
Death of parents [#]	0.52	0.46	0.47	0.61-3.57
History of mental disorders in parents [#]	0.55	0.46	2.00	0.26-34.58
Opium addiction of parents [#]	0.41	0.84	0.80	0.09-7.00
Marital conflict between parents [#]	0.07	0.79	0.78	0.12-5.00
Marital conflict with spouse*	8.48	0.004	7.80	1.84-33.09
Conflict with other member of family	15.43	<0.001	10.00	2.94-34.00
Addiction of spouse *	0.12	0.91	0.93	0.24-3.56
Socio-economic Status of family	0.66	0.42	1.56	0.53-4.53

In unmarried participants, all of whom lived with their parent(s); * In married participants, all of whom lived with their spouse

Table 8. Differences between self-immolation and familial factors (cases=151; controls=302)				
	χ^2	p-value	Odds Ratio	95% CI
History of suicide in family	11.13	0.001	2.05	1.34-3.13
Divorce of parents [#]	1.68	0.20	2.48	0.60-10.19
Having problem with parents[#]	24.79	<0.0001	4.14	2.33-7.37
Death of parents[#]	5.89	0.02	2.45	1.17-5.12
History of mental disorders in parents[#]	7.85	0.005	2.97	1.35-6.54
Opium addiction of parents[#]	13.84	<0.0001	2.94	1.65-5.25
Marital conflict between parents [#]	3.37	0.07	1.81	0.96-3.41
Marital conflict with spouse*	78.46	<0.0001	20.37	9.52-43.59
Conflict with other member of family	19.83	<0.001	2.67	1.72-4.13
Addiction of spouse *	33.51	<0.0001	5.90	3.16-11.03
Socio-Economic Status of family	20.93	<0.001	2.59	1.71-3.92

In unmarried participants, all of whom lived with their parent(s); * In married participants, all of whom lived with their spouse

Table 9. Final multivariate logistic regression model of risk factors and effects for self-immolation (cases n=151; controls n=302)			
	Odds Ratio	95% CI	p-value
Adjustment disorders	68.56	33.86-138.85	<0.001
Major depression	40.03	16.5-97.05	<0.001
Opium dependence	17.33	5.40-55.58	<0.001
Individual history of suicide attempts	10.66	4.05-28.04	<0.001

Table 10. Multivariate logistic regression model of risk factors and effects for self-immolation (subgroup: married)			
	Odds Ratio	95% CI	p-value
Spouse Marital Conflict	14.91	6.78-32.75	<0.001
Spouse Addiction	2.73	1.9-9.2	0.009

Table 11. Multivariate logistic regression model of risk factors and effects for self-immolation (subgroup: unmarried)			
	Odds Ratio	95% CI	p-value
Problem with parents	4.80	2.46-9.36	<0.001
Parents' death	4.97	2.13-11.61	<0.001
Parents' addiction	2.10	1.10-4.0	0.024

4.4 Sub-study IV: Psychiatric disorders (Papers IV & V)

The descriptive data of psychiatric disorders in the *Main study* and *Preliminary study* are outlined in Table 12. This table presents a breakdown of Axis I (clinical syndrome) & Axis II (developmental disorders and personality disorders) dimensions of the DSM-IV in the sample. In reference to Axis I disorders, there were higher presentations of ‘adjustment disorder’ and ‘major depression’ in case groups. Also a higher percentage of females were diagnosed with these disorders in both case groups. Reports of other diagnoses of Axis I disorders such as drug and alcohol dependence, GAD, OCD, PTSD and schizophrenia, mania in both case groups were negligible. In reference to Axis-II disorders, only a few borderline and antisocial disorders were reported in the case groups. Other disorders of Axis II in both case and control groups were negligible.

Moreover, the results of chi-square and Fisher’s exact tests to determine the association between outcome variable (self-immolation) and psychiatric disorders across cases and controls in the *Main study* are outlined in Table 13. As illustrated in this table, of the seven Axis I disorders used for the analysis, five were significantly associated with the act of self-immolation. They include adjustment disorders, major depression, opium dependence, schizophreniform and heroin dependence. In addition borderline personality disorders and antisocial personality disorders of Axis-II disorders resulted in significant association with self-immolation ($p \leq 0.01$). Overall, in a multivariate logistic regression model, adjustment disorders, major depression and opium dependence from the psychiatric disorders list were significant independent risk factors for self-immolation (Table 9).

4.4.1 Psychiatric disorders and gender

When the sample was looked at separately by gender, several interesting patterns emerged. First, 75% - or 3 out of the 4 male self-immolation patients in the "*preliminary study*" had diagnoses of drug and alcohol dependency or abuse. Those figures included: 1 with opium dependence, 2 with heroin dependence, 2 with alcohol abuse, and 1 with alcohol dependence (some cases had multiple diagnoses). None of the control group participants had any diagnoses (Table 12). Among female 77% (n = 20) of self-immolation patients had adjustment disorder diagnosis while just 8% (n=2) of the female in control group had that diagnosis (Table 12). In the *main study*, results of multivariate logistic regression model revealed that in the female subgroup, adjustment disorders and major depression and in subgroup male, opium dependence and also major depression were meaningful risk factors (Table 17 and 18).

Table 12. DSMIV-TR Psychiatry disorders data of "main study" and "preliminary study"

Variables	<i>Main Study</i> (case=151; control=302)		<i>Preliminary Study</i> (case=30; control=30)	
	case	control	Case	control
Axis I	N (%)	N (%)	N (%)	N (%)
Adjustment disorders*	93(62)	23(8)	20(67)†	3(10)
Males [#]	12(13)	6(26)	0(0)	1(33)
Females [#]	81(87)	17(74)	20(100)	2(64)
Major depression*	30(20)	11(4)	1(3)	0(0)
Males [#]	9(30)	6(55)	0(0)	0(0)
Females [#]	21(70)	5(45)	1(100)	0(0)
Opium abuse*	1(<1)	0(0)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	1(100)	0(0)	0(0)	0(0)
Opium dependence*	9(6)	7(2)	1(3)	0(0)

Table 12. DSMIV-TR Psychiatry disorders data of "main study" and "preliminary study"

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	Case	control
Males [#]	9(100)	7(100)	1(100)	0(0)
Females [#]	0(0)	0(0)	0(0)	0(0)
Heroin dependence*	2(1)	0(0)	2(7)	0(0)
Males [#]	2(100)	0	2(100)	0(0)
Females [#]	0(0)	0(0)	0(0)	0(0)
Alcohol abuse*	1(<1)	0(0)	2(7)	0(0)
Males [#]	1(100)	0(0)	2(100)	0(0)
Females [#]	0(0)	0(0)	0(0)	0(0)
Generalized Anxiety Disorder*	1(<1)	4(3)	0(0)	2(7)
Males [#]	0(0)	1(25)	0(0)	0(0)
Females [#]	1(100)	3(75)	0(0)	2(100)
PTSD¹*	0(0)	1(<1)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	0(0)	1(100)	0(0)	0(0)
Conversion*	0(0)	1(<1)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	0(0)	1(100)	0(0)	0(0)
Obsessive-Compulsion Disorder*	2(1)	4(1)	0(0)	0(0)
Males [#]	0(0)	1(25)	0(0)	0(0)
Females [#]	2(100)	3(75)	0(0)	0(0)
Schizophrenia*	1(<1)	0(0)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	1(100)	0(0)	0(0)	0(0)
Schizophreniform*	3(2)	0(0)	0(0)	0(0)
Males [#]	2(67)	0(0)	0(0)	0(0)
Females [#]	1(33)	0(0)	0(0)	0(0)
Schizoaffective*	1(<1)	0(0)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	1(100)	0(0)	0(0)	0(0)
Delusional*	0(0)	1(<1)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	0(0)	1(100)	0(0)	0(0)
Mania*	1(<1)	1(<1)	0(0)	0(0)
Males [#]	1(100)	0(0)	0(0)	0(0)
Females [#]	0(0)	1 (100)	0(0)	0(0)
Hypomania*	1(<1)	1(<1)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	1(100)	1(100)	0(0)	0(0)
Dysthymia*	1(<1)	1(<1)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	1(100)	1(100)	0(0)	0(0)
Cyclothymia*	1(<1)	1(<1)	0(0)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	1(100)	1(100)	0(0)	0(0)
Axis II				
Schizoid*	1(<1)	0(0)	0(0)	0(0)
Male [#]	1(100)	0(0)	0(0)	0(0)
Female [#]	0(0)	0(0)	0(0)	0(0)

Table 12. DSMIV-TR Psychiatry disorders data of "main study" and "preliminary study"

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	Case	control
Borderline*	4(3)	1(2)	2(7)	0(0)
Males [#]	2(50)	0(0)	1(50)	0(0)
Females [#]	2(50)	1(100)	1(50)	0(0)
Histrionic*	0(0)	1(<1)	0(0)	0(0)
Males [#]	0(0)	1(100)	0(0)	0(0)
Females [#]	0(0)	0(0)	0(0)	0(0)
Antisocial*	4(3)	0(0)	1(3)	0(0)
Males [#]	4(100)	0(0)	1(100)	0(0)
Females [#]	0(0)	0(0)	0(0)	0(0)
Depressive*	0(0)	0(0)	2(7)	0(0)
Males [#]	0(0)	0(0)	0(0)	0(0)
Females [#]	0(0)	0(0)	2(100)	0(0)

1. Post-Traumatic Stress Disorder; * Percentage between all members of case or control groups; #Percentage between gender members of specific diagnose; † p<0.0001 (in "preliminary study")

Table 13. Differences between self-immolation and psychiatric disorders (cases n =151; controls n=302)

	χ^2	p-value	Odds Ratio	95% CI
Adjustment disorders	153.94	<0.001	19.45	11.37-33.28
Major depression	32.19	<0.001	6.56	3.18-13.51
Opium dependence	3.92	0.048	2.67	0.98-7.32
Heroin dependence	4.01	<0.05	-	-
Generalized Anxiety Disorder	0.40	0.53	0.50	0.06-4.48
Obsessive-Compulsion Disorder	0.00	1.00	1.00	0.18-5.52
Schizophreniform	6.04	0.01	-	-
AXIS II				
Borderline personality disorders	4.96	0.03	8.20	0.91-73.93
Antisocial personality disorder	8.07	0.004	-	-

4.5 Adverse life events risk and protective factors

The descriptive characteristic of the samples regarding adverse life events for both *main study* and *preliminary study* are outlined in Table 14. As depicted in this table, more of the cases reported had financial hardship, relationship break-up, individual history of suicide, and sibling or parent's history of suicide. Moreover, Table 15 and 16, shows the results of chi square analysis testing for association between self-immolation and study risk factors in the "*preliminary study*" and "*main study*", respectively. Of the list of adverse life events in *main study*, six were significantly associated with the act of self-immolation (Table 16). They include: report of homelessness, financial hardship, having problems with friends, report of a breakup in a relationship with a boyfriend/girlfriend or a spouse, having anxiety with school performance, and report of suicide attempts by one's siblings or parents (p= 0.005). However, once the role of these variables were tested in the multivariate logistic regression model, our analysis revealed that only an individual's history of suicide attempts played a statistically significant role as a risk factor for self-immolation (Table 9).

Table 14. Adverse life events data of "main study" and "preliminary study"

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	Case	control
Abortion; N (%)				
Yes	3(2)	6(2)	0(0)	1(3)
No	148(98)	296(98)	0(0)	29(97)
Infertility; N (%) *				
Yes	1(1)	4(3)	3(10)	0(0)
No	77(99)	123(97)	27(90)	30(100)
Homelessness; N (%)				
Yes	3(2)	0(0)	1(3)	0(0)
No	148(98)	302(100)	29(97)	30(100)
Financial hardship; N (%)				
Yes	56(37)	63(21)	10(33)	19(63)
No	95(63)	239(79)	20(67)	11(37)
Problems with friends				
Yes	3(2)	25(8)	2(7)	0(0)
No	148(98)	277(92)	28(93)	30(100)
A relationship break-up (with boyfriend/girlfriend or spouse)				
Yes	38(25)	43(14)	20(67)	1(3)
No	113(75)	259(86)	10(33)	29(97)
School/ university failure				
Yes	3(2)	9(3)	3(10)	0(0)
No	148(98)	293(97)	27(90)	30(100)
Anxiety about school/ university performance				
Yes	7(5)	47(16)	25(83)	29(97)
No	144(95)	255(84)	5(17)	1(3)
Problems at work				
Yes	8(5)	12(4)	3(10)	2(7)
No	143(95)	290(96)	27(90)	28(93)
Forced marriage*				
Yes	2(3)	2(2)	1(6)	0(0)
No	76(97)	125(98)	16(94)	19(100)
Individual history of suicide attempts				
Yes	22(15)	14(5)	20(67)	28(93)
No	128(85)	288(95)	10(33)	2(7)
Sibling or parents' history of suicide attempts				
Yes	8(5)	3(1)	4(13)	7(23)
No	143(95)	299(99)	26(87)	23(77)
Having inability and malignant disease				
Yes	11(7)	23(8)	3(10)	1(3)
No	140(93)	279(92)	27(90)	29(97)
Individual history of mental disorders				
Yes	31(10)	25(17)	3(10)	1(3)
No	271(90)	126(83)	27(90)	29(97)

In unmarried participants; * In married people

Table 15. Test of association between self-immolation and study factors (cases= 30, controls= 30)

	χ^2	p-value	Odds Ratio	95% CI
Abortion	0.35	0.50	2.07	0.18-24.1
Infertility	3.16	0.08	1.12	0.23-2.67
Homelessness	1.02	0.31	1.07	0.03-2.79
Financial hardship	5.41	0.02	3.45	1.19-9.90
Problems with friends	2.10	0.15	0.99	0.16-4.58
A relationship break-up (with boyfriend/girlfriend or spouse)	9.02	0.003	5.45	1.20-11.99
School or university failure	3.16	0.08	1.51	0.13-2.95
Anxiety about school/university performance	2.96	0.09	4.79	0.75-15.33
Problems at work	0.22	0.64	0.64	0.10-4.15
Forced marriage*	1.02	0.31	1.00	0.30-3.31
Individual history of suicide attempts	13.58	<0.001	3.51	1.74-7.08
Sibling or parents' history of suicide attempts	1.00	0.32	1.98	0.51-7.64
Individual history of mental disorders	1.07	0.31	0.31	0.03-3.17
Having inability and malignant disease	1.07	0.30	0.31	0.03-3.17

a. Fisher's exact test is used when N<5

* In married participants, all of whom lived with their spouse

Table 16. Differences between self-immolation and Adverse life events (cases n =151; controls n=302)

	χ^2	p-value	Odds Ratio	95% CI
Abortion	<0.001	1.00	1.00	0.25-4.06
Infertility	0.71	0.40	0.40	0.04-3.64
Homelessness	6.04	0.01	0.00	-
Financial hardship	13.68	<0.001	2.24	1.45-3.44
Problems with friends	6.87	0.009	0.23	0.07-0.76
A relationship break-up (with boyfriend/girlfriend or spouse)	8.19	0.004	2.03	1.24-3.30
School or university failure	0.39	0.54	0.66	0.17-2.47
Anxiety about school/university performance	11.45	0.001	0.26	0.12-0.60
Problems at work	0.42	0.52	1.35	0.54-3.38
Forced marriage*	0.25	0.62	1.65	0.23-11.92
Individual history of suicide attempts	3.50	0.06	1.79	0.97-3.32
Sibling or parents' history of suicide attempts	7.87	0.005	5.58	1.46-21.33
Having inability and malignant disease	0.16	0.90	0.95	0.45-2.01
Individual history of mental disorders	3.68	0.055	1.74	0.98-3.06

a. Fisher's exact test is used when N<5

* In married participants, all of whom lived with their spouse

Table 17. Multivariate logistic regression model of risk factors and effects for self-immolation (subgroup: female)

	Odds Ratio	95% CI	p-value
Adjustment disorders	107.04	42.70-268.33	<0.001
Major depression	93.64	26.46-331.34	<0.001
Individual history of suicide attempts	22.09	5.89-82.82	<0.001
Spouse Addiction*	4.35	1.81-10.26	0.001

* In married people

Table 18. Multivariate logistic regression model of risk factors and effects for self-immolation (subgroup: male)

	Odds Ratio	95% CI	p-value
Major depression	4.81	1.52-15.27	0.008
Opium dependence	4.13	1.36-12.57	0.013

4.6 Potential factors for future prevention interventions

The descriptive data, in reference to potential protective factors, for both the *Main study* and *Preliminary study* are outlined in Table 19. This data reveals that the means of self-immolation in most of the patients was kerosene. Imitational self-immolation was more frequent in self-immolation cases. Nearly all the patients in the case and control groups had easy access to the means of self-immolation. Only, a small percentage of the patients in both groups were aware of the burn complications from self-immolation. Table 20 and 21 show the results of chi square analysis testing for the associations between self-immolation and study risk factors in the *Preliminary study* and *Main study*, respectively. These comparisons suggest a non-significant difference in both the case and control groups in respect to 'easy access to the means of self-immolation', especially kerosene fuel, or awareness about medical complications of burns (Table 20-21).

Interestingly, in both case and control groups, we found that the majority of patients had not used any "consulting" services to solve or manage their problems. The multivariate logistic regression analyzes revealed that use of consulting services has a protective role to prevent self-immolation (Table 22). In addition, unplanned (impulsive) self-immolation was detected in more than 70% of all patients and the association between the two variables was statistically significant across males and female.

Table 19. Potential protective data of "main study" and "preliminary study"

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	case	control
The means of self-immolation				
Kerosene	140 (93)	-	28 (94)	-
Domestic gas	7(5)	-	1(3)	-
Petrol	3(2)	-	1(3)	-
Other	1(<1)	-	0(0)	-
Imitational self-immolation				
Yes	83 (55)	-	17(57)	-
No	68(45)	-	13(43)	-
Planning for self-immolation				
Yes	36(24)	-	6(20)	-
No (impulsive)	115(76)	-	24(80)	-
Having access to the means of self-immolation				
Yes	150 (99)	300(99)	30(100)	30(100)
No	1(1)	2(1)	0(0)	0(0)
The main domestic fuel of family				
Kerosene	81(54)	152(51)	25(83)	22(73)
Domestic gas	69(46)	146(48)	5(17)	8(27)
Wood	1(<1)	4(1)	0(0)	0(0)
Awareness about burns complications				
Yes	7 (5)	24(8)	1(3)	5(17)
No	144 (95)	278(92)	29(97)	25(83)
Consulting services used				
Yes	34(23)	128(42)	3(10)	8(27)
No	117(77)	174 (58)	27(9)	22(73)

Table 19. Potential protective data of "main study" and "preliminary study"

Variables	Main Study(case=151; control=302)		Preliminary Study (case=30; control=30)	
	case	control	case	control
Type of consulting services				
Psychiatry/Psychology consulting services	15(44)	29(23)	-	-
Religion Leader	0(0)	2(2)	-	-
Parents	3(9)	49(38)	-	-
Friends	15(44)	48(37)	-	-
Others	1(3)	0(0)		

Table 20. Test of association between self-immolation and potential factors for intervention across cases (n = 30) and controls (n = 30)

	χ^2	p-value	Odds Ratio	95% CI
The main domestic fuel of family	0.88	0.35	1.82	0.52-6.38
Awareness about burns complications	2.96	0.09	5.80	0.64-53.01
Consulting services applying	2.78	0.10	3.27	0.77-13.83

Table 21. Difference between self-immolation and variables (cases n =151; controls n=302)

	χ^2	p-value	Odds Ratio	95% CI
The main domestic fuel of family	0.76	0.68	1.82	0.52-6.38
Awareness about burns complications	1.73	0.19	0.56	0.24-1.34
Consulting services used	17.30	<0.001	0.40	0.25-0.62
Having access to the means of self-immolation	0.00	1.00	1.00	0.09-11.12

Table 22. Final multivariate logistic regression model of protective factors for self-immolation (cases n=151; controls n=302)

	Odds Ratio	95% CI	p-value
Consulting services utilization	0.44	0.24-0.81	0.008
Anxiety about school/university performance	0.35	0.15-0.83	0.018

5 DISCUSSION

5.1 RISK FACTORS FOR SELF IMMOLATION

5.1.1 Socio-demographic characteristics

In contrast with findings from high-income countries where the prevalence of self-immolation tends to be higher among older males [19, 48-50, 53, 77], in the current study the percentage of self-immolation was highest in the 16 to 25 years age groups (60%) and females (76%). Considering that the suicide rate is often underreported, this finding is alarming. Also, nearly 70% of the cases were housewives, which is similar to the characteristics of women who attempted to suicide in Iran [78].

Our results are similar to findings from other parts of Iran, as well as other countries in the region [5, 9, 10, 13, 14, 15, 16, 20- 23, 25, 28, 31, 79-81]. Indeed, it is reported that approximately 70 - 96% of all self-immolation cases that are treated in burn centers in Iran are women [15, 61, 80, 81]. In a study from Afghanistan of 523 burn patients in a one-year period, 21 were due to self-immolation and the median age of the victims was 19 years old [23]. In Sir Lanka of 151 suicide patients in one year, 51 (34%) died of self-immolation and the victims were women between 20-29 years old [82]. Naghavi reports that among Iranian women, self-immolation was the 3rd leading factor for Years of Life Lost [8]. Self-immolation data from different regions in Iran has constantly shown higher incidence in women.

The question then is: why do women in these regions resort to such a violent act of self-harm. What we know from the existing empirical evidence is that a suicide attempt for the majority of women is a call for attention and a "Cry for Help" [5, 9]. In this respect, committing self-immolation may be no exception to the rule. However, why self-immolation? Anecdotal reports reveals that these young women indeed under-estimate the violent and dangerous consequences of suicide by burning and the possibility that not only they may end up surviving but living with serious physical and psychological sequelae. Culturally sensitive interventions are needed to educate and raise awareness among women about the prevalence and the personal, social, and economic consequences of self-immolation [5, 15]. Further studies are needed to investigate self-immolation within the context of traditional gender roles. These studies can shed light on the adaptability process and conflict-resolution mechanisms that women use to alleviate the pressure of gender role expectations and responsibilities. It is equally important to assist women who have attempted to self-immolate to sort out their cognitive schemas and the meanings in their suicide experience to prevent future events. Collecting data from other members of the family such as the spouse also may provide additional insights about family functioning in the context of gender roles [5].

Of note, we also identified 13 cases (9%) of self-immolations in the 11 to 15 years old age category, suggesting appropriate interventions should also be targeted toward youth. School-based self-immolation awareness and peer-support counseling may be needed to reach out to teenage girls for early prevention.

With respect to the role of other socio-demographic characteristics in self-immolation, the empirically supported leading idea is that higher SES is a protective factor. In such a way that it raises one's awareness and equips one with coping resources, which in turn helps with managing the life experiences that trigger suicide ideations and suicide attempts [41, 83]. On the other hand, living in rural areas compounded with lower SES has been identified as a potential risk factor for suicide in most of the lower to middle

income countries [41, 84]. In our study a high percentage of the cases (45%) were living in the rural areas, were married, and were housewives, and had low education. However, in regression analysis of main study, socioeconomic status did not play any major role in predicting suicide behavior, but, once we compared the rates of self-immolation across different provinces in Iran (Study-I), socioeconomic status played a major role in predicting self-immolation behavior [9]. One possible reason could be that in Kermanshah, especially in rural areas, the majority of women are from a lower SES, and this group makes up nearly all the self-immolation cases [10] as we discovered in the current study. However, since in our study we matched the cases and controls by district (urban vs. rural living), as well as age and gender, we may have reduced the chance for this confounding variable to induced variations between these two groups. This could explain why SES did not play any significant role in determining self-immolation in this study.

5.1.2 Family circumstances

In respect to the familial characteristics, we noted a higher percentage of self-immolation in cases who reported having a spouse with addiction problems, having a family with a history of suicide, experiencing parental marital conflict, having deceased parent(s), having marital conflict with the spouse, having parents with a history of mental disorders and/or addiction, and having problems with parents. However, all the familial factors lost their predictive power once we adjusted for their independent roles in the logistic model (Table 9).

Previous researchers have noted a relationship between addictive disorders among other family members and suicide [36, 38, 42]. But similar to our findings, those who have examined the associations between familial factors and self-immolation have not thus far identified any significant role for these variables in predicting self-immolation in low to middle income countries [5, 9, 15, 85]. This could be yet another indication that the risks for self-immolation in Iran differ from suicide risks in other countries. More studies with large enough samples are needed to independently examine the facilitating and inhibiting role of familial attributes on self-immolation.

As for married couples in our sample, the subsample analysis showed that among married couples those with marital conflict and spouse addiction; and among unmarried individuals those who had problem with parents or reported parents' death, or parent addiction had greater odds of committing self immolation. This finding suggests culturally sensitive interventions ingrained with the local culture could help with improving couples' problem-solving and coping skills, as well as management of interpersonal conflicts. In particular, cognitive-behavioral therapy could be helpful in preventing self-immolation, as it has been effective in reducing the likelihood of suicide in general [5]. In addition, the establishment of self-immolation prevention centers that can offer telephone as well as face-to-face counseling to the individuals in need of such services would be a positive step. These centers also can offer outreach screening activities to identify individuals at-risk individuals for self-immolation and refer them further for counseling. In an earlier study we also report that a victim-story-based intervention that was designed to raise awareness among people about the side effects of burns and to increase the coping skills of young men and women living in Gilanharb (a city in Kermanshah) yielded a 57% decrease in self-immolations in compared to the Sarpolzahab (the control site) [15].

Local community-action groups and non-government organizations (NGOs) also are important unites for engaging in self-immolation prevention activities. They also can

provide support for the patients who have attempted self-immolation or family members of the victims. Their staff can be trained to facilitate factors that mitigate pathological responses to stress. For example helping women at-risk for suicide to expand their support network and build stronger relationships with their family members [2, 17]. Elicitation interviews are needed to facilitate and encourage women to openly discuss their life experiences in the context of familial factors, and identify ways in which they come to term with familial related difficulties and challenges.

5.1.3 Diagnostic mental disorders

Axis-I and Axis-II dimensions of the DSM-IV identify clinical syndrome and developmental disorders and personality disorders. In reference to our sample there was a higher presentation of adjustment disorder and major depression in the case group compared to the control group (Axis-I), and women were over-represented with these disorders in both groups. Diagnosis of drug and alcohol dependence, GAD, OCD, PTSD and schizophrenia, mania (other Axis-I disorders) in both groups were negligible. As for Axis-II disorders, less than a handful of the cases were diagnosed with 'borderline' and 'antisocial' disorders in the case group. Presentation of these disorders in the control group was near zero. Ultimately, once we tested for the independent role of psychiatric disorders in predicting self-immolation in cases and control groups, cases with the diagnoses of adjustment disorder, opium dependence, and major depression had a higher odds of exposure to self immolation ($p < 0.001$). Interestingly, these are typical risk factors for suicidal behaviors identified by previous researchers using adult or adolescent samples [47-5454, 58, 59, 63, 56-86].

Analyses of psychological autopsy data also indicate a high representation of adjustment disorders among suicide completers. In a Swedish study 14% of 58 suicide victims were classified as having adjustment disorders [60]. One study also shows that 9% of suicide victims had a diagnosis of adjustment disorder. This study also reports that suicidal behavior among patients with adjustment disorders was less likely to be planned [46]. Others studying the life-time risk of suicide have warned of the synergistic effect of substance abuse, personality disorder, and adjustment disorder in contributing to the suicide risk profile of individuals [84].

Empirical results in Iran, however, indicate that adjustment disorder is the most prevalent psychiatric diagnosis relating to self-immolation [5, 20]. Zarghami revealed that of 318 cases of self-burning in Mazandaran, Iran in three years, 95% had a psychiatric diagnosis - mostly adjustment disorder [20]. Interestingly, the results of our subsample analysis revealed that adjustment disorder was significantly more prevalent in women compared to men in the case group, and the diagnosis of substance abuse was significantly more prevalent in men compared to women in the case group. Presentation of these diagnoses in the control group was quite negligible.

Life stress theories have particular relevance in discussing our findings. Specifically, proponents of the diathesis-stress model describe that people's biological, physiological, and cognitive make up shape their reactions to stress [88, 89]. According to this model, it is expected that women with a higher level of environmental, contextual, and interpersonal stress will be at higher risk for suicide. The majority of women in our case group were diagnosed with major depression and adjustment disorder. Most of them experiencing marital conflicts, and the spouses of 73% of these women were addicted to some type of substance. These women, then, are at higher risk to attempt to self-immolation. Low-cost brief interventions that are aimed at minimizing the impact of daily stress would be advantageous to the mental well-being

of at-risk women, and subsequently can be life saving. Brief interventions seem to have an effective track record in suicide prevention, especially in low resource countries [90]. For example, local clinicians could screen all women, identify those who are diagnosed with adjustment disorder and treat those who require short-term treatment. However, women who present with pre-existing symptomatology or predisposing characteristics such as stress intolerance, or suicidal ideation could be referred for appropriate long-term counseling [46, 59, 91-93].

Clinicians also should intervene with the parents of children with adjustment disorder to help these parents cope better with their care-giving stress, which in turn could minimize the likelihood of pathological adjustment of the children to their disorder. Culturally sensitive screening tools also can enable clinicians to assess their patients' level of vulnerability to long-term stress and daily problems in the context of their capacity for adaption, coping abilities, and resiliency. Additionally, tailored, reliable and valid screening tools can help clinicians with the identification of at-risk patients with adjustment disorder.

5.1.4 Experience of adverse life events

Although, data on the history of adverse life-events among victims of self-immolation is sparse, experiencing such events has been recognized as a risk factor for suicide [35, 36, 47, 57, 63, 64, 65, 67, 94]. In our study a higher percentage of cases reported having 'financial hardship', 'relationship break-up (with boyfriend/girlfriend or spouse)', 'history of suicide', and 'sibling or parents' history of suicide', compared to the control group. Of these factors, however, only 'individual history of suicide attempts' maintained its predictive power in the adjusted regression model (Table 9).

This finding is in line with a more fundamental finding of the relationship between the history of suicide attempts and suicide in general, reported so frequently across suicide literature [95-97]. According to Joiner's interpersonal-psychological model of suicide, the motivation to commit suicide is embedded in having a feeling of burdensomeness, having a low sense of belonging, and having the capability for suicide [97]. He argues that previous suicide attempts in fact equip the individual with a level of acquired capability that is needed to commit suicide [97]. More specifically Joiner shows in his study that the frequency of suicidal behavior predicts current suicidal symptoms even when the symptoms of the Axis I and Axis II syndromes are controlled [97]. Forman and colleague point that multiple suicide attempters compared to one time attempters are more likely to exhibit signs of severe psychopathology, suicidality, and difficulty in their interpersonal relationships. They also seem to form a group with a homogeneous background such as having a history of child abuse and poor interpersonal relationships. The authors suggest that early identification of this group may afford them the chance of receiving timely and appropriate psychotherapeutic care [98]. Miranda and colleagues suggest that screening for past suicide attempts should routinely include inquiry about the frequency of attempts [99]. Indeed, studies that have focused on differentiating between multiple attempters and one-time attempters and the suicide outcome point out the heterogeneous property of these constructs [99]. These studies signify the importance of discriminating between these two concepts when investigating for the behavioral markers of suicide and prevention strategies. In the light of the existing evidence that past suicide attempts are strong predictors for future suicide behaviors, our findings suggest that previous suicide attempters should be monitored carefully by the clinician for early identification of signs of low sense of belonging and perceived sense of burdensomeness, and receive appropriate referral for therapeutic treatment [100].

5.2 LIMITATIONS

This was a retrospective study and this limits causality. Also the lack of statistically significant association in some areas such as adverse life events might have been the result of the sample size limiting our statistical power to detect such relationships. Due to the small sample, also, we could not identify the pathways or the interaction of risk factors that would lead to self-immolation, or the pathway through which protective factors could moderate or mediate the negative impact of risk factors. This is an area for further study with a large prospective cohort study. Another limitation of the study concerns generalizability. The sample for this study was recruited from one region of Iran, and therefore results cannot necessarily be generalized to other parts of Iran or to other countries.

This study, however, offers some strengths. Most prominently, it is the first large-scale study to use a case-control design to examine the risk factors associated with self-immolation in Iran. Additionally, it was conducted in a region where the self-immolation rate is among the highest in the world.

5.3 IMPLICATIONS

Suicide is highly stigmatized and condemned for religious or cultural reasons in Iran, therefore, it is a secretive act and considered taboo. Our identification of risk factors provides valuable information for future targeted treatment and prevention programs. Non-government organizations (NGOs) in local communities should become more proactive in suicide prevention activities by advocating for ethno-cultural-friendly family counseling programs [101]. These programs have the potential to enhance the resilience of at-risk, local women. They could help women to speak up and turn away from self-silencing. This is especially important since in Islamic tradition suicide is condemned and it is taboo to discuss or report it. Religious leaders also have an important role in eradicating the stigma of mental illness in their community and encouraging the local residents to participate in disseminating the message of a suicide-free community.

Clinicians as well, should be observant and make sure to provide appropriate care to female patients who present with symptoms of depression and signs of mental distress [102]. In providing appropriate care, clinicians should identify the coping styles and mental resiliency of these women. Collaboration between NGOs and the local primary care providers can help to enhance providers' awareness of the culture of suicide in their community, and the values and beliefs of the local residents. This improves mutual trust between the clinicians and their local patients, and therefore facilitates the provision of needed care.

Since the majority of the NGO staff works in under-resourced communities. [89], they can benefit from low cost, basic suicide prevention training courses that will not require highly skilled training staff. Trained NGO staff can not only help with suicide prevention strategies, but also help with collection of suicide related data, and identification of priority geographic areas for interventions, as well. In addition, validated suicide screening tools can help clinicians with the identification of behavioral, verbal, and environmental risk factors for self-immolation.

6 CONCLUSION

This study presents a timely examination of self-immolation risk and the protective factors in a region of the world that presents the highest prevalence of this suicide method. It is also an attempt to reveal the psycho-socio make-up of a person that triggers self-immolation. Our findings revealed that self-immolation is more prevalent in young women, and that the risk factors for self-immolation seem to be similar across genders, except for diagnosis of opium dependence. In another words, self-immolation was associated with adjustment disorder, major depression, and an individual's history of suicide attempts in both men and women. Using multiple adjusted logistic regression analysis, each of these variables was an independent predictor of self-immolation. The diagnosis of opium dependence only increased the likelihood of self-immolation in men.

As for the married subgroup, reports of marital conflict and spousal addiction increased the odds of being in the case group. This study revealed that in the unmarried subgroup "problems with parents", "parents' death", and "parents' addiction" were predictors for self-immolation. Furthermore, we found that nearly all the self-immolation cases used kerosene, as reported by Mehrpour and colleagues [80]. These findings can have important implication since they are the results of the first and only large-scale, case-control study identifying a constellation of predisposing (age, gender, familial factors), precipitating (mental disorders, familial factors), and enabling factors (availability of kerosene) in increasing the incidence of self-immolation. This calls for multifaceted self-immolation intervention that: 1) includes policy measures to restrict access and use of kerosene; 2) embraces culturally sensitive self-immolation awareness educational strategies; and 3) invites and involves religious leader in mobilizing their community against the obstacles to mental health and prevention of suicide.

Additional research is needed, both qualitative and quantitative to explore and identify the mechanism by which the aforementioned psycho-socio-cultural risk factors may trigger self-immolation. Longitudinal cohort studies are needed to follow up on the suicidal behaviors of the self-immolation victims. A narratives approach can be useful in examining how victims of self-immolation come to terms with their experiences and struggle with their self-immolation-related burn injuries. These narratives can help clinicians and public health interventionists to develop motivational messages to enhance women's willingness to seek counseling and mental health-related care. They also could shed some light on the cognitive schema that encourage self-silencing in women and therefore inhibits their expression of emotional needs, as well as their need to speak about the distressing aspects of their gender role. These studies can inform development of interventions to replenish the psychosocial reserve capacity for coping, among women at risk for self-immolation.

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8 REFERENCES

1. World Health Organization. *Public health action for the prevention of suicide: a framework*. Geneva, Switzerland: World Health Organization; 2012 Available at:http://apps.who.int/iris/bitstream/10665/75166/1/9789241503570_eng.pdf Accessed January 2012.
2. Bertolote JM, Fleischmann A. A global perspective on the magnitude of suicide mortality. In: D Wasserman and C Wasserman (eds.). *Oxford Textbook of Suicidology and Suicide Prevention: a global perspective*. Oxford: Oxford University Press, 2009. p.91-98.
3. World Health Organization. *World Health Report 2003: Shaping the Future*. Geneva, Switzerland: World Health Organization; 2003. Available at:http://www.who.int/whr/2003/en/whr03_en.pdf. Accessed January 2012.
4. Poeschla B, Combs H, Livingstone S, Romm S, Klein MB. Self-immolation: socioeconomic, cultural and psychiatric patterns. *Burns*, 2011. 37(6): p. 1049-57.
5. Ahmadi A, Suicide by Self-Immolation: Comprehensive Overview, Experiences and Suggestions. *Journal of Burn Care and Research*, 2007. 28(1): p. 30-41.
6. Bertolote, J.M. Fleischmann A. Suicide and psychiatric diagnosis: a worldwide perspective. *World Psychiatry*, 2002. 1(3): p. 181-5.
7. Hoven, CW, Mandell DJ, Bertolote JM. Prevention of mental ill-health and suicide: public health perspectives. *Eur Psychiatry*, 2010. 25(5): p. 252-6.
8. Naghavi M. The mien of mortality and morbidity in 23 provinces of Iran. 2005 (Tir 1384), Tehran:Ministry of Health, Treatment and Medical Education.
9. Ahmadi A, Mohammadi R, Stavrinou D, Almasi A, Schwebel DC. Self-immolation in Iran. *J Burn Care Res*, 2008. 29(3): p. 451-60.
10. Ahmadi A. Frequency of self-immolation in attempted suicide patients in West Islam Abad city (1997-2003). *J Behood*, 2005. 9(1): p. 26-37 [in Farsi].
11. Ahmadi A, Mohammadi R, Schwebel DC. Self-immolation: what are the research priorities? *J Burn Care Res*, 2009. 30(4): p. 758.
12. National Research Center for Medical Sciences, Secretariat of Applicable Research-I.R. Iran, the mien of health in Iran. Tehran: Tabalvor Publishing Co; 2002. p. 1381.
13. Heydari PA. Psychosocial situations of suicidal attempts in Hamedan. *Andisheh va Raftar*, 1997. 1(2): p. 19-31[in Farsi].
14. Maghsoudi H, Garadagi A, Jafary GA, Azarmir G, Aali N, Karimian B, Tabrizi M. Women victims of self-inflicted burns in Tabriz, Iran. *Burns*, 2004. 30(3): p. 217-220.
15. Ahmadi A. Ytterstad B. Prevention of self-immolation by community-based intervention. *Burns*, 2007. 33(8): p. 1032-1040.
16. Rezaeian M, Sharifi G. Self-immolation is the most important way for suicide in Eilam province (a survey from 1996 to 2003). *J Andishe va Raftar*, 2004: p. 21:289.
17. US. Surgeon General, National strategy for suicide prevention: goals and objectives for action. 2001, U.S. Department of Health and Human Services, Public Health Service: Rockville, MD.
18. Laloe V. Patterns of deliberate self-burning in various parts of the world. A review. *Burns*, 2004. 30(3): p. 207-15.
19. Palmu R, Isometsä E, Suominen K, Vuola J, Leppävuori A, Lönnqvist J. Self-inflicted burns: an eight year retrospective study in Finland. *Burns*, 2004. Aug;30(5): p. 443-7.

20. Zarghami M, Khalilian A. Deliberate self-burning in Mazandaran, Iran. *Burns*, 2002. 28(2): p. 115-9.
21. Shrivastava P, Som D, Nandy S, Saha I, Pal PB, Ray TG, Haldar S. Profile of postmortem cases conducted at a morgue of a tertiary care hospital in Kolkata. *J Indian Med Assoc*, 2010. 108(11): p. 730-3.
22. Fernando R, Hewagama M, Priyangika WD, Range S, Karunaratne S. Study of suicides reported to the Coroner in Colombo, Sri Lanka. *Med Sci Law*, 2010. 50(1): p. 25-8.
23. Padovese V, De Martino R, Eshan MA, Racalbuto V, Oryakhail MA. Epidemiology and outcome of burns in Esteqlal Hospital of Kabul, Afghanistan. *Burns*, 2010. 36(7): p. 1101-6.
24. Onarheim, H., Vindenes HA. High risk for accidental death in previously burn-injured adults. *Burns*, 2005. May;31(3): p. 297-301.
25. Maghsoudi H, Samnia R, Garadaghi A, Kianvar H. Burns in pregnancy. *Burns*, 2006. 32(2): p. 246-50.
26. Subba SH, Binu VS, Menezes RG, Kanchan T, Arun M, Patil R, Pant S, Saha A, De A, Rana MS. Pattern and trend of deliberate self-harm in western Nepal. *Journal of Forensic Sciences*, 2009. 54(3): p. 704-7.
27. Chen YY, Chen YY, Wu KC, Yousuf S, Yip PS. Suicide in Asia: opportunities and challenges. *Epidemiologic Reviews*, 2012. 34(1): p. 129-44.
28. Rezaie L, Khazaie H, Soleimani A, Schwebel DC. Self-immolation a predictable method of suicide: a comparison study of warning signs for suicide by self-immolation and by self-poisoning. *Burns*, 2011. 37(8): p. 1419-26.
29. Wu KC, Chen YY, Yip PS. Suicide methods in Asia: implications in suicide prevention. *International Journal of Environmental Research and Public Health*, 2012. 9(4): p. 1135-58.
30. Sheth H, Dziejewski P, Settle JA. Self-inflicted burns: a common way of suicide in the Asian population. A 10-year retrospective study. *Burns*, 1994. 20(4): p. 334-5.
31. Lari AR, Joghataei MT, Adli YR, Zadeh YA, Alaghebandan R. Epidemiology of suicide by burns in the province of Isfahan, Iran. *J Burn Care Res*, 2007. 28(2): p. 307-11.
32. Melhem NM, Walker M, Moritz G, Brent DA. Antecedents and sequelae of sudden parental death in offspring and surviving caregivers. *Archives of Pediatrics and Adolescent Medicine*, 2008. 162(5): p. 403-10.
33. Christiansen E, Larsen KJ, Agerbo E, Bilenberg N, Stenager E. Incidence and risk factors for suicide attempts in a general population of young people: A Danish register-based study. *Australian and New Zealand Journal of Psychiatry*, 2013 Mar;47(3): p. 259-70
34. King CA, Merchant CR. Social and interpersonal factors relating to adolescent suicidality: a review of the literature. *Arch Suicide Res*, 2008. 12(3): p. 181-96.
35. Zhang YQ, Yuan GZ, Li GL, Yao JJ, Cheng ZH, Chu X, Liu CJ, Liu QH, Wang AR, Shi GZ, Wang BH, Cheng YR, Zhang ML, Li K. [A case-control study on the risk factors for attempted suicide in patients with major depression]. *Zhonghua Liu Xing Bing Xue Za Zhi*, 2007. 28(2): p. 131-5.
36. Palacio C, García J, Diago J, Zapata C, Lopez G, Ortiz J, Lopez M. Identification of suicide risk factors in Medellin, Colombia: a case-control study of psychological autopsy in a developing country. *Arch Suicide Res*, 2007. 11(3): p. 297-308.

37. Mittendorfer-Rutz E, Rasmussen F, Wasserman D. Familial clustering of suicidal behaviour and psychopathology in young suicide attempters. A register-based nested case control study. *Social Psychiatry and Psychiatric Epidemiology*, 2008. 43(1): p. 28-36.
38. Abeyasinghe R, Gunnell D. Psychological autopsy study of suicide in three rural and semi-rural districts of Sri Lanka. *Social Psychiatry and Psychiatric Epidemiology*, 2008. 43(4): p. 280-5.
39. Duberstein PR, Conwell Y, Conner KR, Eberly S, Evinger JS, Caine ED. Poor social integration and suicide: fact or artifact? A case-control study. *Psychological Medicine*, 2004. 34(7): p. 1331-7.
40. Compton MT, Thompson NJ, Kaslow NJ. Social environment factors associated with suicide attempt among low-income African Americans: the protective role of family relationships and social support. *Social Psychiatry and Psychiatric Epidemiology*, 2005. 40(3): p. 175-85.
41. Gururaj G, Isaac MK, Subbakrishna DK, Ranjani R. Risk factors for completed suicides: a case-control study from Bangalore, India. *Inj Control Saf Promot*, 2004. 11(3): p. 183-91.
42. van der Hoek W, Konradsen F. Risk factors for acute pesticide poisoning in Sri Lanka. *Tropical Medicine and International Health*, 2005. 10(6): p. 589-96.
43. Gonda X, Pompili M, Serafini G, Montebovi F, Campi S, Dome P, Duleba T, Girardi P, Rihmer Z. Suicidal behavior in bipolar disorder: Epidemiology, characteristics and major risk factors. *J Affect Disord*. 2012 Dec 20;143(1-3): p. 16-26.
44. Finseth PI, Morken G, Andreassen OA, Malt UF, Vaaler AE. Risk factors related to lifetime suicide attempts in acutely admitted bipolar disorder inpatients. *Bipolar Disord*, 2012. 14(7): p. 727-734.
45. Montross LP, Kasckow J, Golshan S, Solorzano E, Lehman D, Zisook S. Suicidal ideation and suicide attempts among middle-aged and older patients with schizophrenia spectrum disorders and concurrent subsyndromal depression. *J Nerv Ment Dis*, 2008. 196(12): p. 884-90.
46. Borges G, Angst J, Nock MK, Ruscio AM, Kessler RC. Risk factors for the incidence and persistence of suicide-related outcomes: a 10-year follow-up study using the National Comorbidity Surveys. *J Affect Disord*, 2008. 105(1-3): p. 25-33.
47. Chiou P, Chen Y, Lee Y. Characteristics of adolescent suicide attempters admitted to an acute psychiatric ward in Taiwan. *J Chin Med Assoc*, 2006. Sep;69(9): p. 428-35.
48. Pham TN, King JR, Palmieri TL, Greenhalgh DG. Predisposing factors for self-inflicted burns. *J Burn Care Rehabil*, 2003. 24(4): p. 223-7.
49. Horner BM, Ahmadi H, Mulholland R, Myers SR, Catalan J. Case-controlled study of patients with self-inflicted burns. *Burns*, 2005. 31(4): p. 471-5.
50. Mulholland R, Green L, Longstaff C, Horner B, Ross E, Myers S, Catalan J. Deliberate self-harm by burning: a retrospective case controlled study. *Journal of Burn Care and Research*, 2008. 29(4): p. 644-9.
51. Kumar V. Burnt wives--a study of suicides. *Burns*, 2003. 29(1): p. 31-5.
52. Ahmadi A, Mohammadi R, Schwebel DC, Yeganeh N, Hassanzadeh M, Bazargan-Hejazi S. Psychiatric Disorders (Axis I and Axis II) and Self-Immolation: A Case-Control Study from Iran. *J Forensic Sci*, 2010. Mar 1;55(2): p. 447-50.

53. Rothschild MA, Raatschen HJ, Schneider V. Suicide by self-immolation in Berlin from 1990 to 2000. *Forensic Sci Int*, 2001. 124(2-3): p. 163-6.
54. Seoighe DM, Conroy F, Hennessy G, Meagher P, Eadie P. Self-inflicted burns in the Irish National Burns Unit. *Burns*, 2011. 37(7): p. 1229-32.
55. Karch DL, Logan J, Patel N. Surveillance for violent deaths--National Violent Death Reporting System, 16 states, 2008. *MMWR Surveill Summ*, 2011. 60(10): p. 1-49.
56. Magat RC, Guerrero AP. Suicidal behavior trends in a pediatric population in Hawai'i. *Hawaii Med J.*, 2008. 67(3): p. 69-73.
57. Way BB, Miraglia R, Sawyer DA, Beer R, Eddy J. Factors related to suicide in New York state prisons. *Int J Law Psychiatry.*, 2005. May-Jun28(3): p. 207-21.
58. Suss A, Homel P, Wilson TE, Shah B. Risk factors for non-fatal suicide behaviors among inner-city adolescents. *Pediatr Emerg Care*, 2004. 20(7): p. 426-9.
59. Kryzhanovskaya L, Canterbury R. Suicidal behavior in patients with adjustment disorders. *Crisis*, 2001. 22(3): p. 125-31.
60. Runeson B. Mental disorder in youth suicide. DSM-III-R Axes I and II. *Acta Psychiatr Scand*, 1989. 79(5): p. 490-7.
61. Saadat M, Bahaoddini A, Mohabatkar H, Noemani K. High incidence of suicide by burning in Masjid-i-Sulaiman (southwest of Iran), a polluted area with natural sour gas leakage. *Burns*, 2004 Dec;30(8): p. 829-32.
62. American Psychiatric Association , DSM IV-TR, Diagnostic and Statistical Manual of Mental Disorders, ed. 4. Washington DC: American Psychiatric Association (AMA). 2000.
63. Sunnqvist C, Westrin A, Träskman-Bendz L. Suicide attempters: biological stressmarkers and adverse life events. *European Archives of Psychiatry and Clinical Neuroscience*, 2008. 258(8): p. 456-462.
64. Renaud J, Berlim MT, McGirr A, Tousignant M, Turecki G. Current psychiatric morbidity, aggression/impulsivity, and personality dimensions in child and adolescent suicide: a case-control study. *Journal of Affective Disorders*, 2008. 105(1-3): p. 221-8.
65. Donald M, Dower J, Correa-Velez I, Jones M. Risk and protective factors for medically serious suicide attempts: a comparison of hospital-based with population-based samples of young adults. *Aust N Z J Psychiatry*, 2006. Jan;40(1): p. 87-96.
66. Marczyńska-Wdówwik AM. [Selected coping resources and critical situations as the risk factors of adolescent's suicide attempts]. *Wiad Lek*, 2002. 55 Suppl 1(Pt 2): p. 791-5.
67. Sadock, B. and V. Sadock, Kaplan & Sadock's comprehensive textbook of psychiatry. 2000, Baltimore: Lippincott Williams& Wilkins.
68. Krysinska K, Lester D. Post-traumatic stress disorder and suicide risk: a systematic review. *Arch Suicide Res*, 2010. 14(1): p. 1-23.
69. Masocco M, Pompili M, Vichi M, Vanacore N, Lester D, Tatarelli R. Suicide and marital status in Italy. *Psychiatr Q.*, 2008. Dec;79(4): p. 275-85.
70. Griffiths C, Ladva G, Brock A, Baker A. Trends in suicide by marital status in England and Wales, 1982-2005. *Health Stat Q*, 2008. Spring(37): p. 8-14.
71. Barber JG, Blackman EK, Talbot C, Saebel J. The themes expressed in suicide calls to a telephone help line. *Soc Psychiatry Psychiatr Epidemiol*, 2004. 39(2): p. 121-5.

72. Sleet DA, Gielen AC, Diekman S, Ikeda R. Preventing Unintentional Injury: A Review of Behavior Change Theories for Primary Care. *Am J Lifestyle Med*, 2010. 4(1): p. 25-31.
73. Shakeri A, Sadeghi S. Epidemiologic study of Mental disorders in Kermanshah province. MD Thesis Kermanshah: Kermanshah University of Medical Science; 2003.
74. Sharifi V, Asadi SM, Mohammadi MR, Amini H, Kaviani H, Semnani Y, Shabanikia A, Shahrivar Z, Davari Ashtiani R, Hakim Shoushtari M, Sedigh A, Jalali Roudsari M. Reliability and feasibility of the persian version of the structured diagnostic interview for DSM-IV (SCID). *Advances in Cognitive Science*. 2004; 6(1-2): p. 10-22.
75. Sharifi V, Asadi SM, Mohammadi MR, Amini H, Kaviani H, Semnani Y, Shabani A, Shahrivar Z, Davari Ashtiani R, Hakim Shoushtari M, Sedighi A, Jalali M. Structured clinical interview for DSM-IV (SCID): Persian translation and cultural adaptation. *Iranian journal of psychiatry*. 2007; 2(1): p. 46-48.
76. Amini H, Sharifi V, Asadi SM, Mohammadi MR, Kaviani H, Semnani Y, Shaabani A, Shahrivar Z, Davari Ashtiani R, Hakim Shoushtari M, Sedigh A, Jalali RM. Validity of the Iranian version of the structured clinical interview for DSM-IV (SCID) in the diagnosis of psychiatric disorders. *Payesh*. 2008; 7(1):49-57.
77. Franchitto N, Faurie C, Franchitto L, Minville V, Telmon N, Rougé D. Self-inflicted burns: the value of collaboration between medicine and law. *J Forensic Sci*, 2011. 56(3): p. 638-42.
78. Nojomi M, Malakouti SK, Bolhari J, Hakimshoushtari M, Fleischmann A, Bertolote JM. Epidemiology of suicide attempters resorting to emergency departments in Karaj, Iran, 2003. *Eur J Emerg Med*, 2008. 15(4): p. 221-3.
79. Dibii A, Gharebayhi A. Study of Suicidal Burns in Ahwaz, Iran [in Farsi]. *J Legal Med Org I.R.I*, 2000. 19: p. 5-10.
80. Mehrpour O, Javadinia SA, Malic C, Dastgiri S, Ahmadi A. A survey of characteristics of self-immolation in the East of Iran. *Acta Medica Iranica*, 2012. 50(5): p. 328-34.
81. Rezaie L, Khazaie H, Soleimani A, Schwebel DC. Is self-immolation a distinct method for suicide? A comparison of Iranian patients attempting suicide by self-immolation and by poisoning. *Burns*, 2011. 37(1): p. 159-63.
82. Fernando RF, Hewagama M, Priyangika WD, Range S, Karunaratne S. A study on suicide by self immolation. *Ceylon Medical Journal*, 2011. 56(4): p. 182-3.
83. Yur'yev A, Värnik A, Värnik P, Sisask M, Leppik L. Employment status influences suicide mortality in Europe. *Int J Soc Psychiatry*., 2012. 58(1): p. 62-8.
84. Phillips MR, Yang G, Zhang Y, Wang L, Ji H, Zhou M. Risk factors for suicide in China: a national case-control psychological autopsy study. *Lancet*, 2002. 360(9347): p. 1728-36.
85. Panjeshahin MR, Lari AR, Talei A, Shamsnia J, Alaghebandan R. Epidemiology and mortality of burns in the South West of Iran. *Burns*, 2001. 27(3): p. 219-26.
86. Thierauf A, Strehler M, Schmidt P, Madea B. [Suicide by self-immolation]. *Archiv fur Kriminologie*, 2007. 220(3-4): p. 103-14.
87. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Archives of General Psychiatry*, 1999. 56(7): p. 617-26.

88. Krackow E, Rudolph KD. Life stress and the accuracy of cognitive appraisals in depressed youth. *J Clin Child Adolesc Psychol*, 2008. 37(2): p. 376-85.
89. Hankin BL. Adolescent depression: description, causes, and interventions. *Epilepsy Behav*, 2006. 8(1): p. 102-14.
90. Fleischmann A, Bertolote JM, Wasserman D, De Leo D, Bolhari J, Botega NJ, De Silva D, Phillips M, Vijayakumar L, Värnik A, Schlebusch L, Thanh HT. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 2008. 86(9): p. 703-9.
91. Juárez-Aragón G, Castañón-González JA, Pérez-Morales AJ, Montoya Cabrera MA. [Clinical and epidemiological characteristics of severe poisoning in an adult population admitted to an intensive care unit]. *Gac Med Mex*, 1999. 135(6): p. 669-75.
92. Borges G, Benjet C, Medina-Mora M, Orozco R, Wang P. Treatment of mental disorders for adolescents in Mexico City. *Bull World Health Organ*, 2008. 86(10): p. 757-64.
93. Borges G, Benjet C, Medina-Mora ME, Orozco R, Familiar I, Nock MK, Wang PS. Service use among Mexico City adolescents with suicidality. *J Affect Disord*, 2009.
94. Marczyńska-Wdówik A. Selected coping resources and critical situations as the risk factors of adolescent's suicide attempts. *Wiad Lek*, 2002. 55 Suppl(1): p. (Pt 2):791-5.
95. Nojomi M, Malakouti SK, Bolhari J, Poshtmashhadi M. A predictor model for suicide attempt: evidence from a population-based study. *Arch Iran Med*, 2007. 10(4): p. 452-8.
96. O'Connor SS, Jobes DA, Lineberry TW, Michael Bostwick J. An investigation of emotional upset in suicide ideation. *Arch Suicide Res*. 14(1): p. 35-43.
97. Joiner TE Jr, Conwell Y, Fitzpatrick KK, Witte TK, Schmidt NB, Berlim MT, Fleck MP, Rudd MD. Four studies on how past and current suicidality relate even when "everything but the kitchen sink" is covaried. *J Abnorm Psychol*, 2005. May;114(2): p. 291-303.
98. Forman EM, Berk MS, Henriques GR, Brown GK, Beck AT. History of Multiple Suicide Attempts as a Behavioral Marker of Severe Psychopathology. *American Journal of Psychiatry*, 2004. 161(3): p. 437-443.
99. Miranda R, Scott M, Hicks R, Wilcox HC, Harris Munfakh JL, Shaffer D. Suicide attempt characteristics, diagnoses, and future attempts: comparing. *J Am Acad Child Adolesc Psychiatry*. 2008 Jan;47(1):32-40., 2008. 47(1): p. 32-40.
100. Van Orden KA, Witte TK, Gordon KH, Bender TW, Joiner TE Jr. Suicidal desire and the capability for suicide: tests of the interpersonal-psychological theory of suicidal behavior among adults. *Journal of Consulting and Clinical Psychology*, 2008. 76(1): p. 72-83.
101. Mofidi N, Ghazinour M, Salander-Renberg E, Richter J. Attitudes towards suicide among Kurdish people in Iran. *Soc Psychiatry Psychiatr Epidemiol*. 2008 Apr;43(4): p. 291-8.
102. Rancāns E, Alka I, Renberg ES, Jacobsson L. Suicide attempts and serious suicide threats in the city of Riga and resulting contacts with medical services. *Nord J Psychiatry*. 2001;55(4):279-86.

9 APPENDIX-I

Some definitions in this study

- Confounding bias:* "Occurs when two factors are associated (travel together) and the effect of one is confused with or distorted by the effects of other"¹
"Confounding factor must have an effect, and it must be imbalanced between the exposure groups that are being compared. It must have two association: 1. A confounder must be associated with the disease (either as a cause or as a proxy for a cause, but not as an effect of disease). 2. A confounder must be associated with the exposure."²
- Interaction:* "A situation in which the simultaneous influence of two variables on a third is not additive"^{3, 4, 5}
- Interaction variable:* "It is a variable constructed from an original set of variables to try to represent either all of the interaction present or some part of it"^{3, 4, 5}
- Conflict Between Parents:* In this study it is defined as "no-conflict"= Less than 2 conflicts per week vs. "yes-conflict"= more than 2 conflicts per week.
- Conflict with Spouse:* In this study it is defined as "no-conflict" = Less than 2 conflicts per week vs. "yes-conflict" = more than 2 conflicts per week.
- DSM-IV-TR:** Diagnostic and Statistical Manual of Mental Disorders (fourth edition, text revision) a standard criteria for the classification of mental disorders published by the American Psychiatric Association.
- History of suicide in family:* In this study it is defined as the history of suicide in all family members similar to: parents, sibling, child, grandchild, nephew, niece, wife, husband, aunt, uncle, cousins, and grandparents, etc.
- Imitational or Copycat Suicide:* "An emulation of another suicide that the person attempting suicide knows about the original suicide."³
- Socio-Economic Status:* In this study it is categorized based on the scales of relevant variables such as: Type of home ownership: rental/ owner (1-0 point); Ownership of agricultural land (1-0 point); Having car (1-0 point); Having cell phone (depending on the individual's place of residence-urban or rural) (1-0 point).
Low= 0 or 1 point, Middle: 2 or 3 points, High: 4 points
- Suicide:* "Death caused by self-directed injurious behavior with any intent to die as a result of the behavior."⁶
- Suicide attempt:* "A non-fatal self-directed potentially injurious behavior with any intent to die as a result of the behavior."⁶

1. Fletcher, Robert H; Fletcher, Suzanne W; Fletcher, Grant S. Clinical epidemiology : the essentials. 5th ed. Philadelphia : Wolters Kluwer/Lippincott Williams & Wilkins Health, c2014.

2. Rothman KJ. Epidemiology: an introduction. New York: Oxford University Press, 2012.

3. www.wikipedia.com: accessed 3 March 2013

4. Dodge Y. The Oxford Dictionary of Statistical Terms. Oxford University Press. 2003.

5. Cox DR. "Interaction". International Statistical Review. 1984; 52 (1): 1–25.

6. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.

10 APPENDIX-II

Summary version of Questionnaire

1= case 0=control

Demographic Variables:

age	male=0, female=1	Living area, rural=1, urban=0	BMI, ≤25=0, >25=1
/ first children=1, middle children=2, last children=3	family size: ≤5=0, >5=1	marital status, Single=0, Married=1, Widow =2 Divorced =3	age of marriage
Early school leaving 1= yes before completing Secondary school vs. 0=no/still in school)	Education state, Illiterate=1, Primary school=2, Secondary school=3, High school graduate=4, Pre-university=5, University=6	Occupational state, Housewives=1, Unemployed=2, Employee-non skilled worker=3, Employee-skilled worker=4, Employee-specialist worker=5, Student=6, others7	having children, no=1, yes=0
number of children	Employed by husband or guardianship, Unemployed=1, Employee-non skilled worker=2, Employee-skilled worker=3, Employee-specialist worker=4, Student=5, others work=6		

Familial Variables

divorce of parents, no=1, yes=2	having problem with parents, no=1, yes=2	history of suicide in family, no=1, yes=2	death of parents, no=1, yes=2
having history of mental disorders in parents, no=1, yes=2	addiction of parents, no=1, yes=2	marital conflict between parents, no(less than 2 per week)=1, yes(greater than 2 per week)=2	marital conflict with spouse(if married), no(less than 2 per week)=1, yes(greater than 2 per week)=2
conflict with other member of family, no=1, yes=2	addiction of spouse: no=1, yes=2	socio-economic level of family: low=1, mid=2, high=3	

Adverse life events (during last 3 months)

abortion, no=1, yes=2	infertility نازايي, no=1, yes=2	homelessness, no=1, yes=2	financial hardship, no=1, yes=2
problems with friends, no=1, yes=2	a relationship break-up (with boyfriend/girlfriend or spouse), no=1, yes=2	school or university failure, no=1, yes=2	anxiety about school/university performance, no=1, yes=2
problems at work, no=1, yes=2	compulsory marriage, no=1, yes=2	individual history of suicide attempts, no=1, yes=2	having inability and malignant disease, no=1, yes=2
TBSA %:	individual history of mental disorders (diagnosed by a psychiatrist), no=1, yes=2	sibling or parents' history of suicide attempts, no=1, yes=2	

Other Variables

the means of self-immolation, kerosene=1, gas=2, petrol=3, others=4	having access to the means of self-immolation (kerosene), no=1, yes=2	the main domestic fuel, kerosene=1, domestic gas=2, wood=3	Awareness about burns complications, no=1, yes=2
Imitational self-immolation, no=1, yes=2	Consulting Services Applying, no=1, yes=2 Psychiatrist/ psychologist/ consulting services <input type="checkbox"/> Religion person <input type="checkbox"/> Friends <input type="checkbox"/> Others <input type="checkbox"/>	planned self-immolation, no(impulsive)=1, yes=2	

DSMIV-TR:

Axis I: Delirium=1, Dementia=2, Nicotine abuse=3, Nicotine dependence=4, Opium abuse=5, Opium dependence=6, Heroin abuse=7, Heroin dependence=8, Alcohol abuse=9, Alcohol dependence=10, Smoked marijuana=11, Ever used illicit drugs other than marijuana=12, Schizophrenia=13, Schizophreniform=14, Schizoaffective=15, Delusional=16, Major depression=17, Mania=18, Hypo manic=19, Dysthymia=20, Cyclothymia=21, agrophobia=22, Specially phobia=23, Social phobia=24, Obsessive-Compulsion Disorder=25, PTSD=26, Generalized Anxiety Disorder=27, Somatization=28, Conversion=29, Hypochondriasis=30, Body Dysmorphic=31, Pain disorders=32, Dissociative amnesia=33, sexual dysfunction=34, Gender Identity=35, anorexia nervosa=36, Insomnia=37, Hypersomnia=38, Narcolepsy=39, sleep disorder related to respiration=40, Sleep rhythm disorder=41, Nightmare=42, sleep terror disorder=43, intermittent explosive disorder=44, Kleptomania=45, Pyromania=46, Adjustment disorders=47,
Axis II: MR=48. Personality disorders, Paranoid=1, Schizoid=2, Schizotypal=3, antisocial=4, borderline=5, Histrionic=6, Narcissistic=7, Avoidant=8, Dependent=9, Obsessive-Compulsive=10, Passive-Aggressive=11, Depressive=12
Axis III: Medical disorder related to psychological factor=49, NEC=50

11 APPENDIX-III

Sub-studies, phases, papers and designs in this study

