Case–control study of suicide in Karachi, Pakistan*

Murad Moosa Khan, Sadia Mahmud, Mehtab S. Karim, Mohammad Zaman and Martin Prince

Background
In recent years suicide has become a major public health problem in Pakistan.

Aims
To identify major risk factors associated with suicides in Karachi, Pakistan.

Method
A matched case–control psychological autopsy study. Interviews were conducted for 100 consecutive suicides, which were matched for age, gender and area of residence with 100 living controls.

Results
Both univariate analysis and conditional logistic regression model results indicate that predictors of suicides in Pakistan are psychiatric disorders (especially depression), marital status (being married), unemployment, and negative and stressful life events. Only a few individuals were receiving treatment at the time of suicide. None of the victims had been in contact with a health professional in the month before suicide.

Conclusions
Suicide in Pakistan is strongly associated with depression, which is under-recognised and under-treated. The absence of an effective primary healthcare system in which mental health could be integrated poses unique challenges for suicide prevention in Pakistan.

Declaration of interest
None. Funding detailed in Acknowledgements.

About a million people die by suicide each year worldwide.[1] Most research information on suicide comes from high-income countries. Few countries outside the Western world report suicide data to the World Health Organization regularly.[2] Prominent among those that do not report are most of the 57 countries with a majority Muslim population, including those with populations in excess of 100 million people, namely Indonesia, Pakistan and Bangladesh.[3]

Pakistan is the sixth most populous country in the world (population 162 million).[4] Overall, 97% of the population are Muslims, 65% people live in rural areas and a third are below the poverty line. The literacy rate is around 35–40%. Official unemployment stands at 12% of the eligible workforce. Health spending is less than 1% of the annual budget; mental health does not have a separate budget.

Karachi is the country's most heavily populated city. In the last official census of 1998, the population was 9.339 million;[4] in 2003 it was estimated to be over 13 million.[5] The city is divided into 18 'towns', each with a town police office. Each town police office has four to five police stations. When a suicide takes place, it is recorded in the police station and information sent to the town police office, which in turn forwards the report to the police headquarters, where a record of all suicides is kept.

Suicide is an under-studied and under-researched subject in Pakistan. Basic epidemiological data, for example, on national rates are not known. A variety of social, legal and religious factors make accurate reporting and data collection difficult.[6]

From religious and sociocultural perspectives, suicide in Pakistan is viewed as a shameful act to be concealed. Families are often ostracised and there are implications, for example, for the marriage prospects of girls of the family. Consequently, numbers of attempted/completed suicide may be underestimated in Pakistan. Despite this, there is evidence that suicides have increased over the past few years.[6–8]

We conducted a study to identify factors associated with suicide in Karachi, Pakistan. This has not been studied previously.

Method

Study design

The study was conducted between January 2003 and December 2003. This was a pair-matched case–control study to explore relationships between exposures (socio-demographic factors, life-events, mental illness, etc.) and outcome (suicide).

Sample size calculations were based on two risk factors: life-events and difficulties, and depression. Estimating from previous Pakistani population-based research that life-events and difficulties will be present in 60% of controls,[9] with an odds ratio (OR) (suicide victims *v.* controls) equal to 3, 80% power and 5% significance level, a sample of 73 suicides and 73 controls was calculated. Similarly, taking a 30–40% prevalence of depression in controls[10,11] with an OR of 3, 80% power and 5% significance level, the sample size came out to be 62 suicides and 62 controls. A sample size of 100 suicides and 100 controls was taken to adjust for confounding variables.

Selection of suicides and controls

We studied the first 100 consecutive suicides during the study period. The Karachi police provided information on suicides.

Controls were matched to suicide victims with respect to age (±2 years), gender and area of residence. They were identified in the immediate vicinity of 20 houses in the same street. When a suitable control could not be identified in the same street, the next streets were visited until a suitable control was identified. Each control was asked to suggest a family member who could act as an informant.

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Written informed consent was obtained from all controls and informants. Ethical approval for the study was obtained from the ethics committee, Institute of Psychiatry, London, UK, and the ethics review committee, Aga Khan University, Karachi, Pakistan.

Interview techniques

The psychological autopsy method was employed to obtain information. The main sources of information were the close family members of the suicide victims.

A semi-structured interview schedule was used, similar to one used in other psychological autopsy studies.[12,13] The mental state section consists of questions about symptoms, leading to an ICD–10 diagnosis.[14] The life-events section was derived from Paykel's Life Events Schedule and consisted of 44 life-events plus two 'others'.[15] There were at least three items that related directly to 'loss of significant person' (death of close friend/relative; death of spouse; miscarriage/abortion/ stillbirth) and four that related to other 'loss events' (move within the same city or area; move to another city or area; loss of objects of personal value; child leaving home). The personality section consisted of the Personality Assessment Schedule;[16] this can be used to diagnose ICD–10 personality disorder categories and to identify less severe abnormalities of personality. All interviews (with informants for suicides and controls) were conducted by M.M.K.

Data analysis

Frequencies were computed to assess the distribution of demographic and educational characteristics, psychiatric symptoms, and diagnoses in suicide victims and controls. Only the principal diagnosis was used in analysis. Univariate analysis was conducted by computing unadjusted matched ORs and their 95% confidence intervals to compare suicides and controls with respect to different risk factors. The dependent variable was suicide or control status and independent variables were hypothesised risk factors. Multivariable conditional logistic regression was conducted to identify risk factors independently associated with suicide. Conditional logistic regression analysis was performed using SAS version 9.1 for Windows.

Results

Of the 100 suicides, 83 were men and 17 were women, with a male:female ratio of 4.9:1.

Distribution of various socio-demographic variables among suicide victims and controls is given in online Table DS1. Those who died by suicide were less educated compared with controls; 21% of suicides and only 4% of controls had no formal education, 44% of suicides and 51% of controls had completed 6–12 grades, and 10% of suicides and 32% of controls had graduate-level education or above.

Of the suicide victims, 24% were married compared with only 11% of controls, whereas 51% of suicides and 73% of controls were single. The proportion of individuals who lived in joint/extended families was 62% among suicide victims and 66% among controls. Unemployment was more prevalent among suicides (39%) compared with controls (10%).

The method employed in suicide was as follows: hanging (n=40), poisoning (n=26), firearms (n=15) and self-immolation (n=10). The remaining 9 cases were: jumping from a height (n=3), jumping in front of a train (n=2), use of sharp instruments (n=2), jumping into the sea (n=1) and self-injection with narcotics (n=1). There were no instances of medication overdose.

An ICD–10 principal diagnosis was found for 96 suicides and 6 controls (Table 1) (McNemar test, $P<0.001$).

Only three suicide victims and two controls were known psychiatric patients. Of the former, one was undergoing treatment by a psychiatrist and two by family physicians. All three were receiving irregular treatment. Only six suicide victims and two controls had made previous suicide attempts (McNemar test, P=0.289). For one control and one suicide, a first-degree relative had died by suicide; for one control (but no suicide victim) a first-degree relative had attempted suicide.

Family history of psychopathology was present for four suicides (three unipolar depression, one organic disorder) and four controls (two unipolar depression, one bipolar disorder and one anxiety disorder). One or more life-events were present in 66 suicides and 28 controls in the 6 months prior to suicide. Of these, 'loss events' were present in two suicides and one control.

Conditional logistic regression analysis

The univariate analysis of socio-demographic, psychiatric and life-event variables as potential risk factors is summarised in online Table DS1. Suicide victims were more likely to have received no formal education or only at primary level compared with controls (OR=4.2, 95% CI 2.0–8.7).

Suicide victims were about three times more likely to have ever been married compared with controls (OR=2.7, 95% CI 1.4–5.1). Moreover, there was a significant association between suicide and low social class (OR=3.4, 95% CI 1.5–8.0), unemployment/household work (OR=7.0, 95% CI 2.7–17.9), relatively isolated/disrupted social network (OR=9.5, 95% CI 4.1–22.0), and depression (OR=77.0, 95% CI 10.7–553.6). There was no association between suicide and religion, and the family structure (nuclear, joint/extended).

The univariate analysis of life-event factors indicated that suicides were more likely to have suffered a moderate/major impact of health problems (OR=2.5, 95% CI 0.8–8.0) and financial problems (OR=3.2, 95% CI 1.3–8.0) and of unemployment (OR=3.0, 95% CI 1.1–8.2) compared with controls.

The multivariable conditional logistic regression model included the independent effects of ICD–10 diagnosis of depression, educational attainment and marital status adjusted for employment status (Table 2). There is overwhelming evidence of an association between depression and suicide after adjusting for education, employment and marital status (OR=208.2, 95% CI 11.0–3935.2). Suicide victims were more than three times more likely to have ever been married (OR=3.6, 95% CI 0.6–22.3) and about five times more likely to have received no formal education or only at primary level (OR=4.9, 95% CI 0.8–29.8) relative to controls. The interaction between employment and marital status was insignificant (likelihood ratio test, $P>0.50$). This could be

Table 1 ICD–10 principal diagnosis

Diagnosis	Cases (n=100)	Controls (n=100)
Moderate depressive episode (F32.1)	30	1
Severe depressive episode (F32.2)	43	0
Severe depressive episode with psychotic symptoms (F32.3)	6	2
Schizophrenia (F20)	6	2
Adjustment disorders (F43.2)	3	0
Acute stress reaction (F43.0)	6	0
Alcohol use (F10.0)	0	0
Substance abuse (F11.0)	1	0
Mental retardation (F79)	1	0
Personality disorder (F60)	1	1
No psychiatric diagnosis	4	94

Table 2 Final multivariable conditional logistic regression model

Variable	Adjusted OR (95% CI)
Educational attainment	
No formal education/primary[a]	4.9 (0.8–29.8)
Secondary and above	1.0
Marital status	
Never married	1.0
Ever married	3.6 (0.6–22.3)
Depression	
No	1.0
Yes	208.3 (11.0–3935.2)

a. Adjusted for employment status.

noted as a limitation in terms of sample size leading to low power to detect the interaction that appears to be biologically meaningful.

Discussion

Studies of suicide from Pakistan are few and mostly descriptive case series.[17–19] This is the first study that has studied risk factors using a matched-pair case–control method for suicides in Pakistan.

Our results suggest that among those who died by suicide, 96 individuals had an ICD–10 psychiatric disorder. This finding is comparable to other psychological autopsy studies, which have also found mental disorders to be present in 80–100% of their samples, with depression as the most common primary diagnosis.[12,13,20–23]

In our study, depression was the principal diagnosis in 79 people. This is contrary to what is generally reported as underlying suicides in Pakistan, i.e. interpersonal relationship problems, domestic disputes and financial problems.[17,18,24] Mental illness is mentioned in only a small numbers of suicides. Many of these reports are based on police or forensic medicine data, which do not study psychological factors in suicides.

This approach has given rise to a 'reductionist model' that portrays the suicide victim in low- and middle-income countries like Pakistan as an impulsive individual who, for example, over-reacts to personal setbacks and in an emotional fit ingests an easily accessible but highly dangerous substance such as organophosphate pesticide.[3] The absence of good medical facilities for resuscitation leads to a high case:fatality ratio.[25] This model holds the individual responsible for his/her actions, emphasising the immediate proximal factors (e.g. a row with significant other), while ignoring intermediate (e.g. depression) and distal factors (e.g. adverse social circumstances) which form the groundwork on which proximal factors act.[28]

Among the suicides, there was only one person with a diagnosis of alcoholism, while three were reported to have consumed alcohol on the day of death. This finding is in contrast to other studies including Asian countries, where alcohol features prominently in suicides.[20,23] Alcohol is prohibited in Islam and legally banned in Pakistan. It has never been part of the culture and except in certain small sections of the society, is not used socially. In the absence of disinhibitory influence of alcohol, suicides in Pakistan appear to be less 'contaminated' or more 'pure'. This observation needs further exploration.

The most common method of suicide was hanging, followed by poisoning. In Pakistan, poisoning is usually by organophosphate pesticides. These substances have a high ingestion:fatality ratio, compounded by absence of timely and proper medical management. In the West the case:fatality ratio from poisoning is estimated to be 1–2%, but in low- and middle-income countries this can be as high as 12–15%.[25]

Firearms were used by 15% of suicides. Compared with earlier studies[18] there has been a significant increase in the use of firearms, which reflects the fast-growing problem of firearms availability in Pakistan over the past few years.

Among suicides, the number of single people (51%) was almost equal to those ever-married, whereas in controls 73% were single and 27% ever-married. This difference remained striking in the multiple conditional logistic regression model. Unlike in the West, where marriage is protective, in Pakistan, marriage appears to be a significant source of stress (especially for women), leading to high psychological morbidity and suicidal behaviour.[27]

When questioned about their observations of any changes in the victims prior to the suicide, 90% of the relatives responded that in the days and weeks prior to the suicide the victim did not appear 'their usual self'. Of these, 34% felt the individual was under some sort of 'mental pressure', while 22% considered it to be serious enough to 'consult a doctor'. Of these 22, 5 individuals refused to see a doctor, while in 17 cases family members did not know where to seek help or have the resources to pay the doctors' fees.

Limitations

There were several limitations in our study: the ascertainment of suicide by police was one. It is possible that some potential risk factors may also be factors associated with the police's misclassification of some suicides; for example, underestimating suicide among people of higher social class, practising Muslims, the employed and use of certain methods such as burning. The small number of personality disorders may be related to informants' reluctance to talk negatively about their deceased relative. The low number of cases with previous history of self-harm, and family history of suicide and self-harm were similar to those from China,[22] India[23] and Sri Lanka[25] that also show high fatality in first-time attempters, although not in others such as Taiwan.[21] Another limitation was the low number of psychiatric disorders in controls, whereas population-based prevalence studies for depression give high figures for Pakistan (15–33% for men and 40–66% for women).[11] Very likely, there was underestimation of psychiatric morbidity in controls. Despite every effort to keep interviews as objective as possible, the fact there was no masking of suicide or control status meant the quality of interviews may have been lower in controls.

Implications for suicide prevention in Pakistan

Our study has important implications for suicide prevention in Pakistan. The majority of suicide victims died at their first attempt, showing a high case fatality rate and lethality of method. Also, although the majority of suicide victims had a mental disorder, only a small minority were receiving psychiatric treatment at the time of death. No victim made contact with health facilities during the month before suicide, and only nine people ever received treatment for psychiatric disorders in the past.

These findings imply that in Pakistan, suicide prevention interventions would have to be pre-emptive rather than reactive, i.e. before the first attempt, either at the stage of suicidal ideation or earlier. Low-cost community-based mental health programmes that would detect and treat mental disorders at an early stage would be an effective way to address this.

In low- and middle-income countries like Pakistan, there is a need for effective health systems with a primary care/public health

approach, of which mental health is an integral part. Unfortunately, the primary healthcare system in Pakistan remains largely ineffective, inefficient, poorly organised and under-funded.[28] For mental health to be integrated, the primary health system itself would need to be improved substantially.

Training primary care health professionals in detection and management of depression has been shown to lower suicide rates.[29] Strategies that restrict access to lethal means of suicide, for example pesticides, have also been found to be effective.[30] These have important implications for suicide prevention in Pakistan.

Murad Moosa Khan, MRCPsych, Department of Psychiatry, Aga Khan University, Pakistan; **Sadia Mahmud**, PhD, **Mehtab S. Karim**, PhD, Department of Community Health Sciences, Aga Khan University, Pakistan; **Mohammad Zaman**, MA, Department of Psychiatry, Aga Khan University, Pakistan; **Martin Prince**, MRCPsych, Kings College, Institute of Psychiatry, London, UK

Correspondence: Dr Murad M. Khan, Department of Psychiatry, Aga Khan University, Stadium Road, PO Box 3500, Karachi 74800, Pakistan. Email: murad.khan@aku.edu

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EXTRA CONTENT ONLINE

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Data supplement

Table DS1 Univariate conditional logistic regression analysis

Variable	Cases (*n*=100)	Controls (*n*=100)	OR (95% CI)	*P*[a]
Socio-demographic factors				
Education				
No formal education/primary[b]	46	17	4.2 (2.0–8.7)	0.000
Secondary and above	54	83	1.0	
Marital status				0.001
Never married	51	73	1.0	
Ever married	49	27	2.7 (1.4–5.1)	
Religion				0.653
Muslim	96	95	1.0	
Hindu/Christian	4	5	0.7 (0.1–4.0)	
Religious level				0.191
Very religious/moderate	80	87	1.0	
Minimal	20	13	1.6 (0.8–3.5)	
Social class				0.002
Upper /middle	13	30	1.0	
Lower	87	70	3.4 (1.5–8.0)	
Children				0.184
Yes	28	38	1.0	
No	13	12	1.6 (0.6–4.4)	
Not known	59	50	2.0 (1.0–4.4)	
Type of family				0.221
Joint/other	66	73	1.0	
Nuclear	34	27	1.5 (0.8–3.1)	
Employment status				0.000
Employed student	48	72	1.0	
Unemployed/household work	47	16	7.0 (2.7–17.9)	
Other[c]	5	12	0.5 (0.2–1.4)	
Social network				0.000
Normal	36	87	1.0	
Other[d]	64	13	9.5 (4.1–22.0)	
Psychiatric factors				
Depression				0.000
No	21	97	1.0	
Yes	79	3	77.0 (10.7–553.6)	
Schizophrenia				0.088
No	94	98	1.0	
Yes	6	2	5.0 (0.6–42.8)	
Previous suicide attempt				0.148
No	94	98	1.0	
Yes	6	2	3.0 (0.6–14.9)	
Life-events				
Health problems				0.103
Absent/minor impact	90	96	1.0	
Moderate/major impact	10	4	2.5 (0.8–8.0)	
Financial problems				0.007
Absent/minor impact	76	89	1.0	
Moderate/major impact	24	11	3.2 (1.3–8.0)	
Unemployment[e]				0.022
Absent/minor impact	83	93	1.0	
Moderate/major impact	17	7	3.0 (1.1–8.2)	
Problems at work[f]				0.600
Absent/minor impact	98	99	1.0	
Moderate/major impact	2	1	2.0 (0.2–22.1)	

a. Likelihood ratio test.
b. Grades 1–5.
c. Long-term illness/others
d. Relatively isolated and disrupted network.
e. Impact of unemployment was asked only from those who were unemployed; the remaining occupations were classified as 'absent'.
f. Impact of problem at work was asked only from those who were employed; any remaining problems were classified as 'absent'.

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