Suicide and deliberate self-harm in Pakistan: a scoping review

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Abstract

Background: Suicide is a major global public health problem with more than 800,000 incidents worldwide annually. Seventy-five percent of the global suicides occur in low and middle-income countries (LMICs). Pakistan is a LMIC where information on suicidal behavior is limited. The aim of the review is to map available literature on determinants, risk factors and other variables of suicidal behavior in Pakistan.

Method: This study was based on Arksey and O'Malley's methodological framework of scoping review, combining peer reviewed publications with grey literature. Ten databases including Applied Social Sciences Index and Abstracts (ASSIA), Cochrane Trials Register (CRG), Cumulative Index to Nursing and Allied Health (CINAHL), National Library of Medicine Gateway (NLMG), ExcerptaMedica (EMBASE), National Library of Medicine's MEDLINE (PUBMED), PSYCHINFO, Social Science Citation Index and Science Citation Index (SCI) and Pakmedinet.com were searched from the beginning of their time frames until December 2016 using a combination of key terms. The inclusion criteria included studies of various study designs covering different aspects of suicidal behavior in English language.

Results: Six hundred and twenty three articles were initially retrieved from all ten databases. Two independent reviewers screened the titles and abstracts for relevance. One hundred and eighteen articles were read in full, out of which 11 were excluded because they did not fit the eligibility criteria. One hundred and ten articles, including two student theses and one report, were included in the final review. Most studies were descriptive in nature, with only three that used a case-control design. Majority of the studies were from urban areas, and addressed determinants rather than risk factors. Gender differences and age were predominantly reported, with more males committing suicide. Suicidal behavior was more common among individuals younger than 30 years of age. The three most common methods for suicides were hanging, poisoning and use of firearms. Mental illness as a risk factor for suicides was mentioned in only three studies.

Conclusions: This review is the first attempt to synthesize available literature on suicidal behavior in Pakistan. The evidence is limited, and calls for more robust analytical research designs, along with a focus on risk factors.

Keywords: Pakistan, Muslim, Suicidal behavior, Public health

Background

In 2012, an estimated 804,000 deaths by suicide occurred worldwide, representing an annual global age-standardized suicide rates of 11.4 per 100,000 population (15.0 for males and 8.0 for females) [1]. Suicide is considered the second leading cause of death in people between the ages of 15 and 29 years worldwide [2]. Although the numbers and rates differ significantly between countries, 75% of all global suicides occur in low and middle-income countries (LMICs) [1].

Research into suicidal behavior (which includes completed suicide, deliberate self-harm (DSH) and suicidal ideation) shows variations with respect to determinants, risk factors and motivations for such acts. Much of the research has been conducted in Western, industrialized countries where mental disorders appear to play a crucial role in suicidal behaviors, whereas in non-Western settings (particularly in South Asian cultures), interpersonal relationship problems appear to play a more critical role [3, 4].

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Reported rates of suicide in several Asian countries appear to be higher than the average global rates with only two countries (India and China) contributing more than 45% of the global suicides [5]. Although there has been a percentage decrease in the rates of both countries, the numbers still remain high at 258,075 and 120,730 respectively [1, 5]. Pakistan is a low and middle income country with an estimated population of 200 million, making it the 6th most populous country in the world [6]. Ninety-seven percent of its population is Muslim and the Islamic religion plays an important role in peoples’ daily lives [7]. Approximately 50% of its population is under the age of 25 years [6]. The country has four provinces (Punjab, Sindh, Balochistan and Khyber Pakhtunkhawa), several languages, cultures, sub-cultures, ethnicities and religious sects. Since its independence, the country has faced major challenges of an unstable political system and poor governance and the country’s social and health indicators remain consistently poor [8]. Prevalence rates of common mental disorders (CMDs) put the figure as high as 34% [9].

Suicidal behavior remains an under-researched and under-studied subject in Pakistan [10]. Official mortality statistics on suicide are not available since they are not part of the national vital registration system nor reported to the WHO. Over the last couple of decades, there have been a growing number of studies on suicide and DSH that draw attention to the fact that suicidal behavior is being recognized as a serious public health problem [11, 12]. However, these are individual level studies that make it difficult to get a national picture of suicidal behavior. The recently published WHO report on suicide estimated that in 2012, there were 13,377 suicides (females 7085; males 6021) in Pakistan, with rates of 7.5 per 100,000 [1]. This is an increase of 2.6% in rates from the year 2000 [1]. WHO also estimates that for every suicide there are at least 10–20 acts of DSH. By this estimate, there may be between 130,000 to 270,000 acts of DSH in Pakistan annually [1].

Under-reporting and lack of research may occur due to criminalization of suicidal behavior in Pakistan. The Pakistan Penal Code (PPC) 325 states “Whoever attempts to commit suicide and does any act towards the commission of such offence, shall be punished with simple imprisonment for a term which may extend to one year, (or with fine, or with both)” [12]. The law itself derives from the tenants of Islam, which strongly condemns suicidal behavior [13]. Under this law every case of suicide or DSH must be taken to one of the city/town’s government hospitals that is officially designated as a ‘medico-legal center’ (MLC). Only the MLCs are authorized to receive cases of suicide and DSH [13]. In reality however, people with DSH avoid going to the MLCs, for fear of legal complications and many seek treatment from private hospitals. Similarly, the latter, in order to protect the individual (and themselves) do not report DSH cases to the police, mislabeling them as either ‘accidental’ or give them a medical diagnosis. Also, as private medical care in Pakistan is quite expensive, many people leave against medical advice after emergency medical treatment [14]. Therefore, due to both financial reasons as well as legal, socio-cultural and religious stigma surrounding suicidal behavior in Pakistan, the underlying psychosocial issues remain largely unaddressed. The social consequences of suicidal behavior in Pakistan can be quite significant, with families often stigmatized and ostracized [14]. Stigmatization of suicidal behavior in Pakistani society may also be contributing to lack of research on the subject.

Considering the limited evidence available on suicidal behavior in Pakistan, we conducted a scoping review on the subject. The study aims to map the available literature on suicidal behavior in Pakistan, to provide a collective synthesis on the subject, allowing for future research and to inform policy for suicide prevention programs in the country. To the best of our knowledge, no previous study has employed this methodology for mapping suicidal behavior in Pakistan.

**Methods**

We conducted a scoping review of suicidal behavior in Pakistan. Scoping review is recommended in settings where there is limited evidence on a subject, as it allows wider coverage of the topic [15].

The following operational definitions were utilized: i) Suicide is defined as an act of self-harm with a fatal outcome [16], ii) Deliberate self-harm (DSH) is defined as a non-fatal act of self-harm carried out with variable motivations [16], iii) Suicidal ideation is defined as thoughts, ideas and desire to commit suicide [17], iv) Determinants are a range of behavioral, biological, socio-economic factors influencing the health of the populations [18] v) Risk factors are characteristics or attributes within an individual that increases the likelihood of a disease [19].

For the review, we followed Arksey and O’Malley’s (2005) methodological framework, which includes the following six stages: (i) identification of the research question (ii) identification of relevant studies (iii) study selection (iv) data charting (v) data analysis and reporting the results (vi) consultation exercise [15].

The methods of this scoping review are described in light of the above mentioned six stages.

**Stage 1:** “What are the risk factors and determinants of suicidal behavior and methods employed in Pakistan?”

**Stage 2:** We developed a robust search strategy to identify relevant studies on the topic under review. We used a combination of key terms, including “Pakistan” and (“suicide” OR “attempted suicide” OR “parasuicide”
OR “deliberate self-harm” OR “drug overdose” OR “self-poisoning” OR “acute poisoning” OR “organophosphate poisoning” OR “suicidal behavior”).

We searched ten different electronic databases, from the beginning of their timeframes, including Applied Social Sciences Index and Abstracts (ASSIA), Cochrane Trials Register (CRG), Cumulative Index to Nursing and Allied Health (CINAHL), National Library of Medicine Gateway (NLMG), ExcerptaMedica (EMBASE), National Library of Medicine’s MEDLINE (PUBMED), PSYCHINFO, Social Science Citation Index and Science Citation Index (SCI). Pakmedinet.com, a Pakistani medical publication website, was also searched for relevant literature. We also searched ‘grey literature’ which included unpublished theses and other reports. Databases were searched until December 2016.

The literature search was conducted by the head librarian (KM) who had access to the above databases via Aga Khan University and University of Alberta library resources.

**Eligibility criteria**
The **inclusion criteria:**

- Any study design (primary research, case series or reports)
- Different types of suicidal behavior (including completed suicides, DSH and suicidal ideation)
- Suicidal behavior in both genders and across all ages
- Studies focusing on any of the three aspects: determinants, risk factors or methods employed

The **exclusion criteria:**

- Studies on Pakistanis residing outside the country (not included because of varied social context)

Variables of interest in each study included sociodemographic details, risk factors and methods employed in the suicidal act.

**Stage 3:** For study selection, screening was undertaken in two steps. Two reviewers (SS and DH) first screened the abstracts. After application of eligibility criteria, full text of the remaining articles were retrieved, which were also screened by the two reviewers.

**Stage 4:** The retained articles were entered in a data charting form, developed on Microsoft Excel, based on the literature review and research question. Key attributes of the data charting form included the site of the study, study design, number of subjects and outcome measures, along with specific information on risk factors, determinants and in cases of suicide and DSH, the methods employed. The form was pilot tested and modifications were made accordingly.

**Stage 5:** Information on distribution and nature of studies was extracted from data charting forms and reported after manual synthesis. The research question consisted of risk factors, determinants and methods employed that formed the basis for analysis. Main characteristics of studies on completed suicides and DSH were also reported in a tabular form. In cases where there was an overlap between risk factors and determinants, it was resolved via mutual consultation within the research team and reported separately.

**Stage 6:** We also undertook a consultation exercise with the subject expert (MMK) in order to add strength to our study. He also provided additional articles, which were included in the scoping review.

The subject expert also read the results and provided feedback, adding extra value to the review. Badger et al. (2000) recommend utilization of existing knowledge and networks generation of information on primary research [20].

**Results**

Through the ten search engines we initially retrieved 623 articles, of which 265 were duplicates and were excluded (Fig. 1). Two reviewers (SS and DS) reviewed the abstracts of the remaining 358 articles individually. In addition, 12 articles were also retrieved from the subject expert. Eighty-two studies not conducted in Pakistan or covering Pakistani population, one poster presentation, four conference proceedings, three articles that could not be retrieved (despite our best efforts) and 162 articles that did not cover suicidal behavior were excluded. One hundred and eighteen articles were read in full, out of which 11 were further excluded (nine were not relevant to our research question, one was a conference abstract and in one, information was difficult to extract), leaving us with 107 articles. To this number, one report and two PhD dissertations were added, giving a final total of 110 articles included for the final review. Table 1 summarizes the key characteristics of included original studies.

Forty-eight studies were conducted in Sindh (39 from Karachi), 31 in Punjab (16 from Lahore and 11 from Rawalpindi/Islamabad), 9 from KPK (7 from Peshawar) and 2 in Baluchistan. The remaining 20 were describing trends from all over Pakistan.

The reviewed articles consisted of 25 cross-sectional surveys, fourteen prospective case-series and 45 retrospective case series. There were only five case-control studies and only one randomized control trial. 19 articles were literature reviews, commentaries or editorials. One paper was a population-based cohort study.

Rates of suicide or DSH were mentioned in only six studies. Two studies determined rates through descriptive study designs, whereas two from literature review
and archival researches. Two studies determined rates of suicides for individual cities [21, 22]. Suicide rates varied from 0.43/100,000/year (for the years 1991–2000) in Peshawar to 2.86/100,000 (in 2006) in Rawalpindi. Gender-specific rates showed lowest and highest rates for men were 0.61/100,000 in Peshawar and 5.2/100,000 in Rawalpindi, respectively and for women 0.23/100,000 in Peshawar and 1.77/100,000 in Larkana, respectively [10, 23]. Average suicide rates for the years 1985–1999 in the province of Sindh was calculated to be 1.15/100,000 population v[10].

**Determinants**

Gender differences were reported in almost all studies of both completed suicides and DSH. Collectively, more males than females committed suicide. However, 18 studies on DSH reported more females than males, while the trend was reversed in 10 studies. Suicidal ideation was more common in females than males. Data on gender and marital status was not disaggregated in all studies but in studies where disaggregation was done, they showed there are more married than single females in both suicides and DSH [24–26].

A number of studies focused on suicidal behavior in Pakistani women exclusively: six studies on suicidal ideation, three on completed suicides and two on DSH. A study on suicide in women in the Ghizer district in the remote Northern areas of Pakistan showed average annual rates of 14.89/100,000 for the years 2000–2004, with rates in those of over 15 years of age as 33.22/100,000. Important correlates were domestic violence and high levels of psychiatric morbidity [27].

More than half of the studies reported the age of their study sample but used different age ranges. Both suicide and DSH appears to be more common among the young, with majority being less than 30 years of age.

‘Unemployment’ or ‘financial hardship’ as a cause of suicidal behavior was also mentioned in a few studies (8 studies on suicide, 8 on DSH and one on suicidal ideation). Unemployment rates varied from 4% to 39% in suicides and from 4% to 86% for DSH. A case-control study of 100 suicides and matched living controls in Karachi showed that 39% of cases were unemployed as compared to 17% of controls [28].

Two studies (one for DSH and one for suicidal ideation) reported on the association between level of income and suicidal behavior. 46%–67% of those who
| Author / Year | Study Design | Setting (City, Province) | Studies reporting on | Number of suicidal cases | Male to female ratio | Age of the study population | Method (three most common) | Psychiatric Diagnosis (% of sample) |
|---------------|--------------|--------------------------|---------------------|-------------------------|---------------------|---------------------------|---------------------------|--------------------------------|
| Jamil et al. (1977) [56] | Retrospective case series (1976) | Karachi, Sindh | Unnatural deaths | 35 out of 53 | N/A | N/A | Poisoning | N/A |
| Jamil et al. (1977) [40] | Retrospective case series (1976) | Karachi, Sindh | Unnatural deaths | 96 out of 157 | N/A | N/A | Poisoning | N/A |
| Ahmed et al. (1981) [57] | Retrospective case series (1974–1978) | Karachi, Sindh | Suicide & DSH | 25 suicide | 1.27:1; 1.27 yrs. | Suicide: 11–20 yrs.; 64% | Suicide: drugs, poisons, sharp instruments | Suicide: 8%; DSH: 1% |
| Noor et al. (1988) [58] | Retrospective case series (1984–1987) | Multan, Punjab | Unnatural deaths | 20 out of 112 | N/A | N/A | Poisoning | N/A |
| Jamil et al. (1990) [59] | Retrospective case series (1976–1985) | Karachi, Sindh | Unnatural deaths | 1330 out of 1900 | N/A | N/A | Poisoning | N/A |
| Javed et al. (1996) [24] | Cross-sectional (1992) | Lahore, Punjab | Suicidal ideation | 27 out of 60 | 0.66:1 | N/A | N/A | N/A |
| Khan et al. (1996) [60] | Retrospective case series (1989–1992) | Karachi, Sindh | DSH | 314 | 0.69:1 | <30 yrs.; 71% | Poisoning, hanging, wrist slashing | 31% affective disorder; 6% schizophrenia |
| Khan et al. (1996) [25] | Retrospective case series (1989–1993) | Karachi, Sindh | DSH | 382 | 0.69:1 | <30 yrs.; 69% | Poisoning | N/A |
| Waseem et al. (1997) [61] | Prospective case series (1996) | Lahore, Punjab | Suicide | 20 | 1.85:1 | N/A | Poisoning | N/A |
| Khan et al. (1998) [39] | Retrospective case series (1989–1994) | Karachi, Sindh | DSH | 447 | 0.69:1 | <30 yrs.; 62% | Poisoning | 14% |
| Aziz et al. (1999) [62] | Retrospective case series (1993 & 1995) | Lahore, Punjab | Suicide | 96 | 1.43:1 | 20–30 yrs.; 49% | Hanging, firearms, burning | 15% |
| Malik et al. (1999) [36] | Retrospective case series (1984–1996) | Lahore, Punjab | Unnatural deaths | 2 out of 837 | 1:1 | N/A | Cutting | N/A |
| Bashir et al. (2000) [63] | Retrospective case series (1994–1999) | Lahore, Punjab | Unnatural deaths | 45 out of 91 | N/A | N/A | Hanging | N/A |
| Rana et al. (2000) [64] | Retrospective case series (1984–1988) | Lahore, Punjab | Unnatural deaths | 21 | N/A | N/A | Poisoning | N/A |
| Khalid et al. (2000) [65] | Retrospective case series (1997–2001) | Karachi, Sindh | Suicide | 1230 | 2.19:1 | 21–30 yrs.; 47.21% | Gunshot, hanging, poisoning | 9% males; 5% females |
| Khan et al. (2000) [66] | Retrospective case series (1996–1997) | Karachi, Sindh | Suicide | 306 | 2.1:1 | <30 yrs.; 82% | Poisoning, hanging, firearms | 3% |
| Bunggush et al. (2000) [67] | Retrospective case series | Pakistan | Unnatural deaths | 243 out of 408 | N/A | N/A | Poisoning | N/A |
| Author / Year | Study Design | Setting (City, Province) | Study Reporting on | Number of Suicidal Cases | Male to Female Ratio | Age of the Study Population | Method (three most common) | Psychiatric Diagnosis (% of Sample) |
|---------------|--------------|--------------------------|--------------------|--------------------------|----------------------|-----------------------------|----------------------------|----------------------------------|
| Haider et al. (2001) [30] | Cross-sectional (2000) | Lahore, Punjab | DSH | 100 | 0.67:1 | 15–24 yrs: 36% | Poisoning | 34% |
| Agha et al. (2001) [31] | Case-control (1999) | Karachi, Sindh | DSH | Case: 72 Control: 72 | | | | |
| Khan et al. (2001) [31] | Case-control (1998) | Peshawar, KPK | Suicidal ideation | 4 out of 50 | N/A | | | |
| Ghazanfar et al. (2001) [31] | Retrospective case series (2006–2008) | Rawalpindi, Punjab | Unnatural deaths | 27 out of 91 | 1.7:1 | 15–35 yrs: 66% | Poisoning, cutting, firearms | 52% |
| Haider et al. (2002) [30] | Cross-sectional (2000) | Lahore, Punjab | DSH | 385 | 0.81:1 | 15–35 yrs: 66% | Poisoning, cutting, firearms | 52% |
| Ahmad et al. (2002) [31] | Cross-sectional (1996–2000) | Multan, Punjab | Unnatural deaths | 193 out of 370 | N/A | | Poisoning | N/A |
| Haider et al. (2002) [31] | Cross-sectional (2002) | Lahore, Punjab | DSH | 147 | 0.88:1 | Mean age (males): 30.5 yrs. | Poisoning | 71% |
| Sultana et al. (2002) [32] | Retrospective case series | Karachi, Sindh | Unnatural deaths | 51 out of 632 | N/A | N/A | Hanging, drowning, cutting | N/A |
| Hasan et al. (2002) [33] | Retrospective case series (1998–2001) | Rawalpindi, Punjab | Unnatural deaths | 101 out of 181 | N/A | N/A | N/A | N/A |
| Saeed et al. (2002) [34] | Retrospective case series (1998–2001) | Faisalabad, Punjab | Suicide | 95 | 2.44:1 | 20–29 yrs: 43.1% | Hanging, Firearms, poisoning | N/A |
| Khan et al. (2003) [35] | Retrospective case series (2001) | Quetta, Baluchistan | DSH | 46 | 100% | 16–25 yrs: 65.2% | Poisoning | 78% |
| Ali et al. (2003) [36] | Retrospective case series (2001) | Peshawar, KPK | Unnatural deaths | 2 out of 679 | 100% | | Firearms, sharp weapons | N/A |
| Ali et al. (2003) [37] | Retrospective case series (1997–2001) | Peshawar, KPK | Unnatural deaths | 9 out of 52 | N/A | | Poisoning | N/A |
| Ahmed et al. (2003) [38] | Retrospective case series (1995–2001) | Karachi, Sindh | Suicide | 1379 | 1.7:1 | 21–30 yrs: highest | Poisoning, hanging, firearms | N/A |
| Bashir (2003) [39] | Retrospective case series (1991–2000) | Peshawar, KPK | Suicide | 39 | 2.9:1 | 20–29 yrs: highest | Firearms, hanging | N/A |
| Safdar et al. (2003) [40] | Retrospective case series | Sukkur, Sindh | Unnatural deaths | 14 out of 26 | N/A | | Poisoning | N/A |
| Author / Year          | Study Design          | Setting (City, Province)            | Studies reporting on | Number of suicidal cases | Male to female ratio | Age of the study population | Method (three most common) | Psychiatric Diagnosis (% of sample) |
|------------------------|-----------------------|-------------------------------------|----------------------|--------------------------|-----------------------|-----------------------------|-------------------------------|-----------------------------------|
| Farooqi (2004)          | Cross-sectional       | Lahore, Punjab                      | Suicidal ideation   | 50 out of 100            | 1.5: 1                | N/A                         | N/A                           | 40% depression 24% schizophrenia |
| Valika et al. (2004)    | Cross-sectional       | Pakistan                            | Suicidal behavior   | 19                       | 1: 0.88               | N/A                         | Poisoning                     | N/A                              |
| Farooqi et al. (2004)   | Cross-sectional       | Karachi, Sindh                      | DSH                  | 50                       | 1.5: 1                | 11–20 yrs.: 40%             | Poisoning                     | N/A                              |
| Waseem et al. (2004)    | Prospective case series (2003–2004) | Lahore, Punjab                           | Unnatural deaths     | 31 out of 70             | N/A                   | N/A                         | Poisoning                     | N/A                              |
| Shoaib et al. (2005)    | Prospective case series (2004) | Lahore, Punjab                          | Suicide & DSH       | 107                      | 1.22:1                | 21–30 yrs.: 49%             | Poisoning                     | 9%                               |
| Khoker et al. (2005)    | Cross-sectional       | Karachi, Sindh                      | Suicidal ideation   | 68 out of 217            | 0.87:1                | N/A                         | N/A                           | N/A                              |
| Hussain et al. (2005)   | Retrospective case series (1996–2002) | Karachi, Sindh                           | Unnatural deaths     | 40 out of 50             | N/A                   | N/A                         | Poisoning                     | N/A                              |
| Asif et al. (2005)      | Cross-sectional       | Lahore, Punjab                      | DSH                  | 1390                    | 2.22:1                | 21–30 yrs.: 36%             | Poisoning                     | N/A                              |
| Rasheed et al. (2005)   | Prospective case series (2004) | Rawalpindi, Punjab                      | Suicidal ideation   | Under-trial prisoners: significant relationship with suicidal behavior | 100% males | N/A | N/A | N/A |
| Kermani et al. (2006)   | Retrospective case series (2004) | Karachi, Sindh                          | DSH                  | 150                     | 0.75: 1                | 21–25 yrs.: 41%             | Poisoning                     | N/A                              |
| Aziz (2006) et al. [85] | Cross-sectional       | Larkana, Sindh                       | Suicide              | 52                      | 2.03: 1                | 30–39 yrs.: 44.2%           | Firearms, hanging, burning    | 73%                              |
| Khan (2006) [10]        | Retrospective case series (1985–1999) | Karachi, Sindh                          | Suicide              | 2568                   | 2.78: 1                | N/A                         | Poisoning, hanging & drowning | N/A                              |
| Suliman et al. (2006)   | Prospective case series (2002–2003) | Bahawalpur, Punjab                    | Unnatural deaths     | 111 out of 143          | N/A                   | N/A                         | Poisoning                     | N/A                              |
| Tahir et al. (2006)     | Prospective case series (2003–2004) | Sukkar, Sindh                           | Unnatural deaths     | 17 out of 24            | N/A                   | N/A                         | Poisoning                     | N/A                              |
| Rathore et al. (2007)   | Prospective case series (2006–2007) | Lahore, Punjab                          | Suicide & DSH       | 50                      | 1.27: 1                | 21–30 yrs.: 44%             | Poisoning                     | N/A                              |
| Ahmad et al. (2007)     | Prospective case series (2002–2003) | Islamabad, Punjab                      | Unnatural deaths     | 9 out of 142            | N/A                   | N/A                         | Burns                         | N/A                              |
| Shaikh et al. (2008)    | Retrospective case series | Hyderabad, Sindh                        | Unnatural deaths     | 99 out of 111           | N/A                   | N/A                         | Poisoning                     | N/A                              |
| Raja et al. (2008) [48] | Cross-sectional       | Karachi, Sindh                       | Unnatural deaths     | 9539 out of 27,254      | N/A                   | N/A                         | Poisoning                     | N/A                              |
Table 1: Characteristics of original studies included in review (Continued)

| Author / Year | Study Design | Setting (City, Province) | Studies reporting on | Number of suicidal cases | Male to female ratio | Age of the study population | Method (three most common) | Psychiatric Diagnosis (% of sample) |
|---------------|--------------|--------------------------|----------------------|--------------------------|----------------------|-----------------------------|-------------------------------|-----------------------------------|
| Babar et al. (2008) [35] | Retrospective case series (2002) | Islamabad, Punjab | Suicide | 227 | 2.3:1 | 25–45 yrs.: 63% | Poisoning, shooting | 3% |
| Syed et al. (2008) [45] | Retrospective case series (1999–2006) | Karachi, Sindh | DSH | 69 | 0.59:1 | > 14 yrs.: 89.9% | Poisoning, hanging, firearms | 5.8% |
| Shahid et al. (2008) [89] | Retrospective case series (2004) | Karachi, Sindh | DSH | 98 | 0.58:1 | Mean age: 23.5 yrs | Drug ingestion, organophosphate poisoning | N/A |
| Karamaliani et al. (2008) [90] | Cohort study | Hyderabad, Sindh | DSH | 2 out of 2324 | N/A | N/A | N/A | N/A |
| Patel et al. (2008) [91] | Retrospective case series (2002–2006) | Karachi, Sindh | DSH | 202 | 0.69:1 | Mean age: 17 yrs | Benzodiazepines, anti-depressants 5.8% depression, 10.9% bipolar disorder | 58.4% depression, 10.9% bipolar disorder |
| Khan et al. (2008) [28] | Case-control (2003) | Karachi, Sindh | Suicide | 100 cases 100 controls | 4.88:1 | N/A | Hanging, poisoning & firearms | 90% |
| Khurram et al. (2008) [33] | Cross-sectional (2006) | Rawalpindi, Punjab | DSH | 60 | 0.72:1 | N/A | Poisoning | % not mentioned |
| Shaikh et al. (2008) | Retrospective case series (2004–2006) | Karachi, Sindh | Unnatural deaths | 99 out of 111 | N/A | N/A | Poisoning | N/A |
| Zakiullah et al. (2008) [92] | Retrospective case series (1997–2002) | Karachi, Sindh | DSH | 283 | 0.66:1 | 12–15 yrs.: 22.2% | Poisoning, cutting, burning | 50.3% |
| Khan (n.d) [93] | Cross-sectional | Chitral, KPK | Completed Suicides | 32 | 100% females | 16–20 yrs.: 59% | N/A | 0% |
| Farooq et al. (2009) [94] | Retrospective case series (1999–2008) | Rawalpindi, Punjab | Unnatural deaths: 5.06% suicidal | 9 | N/A | N/A | Burns | N/A |
| Ayub (2009) [95] | Cross-sectional | Pakistan | Suicidal ideation | N/A | N/A | N/A | N/A | Hopelessness linked to suicidal ideation |
| Khan et al. (2009) [27] | Cross-sectional (2000–2004) | Ghizer, KPK | Suicide | 49 | 100% females | 18–25 yrs.: 59% | Drowning, Poison, hanging | N/A |
| Shahid et al. (2009) | Retrospective case series (2008) | Karachi, Sindh | DSH | 98 | 0.59:1 | Mean age: 23.5 yrs | Benzodiazepines, organophosphate poisoning, alcohol poisoning | 24.2% |
| Asad et al. (2010) [117] | Cross-sectional | Hyderabad, Sindh | Suicidal ideation & attempts | 41 attempted suicide 150 suicidal thoughts | 100% females | N/A | N/A | 18% |
| Farooq et al., (2010) [42] | Retrospective case series (2007–2008) | Rawalpindi, Punjab | DSH | Police reports: 7 ED: 33 | Police reports: 13.2:1 ED: 5.6:1 | Police reports: ED: 15–56 yrs.: 77.3% | Poisoning | N/A |
| Rizwan (2010) [97] | Case-control | Karachi, Sindh | Suicidal ideation | 120 in case, 120 in control | Case: 2.15:1 | Mean age in case: 22 yrs | N/A | 100% in case group |
| Author / Year | Study Design | Setting (City, Province) | Studies reporting on | Number of suicidal cases | Male to female ratio | Age of the study population | Method (three most common) | Psychiatric Diagnosis (% of sample) |
|--------------|--------------|--------------------------|---------------------|-------------------------|---------------------|----------------------------|-----------------------------|---------------------------------|
| Tahir et al. (2010) [55] | Retrospective case series (2001–2008) | Jamshoro, Sindh | DSH | 154 | 0.55: 1 | Mean age: 31.21 yrs | Burning | 6.7% |
| Faruqui et al. (2011) [98] | Cross-sectional (2009) | Islamabad, Punjab | Suicidal ideation | 15 out of 50 | N/A | N/A | N/A | N/A |
| Naz (2012) [99] | Retrospective case series (2010) | Karachi, Sindh | Suicide | 10 | N/A | N/A | N/A | N/A |
| Ali et al. (2012) [100] | Cross-sectional | Karachi, Sindh | Suicidal ideation | 28 | 100% females | Not mentioned | N/A | % not mentioned |
| Kumar et al. (2012) [101] | Retrospective case series (2010–2012) | Larkana, Sindh | Unnatural deaths | 91 out of 10,130 | N/A | N/A | N/A | N/A |
| Lakhair et al. (2012) [102] | Prospective case series | Hyderabad, Sindh | Unnatural deaths | 58 out of 70 | N/A | N/A | N/A | N/A |
| Mirza et al. (2012) [103] | Retrospective case series (2005–2010) | Karachi, Sindh | Unnatural deaths | 7 out of 61 | N/A | N/A | N/A | N/A |
| Ali (2012) et al. [104] | Prospective case series (2008) | Karachi, Sindh | Unnatural deaths | 65 out of 100 | N/A | N/A | Organophosphorous poisoning | N/A |
| Kehtran et al. (2012) [105] | Retrospective case series (1998–2000) | Barkhan, Baluchistan | Unnatural deaths | 2 out of 268 | N/A | N/A | Firearms | N/A |
| Riaz et al. (2012) [106] | Cross-sectional (2012) | Karachi, Sindh | DSH | 9 | N/A | N/A | Cutting | |
| Tahir et al. (2013) [107] | Cross-sectional (2011) | Mianwali, Punjab | DSH | 108 | 3.54: 1 | 21–30 yrs: 50.5% | Poisoning & firearms | 33% |
| Khalil et al. (2013) [96] | Retrospective case series (2009–2012) | Peshawar, KPK | Unnatural deaths | 66 out of 2365 | 12.2: 1 | 20–40 yrs | Firearm, blunt trauma | N/A |
| Ali (2013) et al. [108] | Cross-sectional | Karachi, Sindh | Suicidal ideation | 759: 58.8% had suicidal thoughts | 100% females | N/A | N/A | % not mentioned |
| Ayub et al. (2013) [109] | Cross-sectional (2012) | Lahore, Punjab | Suicidal ideation | 636 out of 650 | 100% females | N/A | N/A | 93% |
| Raza et al. (2014) [110] | Retrospective case series (2009–2013) | Lahore, Punjab | Unnatural deaths | 3 out of 31 | N/A | N/A | Knife, razor blade | N/A |
| Shaikh et al. (2014) [111] | Prospective case series | Karachi, Sindh | Suicidal ideation | 171 | N/A | N/A | N/A | Anxiety statistically significant with suicidal ideation |
| Salman et al. (2014) [112] | Prospective case series (2012) | Peshawar, KPK | DSH | 45 | 0.8: 1 | <35 yrs: 96% | Burning | N/A |
| | | | DSH | 93 | 0.24: 1 | <35 yrs: 96% | Burning | 1.07% |
| Author / Year | Study Design          | Setting (City, Province) | Studies reporting on | Number of suicidal cases | Male to female ratio | Age of the study population | Method (three most common) | Psychiatric Diagnosis (% of sample) |
|--------------|----------------------|--------------------------|----------------------|--------------------------|----------------------|-----------------------------|----------------------------|----------------------------------|
| Saiq et al. (2014) [113] | Prospective case series (2010–2012) | Islamabad, Punjab | Suicidal ideation | 118 out of 331 | 0.70:1 | Mean age: 20.73 yrs | N/A | N/A |
| Osama et al. (2014) [114] | Cross-sectional (2013) | Karachi, Sindh | Suicidal ideation | 0.70:1 | 2013 | Mean age: 23.1 yrs | Poisoning | N/A |
| Hussain et al. (2014) [36] | Randomized controlled trial (2010–2012) | Karachi, Sindh | DSH | 221 | 0.45:1 | Mean age: 23.1 yrs | N/A | N/A |
| Shagufta et al. (2015) [115] | Prospective case series (2014) | Peshawar, KPK | Suicidal ideation | 91 out of 415 | 100% males | 11–18 yrs: 100% | N/A | 0.24% |
| Rao et al. (2015) [116] | Cross-sectional (2009) | Pakistan | Suicidal ideation | 334 out of 4583 | N/A | N/A | N/A | N/A |
| Shahid et al. (2015) [46] | Case-control study (2011–2012) | Karachi, Sindh | DSH | 201 cases 201 controls | 0.7:1 | N/A | N/A | 9% depression |

*Unnatural deaths (homicidal, accidental & suicidal)*
engaged in suicidal behavior had an income of less than Rs. 6000 per month (US $60) [23, 29]. In four DSH studies, 67% to 91% belonged to lower socio-economic class, whereas only 1% to 4% belonged to upper class [30–33].

Level of education was reported in 14 studies: 3 for suicidal ideation, 2 for completed suicides and 9 for DSH and showed that suicidal behavior was more common among those who had little or no education, with rates varying from 30% to 60%. In the case-control study on suicide, 21% of cases were uneducated as compared to 4% of controls [28].

Other determinants that were reported in some studies included occupation. Housewives were 20% to 60% while students were 4% to 17.5% of the study sample [28, 34, 35].

Risk factors
While determinants for suicidal behavior were mentioned in several studies (above), only two studies (both were case-control design) investigated risk factors for suicide and DSH specifically. In the DSH study, ‘mental illnesses, low socio-economic status and loneliness’ were found to be the risk factors for patients presenting to three emergency departments of Karachi, while the case-control psychological autopsy study of suicide identified six factors: life-events, disrupted social network, level of academic qualification, marital status, ethnicity and depression, that were linked to very high Population Attributable Risk Fractions (PARFs) ranging from 37% for education to 97% for life events [28].

There has been only one intervention trial for suicidal behavior in Pakistan, that compared the efficacy of a brief psychological intervention (delivered following an episode of self-harm) with treatment as usual (TAU) [36]. Patients in the intervention group showed statistically significant improvement on the Beck Scale for Suicide Ideation and Beck Hopelessness Inventory, which was sustained at 3 months [36].

Methods for suicidal behavior
Methods of suicide and DSH were reported in more than 50% of the studies. The three most common methods for suicide in Pakistan appear to be hanging, ingesting poisons and use of firearms [21, 36–38]. Amongst ‘poisons’, the majority of victims used insecticides and pesticides, (that contain organophosphate (OP) compounds), that are available in most homes in the urban areas and used in agriculture in the rural areas of Pakistan respectively. Despite being freely available over-the-counter, medications (including analgesics and psychotropics) are not used widely as means to commit suicide. In contrast, self-poisoning with medications (particularly benzodiazepines) was the most common method in DSH in the urban areas [39]. On the other hand, self-poisoning was more common in both suicide and DSH in semi-urban or rural areas [40].

Discussion
This scoping review is the first attempt to synthesize the available literature on suicidal behavior in Pakistan. The results reveal that there are significant gaps in evidence. Majority of the studies are from the main urban centers of the country, and there is dearth of data from rural areas, despite the fact that almost two-thirds of the population in Pakistan lives in rural areas.

Most of the studies reviewed were descriptive in nature (majority were case series and cross-sectional surveys that do not allow for the establishment of relationships), with only five case-control studies.

A number of studies were on “unnatural deaths”, in which the manner of death (for example, whether accidental, homicidal or suicidal) was not disaggregated, making it difficult to study the characteristics (such as age, gender or marital status) of the suicidal group separately.

Lack of official statistics for suicide prevents the problem being recognized. Since suicide and DSH remain criminal acts in Pakistan, this further poses a challenge in accurate data collection [41]. Studies have reported a discrepancy in reported rates between newspaper reports and police data [42]. In Pakistan, given the strong religious views against suicide, decriminalization may be perceived as endorsing suicidal behavior as a way out of one’s problems [43]. However, as the WHO estimates show (an increase of 2.6% in suicide rates between 2000 and 2012) religion may not be as strong a deterrent as previously perceived [1]. Decriminalization would have the effect of partly decreasing the stigma surrounding the act, thus allowing people to seek help without fear of prosecution or harassment by the law enforcement authorities. Although the Mental Health Act of 2001 has made some provisions for the protection of those who attempt suicide by including that “a person who attempts suicide shall be assessed by an approved psychiatrist and if found to be suffering from a mental disorder shall be treated appropriately under the provisions of this Ordinance”, this has yet to translate into practice. More recently, there is some indication that suicidal behavior may be decriminalized in Pakistan [44]. Indeed if this was to happen, it would be a major step in eliminating the stigma and addressing the psychological needs of suicidal persons in the country.

Despite the poor quality of many studies one consistent finding that emerges in our review is that gender is an important determinant for suicide and DSH in Pakistan, especially when considered in the context of marital status. There was a larger representation of married women
compared to single women or married or single men. It appears that unlike the West, where it is protective, marriage is a risk factor for psychiatric morbidity and suicidal behavior for Pakistani women [45]. Associated factors include early age of marriage, lack of autonomy in choice of male partner (‘arranged marriage’), pressure to have children early in the marriage, desire for a male offspring, curtailment of education, economic dependence on husband, joint or extended family system and domestic violence [46]. These factors put many young married women in Pakistan in a highly disadvantaged position and many resort to suicidal behavior as a way to express their distress. Other studies report that being a female in Pakistan is in itself a risk factor for suicide and DSH, with lack of employment being a significant determinant, and its association with issues of control and empowerment [47].

This scoping review shows that majority of individuals who engaged in suicidal behavior are below the age of 30 years, underscoring the need to address mental health and other issues faced by young people in Pakistan. Conversely, suicide and DSH was uncommon among the elderly, a finding that is in sharp contrast to studies from the West [48]. Part of the explanation may lie in the fact that in Pakistan, few elderly people are socially isolated or live on their own where they have to fend for themselves. The majority are looked after by their families, who provide both physical as well as financial support.

Unemployment and financial hardships appear to be strongly correlated with both suicide and DSH, particularly among males in Pakistan [49]. Unemployment, poor economic conditions and rising poverty are macro level factors in suicidal behaviors that need to be addressed at policy levels [50].

Low educational attainment strongly correlated with both suicide and DSH in the studies we reviewed. This is likely mediated through poor stress coping abilities, inability to compete for jobs or acquire greater social standing [51].

Our scoping review showed that poisoning is the second most common method (after hanging) in suicides in Pakistan. Amongst poisons, organophosphorous compounds feature highly in both DSH and suicide. These substances are highly toxic due to their anticholinesterase effects, leading to a high case-fatality index (even in cases with low suicidal intent). The free availability of pesticides in rural areas pose particular risk to those working in the agriculture sector in Pakistan, shown by their increased use in cases of self-poisoning. This is compounded by the absence of quality medical care in cases of poisonings in Pakistan.

As part of its suicide prevention strategy, the WHO lists restricting access to toxic agents as one of its recommendations. Trials of ‘locked boxes’ (that restrict access to toxic pesticides in crisis situations) undertaken in India and Sri Lanka have given encouraging results [52]. WHO also recommends use of less toxic pesticides for agricultural purposes, i.e. Class I OP pesticides and Class II endosulfan [52]. Both these measures could be applied for suicide prevention in Pakistan.

The increased use of firearms in suicides in Pakistan reflects their growing availability in the country, estimated at more than 20 million (of which only 7 million are registered), with almost 13,000 annual homicides [53]. There is urgent need for firearm control in the country.

This paper highlights the lack of studies on risk factors for suicide and DSH in Pakistan. Mental illness as a risk factor is addressed in a small minority of studies reviewed. This may be due to the fact that most studies in our review were conducted by non-mental health professionals [33, 54, 55], who are not sensitized to study mental illness in suicidal behaviors. Data is also biased away from mental illness as a risk factor due to stigma surrounding mental illness and suicidal behavior in itself.

There are serious lacunae and weaknesses in the current system of registration and diagnosing of suicidal behavior in Pakistan. There is lack of standardized system of certifying suicidal deaths across the country. Processes to investigate suicides are weak and influenced by socio-political and cultural factors. For example due to stigma it is not uncommon for families to have the suicidal death registered as an accident or a medical condition [2]. Conversely, many cases of homicide (particularly where the woman is set on fire by the husband and/or in-laws) are labeled as self-immolation suicides. Therefore, there is underreporting of suicidal behaviors in the country, the true extent of which is difficult to determine.

Currently, data on suicide and DSH is neither included in the National Health Morbidity Statistics nor reported to the WHO. As a consequence national rates of suicide are not known [1]. On the other hand, as several health-facility based studies in our review show, cases of DSH do report to health facilities across the country. With decriminalization and a proper system for recording and collating data, it is possible to get a better picture of the problem in the country.

**Recommendations**

There is an urgent need for DSH and suicide mortality statistics to be collected through a standard system of registration, recording and diagnosis, at all town/city, district and provincial levels throughout the country. The information obtained can be used for epidemiological-analytical, intra-country and cross-national studies. A mandatory reporting of suicide mortality statistics to the
WHO would help improve data collection and surveillance of suicides and DSH in Pakistan.

Based on this review's findings, there emerges a need for improving the system of investigating and diagnosing suicides in the country. Training and education of key personnel involved in the process is vital, including the police, medico-legal officers, forensic medical specialists as well as general/family physicians.

Prohibiting use of the more toxic pesticides and replacing them with less toxic ones can help prevent many suicidal deaths, especially those with a low suicidal intent. There is need for improved emergency medical treatment for DSH victims, particularly those of self-poisoning with toxic agents.

This scoping review signifies that the existing evidence on suicidal behavior is limited in the context of Pakistan. Therefore, more robust analytical research designs such as case control and psychological autopsy methods are needed with a focus on risk factors, particularly mental illness. There is also need for intervention studies for prevention of suicidal behaviors in Pakistan.

All of the above recommendations demonstrate the need to have suicide prevention programs with an integrated research agenda in the existing health systems of Pakistan.

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Authors' contributions
SS was one of the independent reviewers responsible for screening the articles for relevance, who also took part in analysis of data and writing the manuscript. SP envisaged the idea of a scoping review for suicidal behavior in Pakistan, took part in analysis of data, helped in writing the manuscript. KA devised the search strategy and conducted the search. SB facilitated in conducting the search. MMK was the lead expert of the team, who analyzed the data and wrote part of the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate
Ethical approval has been granted by the Ethics Review Committee (ERC) of Aga Khan University.

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