

Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning

Hossein Hassanian-Moghaddam, Saeedeh Sarjami, Ali-Asghar Kolahi and Gregory L. Carter

Background

Hospital-treated self-poisoning is common, with limited effective interventions for reducing subsequent suicidal behaviour.

Aims

To test the efficacy of a postcard intervention to reduce suicidal behaviour.

Method

Randomised controlled trial of individuals who self-poisoned ($n=2300$), the intervention consisted of nine postcards sent over 12 months versus usual treatment. Outcomes assessed at 12 months ($n=2113$) were suicidal ideation, suicide attempts and self-cutting (proportion and event rates).

Results

There was a significant reduction in any suicidal ideation (relative risk reduction (RRR)=0.31, 95% CI 0.22–0.38), any suicide attempt (RRR=0.42, 95% CI 0.11–0.63) and number of attempts (incidence rate ratios (IRR)=0.64, 95% CI 0.42–0.97). There was no significant reduction in any self-cutting (RRR=0.14, 95% CI –0.29 to 0.42) or self-cutting events (IRR=1.03 95% CI 0.76–1.39).

Conclusions

A postcard intervention reduced suicidal ideation and suicide attempts in a non-Western population. Sustained, brief contact by mail may reduce suicidal ideation and suicide attempts in individuals who self-poison.

Declaration of interest

None.

Hospital-treated self-harm is common and self-poisoning is the most common variant.¹ A review of observational and experimental studies only identified ones from the UK, Ireland, Scandinavia, Finland, North America, Australia and New Zealand.² After hospital-treated self-harm the repetition rate is 15% and the suicide rate 0.5–2.0% within 1 year.² One in four suicides was preceded by hospital-treated self-harm in the previous year.³

Studies of suicidal behaviour in non-Western countries are needed, since these countries account for a substantial proportion of the world's suicides.⁴ It is feasible to evaluate interventions for suicidal behaviour in non-Western countries; a recent randomised controlled trial (RCT) of brief intervention and ongoing contact for 'suicide attempters' in Brazil, India, Sri Lanka, the Islamic Republic of Iran and China, reported significantly fewer suicides.⁵ Only five non-pharmacological interventions have demonstrated a reduction in the proportion of self-harming or self-poisoning as an outcome, mostly in subgroups of various self-harming or self-poisoning populations or in populations at risk for self-harm. These interventions are: day hospital-based mentalisation treatment for borderline personality disorder;^{6,7} dialectical behaviour therapy for females who have self-harmed and had borderline personality disorder;^{8,9} group therapy for adolescents who self-harm;¹⁰ and two studies with multiple exclusion criteria, nurse-led psychodynamic interpersonal therapy (119 randomised from 587 individuals who had self-poisoned)¹¹ and cognitive therapy (120 randomised from 350 individuals who had self-harmed).¹² Reduction in self-harm event rates using cognitive-behavioural therapy have been shown (90 participants randomised from an initial 222).¹³ The Postcards from the EDge project showed a reduction in self-poisoning event rates at 12 months and 24 months (but no difference in proportions), in a largely unselected sample of hospital-treated self-poisoning patients (722 randomised from 922 assessed).^{14,15}

In this study our aims were to test the efficacy of a postcard intervention plus treatment as usual (TAU) versus TAU in an

RCT for three primary outcomes: suicidal ideation, suicide attempts and self-cutting (or self-mutilation), and the secondary outcome was any deaths.

Method

Setting

The Loghman-Hakim Poison Hospital is the referral hospital for poisoned individuals in Tehran (12.5 million permanent, 6.5 million temporary residents). There are over 24 000 patients annually including 10 000 hospitalisations (i.e. in-patient treatment); the balance are treated in the emergency department and discharged directly home.¹⁶ Individuals with toxicologically trivial self-poisoning presenting to other Tehran hospitals might be treated and discharged home, however all individuals needing admission are transferred to Loghman-Hakim Poison Hospital. Individuals under 12 years are not treated in this hospital but in a paediatric hospital. The Loghman-Hakim Poison Hospital has 20 intensive care unit beds, 60 ward beds and an emergency department; probably the largest medical toxicology centre in the world. The psychiatry department sees all self-poisoning in-patients for assessment, diagnosis, management and discharge destination.

Participants

Potential participants were consecutive individuals with poisoning, admitted from March to June 2006. Inclusion criteria were: above 12 years of age with self-poisoning defined by exclusion of poisoning classified as recreational, habitual misuse, accidental or iatrogenic by the treating medical toxicologist. Exclusions were: treatment only in emergency department, incapable of informed consent, psychosis, having no fixed address, insufficient Farsi (official language) to read a letter, and potential threat to an interviewer. The CONSORT diagram is shown in Fig. 1. In total, 4420 people were admitted: 2004 were excluded (habitual misuse,

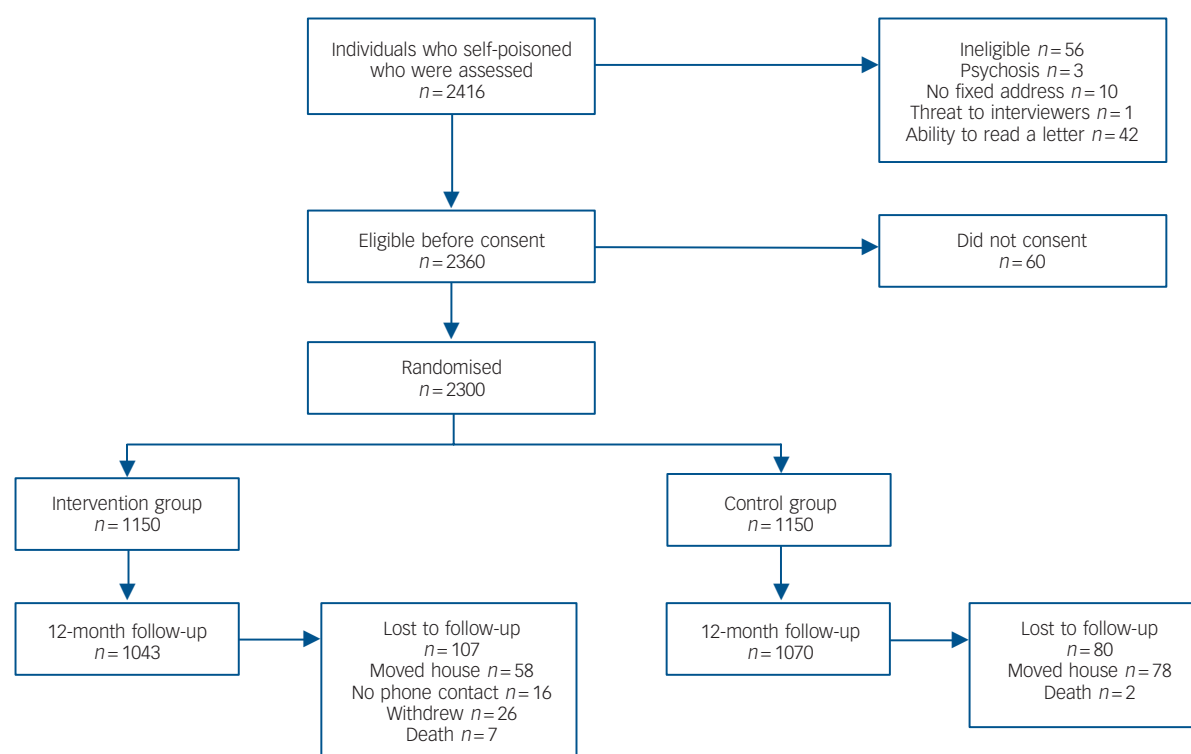


Fig. 1 CONSORT diagram of participant flow through the study.

recreational, accidental or iatrogenic poisoning) and 2416 were assessed (56 not eligible, 60 did not consent), resulting in 2300 being included in the RCT. After 12 months, 2113 were retained (92%).

Variables

Participant characteristics and outcomes (except death) were determined by a baseline questionnaire and at 12 months by a follow-up questionnaire delivered by the research psychologist. The baseline interview was in person in the hospital ward; follow-up was by telephone for all but three who were interviewed in person.

Baseline characteristics included gender, marital status, employment, previous suicide attempt, current use of illicit drugs, current smoker, current or past victim of abuse (physical, sexual, emotional) (categorical); and age, number of children and years of schooling (continuous).

Outcomes were determined by direct questions, for example 'Did you have any self-mutilation (self-cutting) during the study period? Did you have any suicidal thoughts during the study period? If yes, did you have any suicide attempts during the study period?'

The three primary outcomes were: any suicidal ideation (proportion with any episode); suicide attempts (proportion with any episode and number of episodes); and cutting or self-mutilation (proportion with any episode and number of episodes). Any reported suicide attempt with hospital treatment was cross-validated against hospital records.

The follow-up interview included several other questions: details of follow-up care including professional consulted and number of consultations; and for the intervention group the number of contacts made in response to the postcards, recall of number of postcards received and belief that the postcards might be helpful in preventing suicide.

The secondary end-point was deaths (informant and official death records).

Design, consent and randomisation

A standard two-arm, parallel RCT design with informed written consent from all participants was used. Participants were masked to study outcomes and the consent process included alternate contact with a family member when participants were uncontactable. The baseline assessment was completed before randomisation. To maintain masking to allocation, randomisation was not revealed to the recruiting toxicologist until all information was entered and eligibility determined. Block randomisation (blocks of 100) was undertaken using a random digit table. Other staff were masked to allocation status during hospital treatment. The research psychologist was not masked to allocation status at follow-up.

Intervention

The intervention was based on the Postcards from the EDge study, with modification so that each postcard had a different message and a variety of mostly floral images as a four-page greeting card rather than a two-sided postcard format. Eight postcards were mailed at 1, 2, 3, 4, 6, 8, 10 and 12 months after discharge. A ninth postcard was sent for each participant's birthday, which was included with the monthly postcard if the birthday fell in the first 4 months or on the actual birthday if the postcards were on a 2-monthly interval during the final 8 months of intervention (details in the online supplement).

Each postcard was mailed in a sealed envelope, with the initial postcard enclosing a stamped addressed envelope to make contact, to change contact details or to withdraw. Participants were assured that replies would be made to any questions or requests and included with the subsequent postcard. The intervention group also received TAU.

Control group

The control condition was TAU. Follow-up care for self-poisoning in Tehran is generally poor. Public and private sector care is not

coordinated. Contact is mainly hospital- or office-based, and community-based programmes are almost non-existent. Psychiatric beds are often at 100% occupancy, with short admissions and frequent readmissions.

Sample sizes

To detect a difference in proportions of 5% in subsequent suicide attempts (15% control to 10% intervention) with an estimated 20% drop-out rate from both groups (15% suicide attempt rate in those that dropped out), with $P=0.05$ at 90% power, required 1100 per group.

Statistical analyses

All outcomes were analysed on randomisation status at baseline for 12-month follow-up (per protocol). Baseline and outcome data were analysed as binary variables (e.g. proportion with suicide attempt), as counts (e.g. number of episodes of suicide attempt) or as continuous variables (e.g. age). Comparisons were carried out using chi-squared (binary), Poisson regression (counts) and Student's two-tailed t -test (continuous), with P -values of <0.05 considered statistically significant. Results for primary and secondary outcomes were reported as relative risk reduction (RRR), number needed to treat (NNT) or number needed to harm (NNH) for binary variables; and incidence rate ratios (IRRs) for count data; all with 95% confidence intervals. Because participants dropped out from both arms of the study, sensitivity analyses were done for any primary binary outcomes that showed significant differences. First, a standard extreme case sensitivity analysis (assuming no differential effect) was done, using best possible (all missing participants did not report suicide attempts or suicide ideation) and worst possible (all missing participants did report suicide attempts or suicide ideation) outcome for all missing participants. However, since this form of analysis is rarely conclusive, a graphical sensitivity analysis was also done, which displays results for all possible allocations of missing participants.¹⁷ A comparison (baseline characteristics) was made for all participants at follow-up with those missing at follow-up.

Post hoc analyses were undertaken for subgroups based on gender and history of previous suicide attempt at baseline, for significant binary outcomes (suicidal ideation or suicide attempt)

and for each event outcome. Two possible mechanisms of action were considered: number of postcards received and the participants' belief in the effectiveness of the postcards as an intervention. *Post hoc* analyses within the intervention group examined the relationship of the 'dose' of the recalled number of postcards received to the two significant binary outcomes. Two logistic regressions were used with any ideation or any attempt as the dependent variables and the number of postcards received (zero to nine) as a continuous predictor variable, with results reported as odds ratio (OR) with 95% CI for each additional postcard received. *Post hoc* analyses were also done within the intervention group for the belief that postcards were 'helpful in the prevention of suicide' associated with the number of postcards received. The belief that postcards were 'helpful in the prevention of suicide' was analysed as a categorical, three-level variable – believed they were helpful – some belief they were helpful, and no belief they were helpful, whereas the number of postcards received was a continuous variable (zero to nine), using ANOVA reported as F -statistic, P -value with *post hoc* Scheffe test for all comparisons. The final *post hoc* analyses within the intervention group explored the relationship of the belief that postcards were 'helpful in the prevention of suicide' as a three-level predictor variable (as above) to the two dependent variables suicide ideation and suicide attempt respectively, in two further logistic regression analyses. The referent group was 'believed the postcards were helpful in the prevention of suicide' for each regression, with results reported as OR with 95% CI.

Data were analysed using SPSS version 15.0, intercooled STATA version 7, DAG-Stat for the extreme case sensitivity analyses,¹⁸ and for the graphical sensitivity analysis R version 2.9.0, all run on Windows. Ethical approval was given by the Shahid Beheshti Medical University ethical committee and the Legal Medicine Organization.

Results

Sample characteristics and effectiveness of randomisation

Participants were predominately young, female, employed or students and never married. Baseline variables showed no statistical differences (imbalances) at randomisation (Table 1).

Table 1 Baseline characteristics and comparison of intervention v. control groups

Characteristics	Total ($n=2113$)	Intervention group ($n=1043$)	Control group ($n=1070$)	t -test	χ^2	P
<i>Demographics</i>						
Age: years, mean (s.d.)	24.13 (8.11)	24.17 (7.97)	24.09 (8.25)	0.23		0.82
Number of children, mean (s.d.)	1.32 (1.36)	1.32 (1.28)	1.31 (1.44)	0.14		0.86
Years of schooling, mean (s.d.)	10.74 (2.87)	10.85 (2.82)	10.63 (2.91)	1.79		0.07
Gender, n (%)					0.13	0.72
Male	711 (33.7)	347 (33.3)	364 (34.0)			
Female	1402 (66.4)	696 (66.7)	706 (66.0)			
Marital status, n (%)					2.72	0.44
Never married	1169 (55.3)	585 (56.1)	584 (54.6)			
Engaged	197 (9.3)	93 (8.9)	104 (9.7)			
Married	650 (30.8)	311 (29.8)	339 (31.7)			
Divorced/widowed	97 (4.6)	54 (5.2)	43 (4.0)			
Employment status, n (%)					1.18	0.28
Employed or student	1227 (58.1)	618 (59.3)	609 (56.9)			
Not in paid employment	886 (41.9)	425 (40.7)	461 (43.1)			
<i>Clinical</i>						
Previous suicide attempt, n (%)	723 (34.2)	367 (35.2)	356 (33.3)		0.86	0.35
Current use of illicit drugs, n (%)	191 (9.0)	93 (8.9)	98 (9.2)		0.04	0.85
Current smoker, n (%)	457 (21.6)	217 (20.8)	240 (22.4)		0.82	0.36
Physical, verbal or sexual abuse, n (%)	423 (20.0)	218 (20.9)	205 (19.2)		1.00	0.32

Primary outcomes

There was a significant reduction in suicidal ideation (RRR = 0.31, 95% CI 0.22–0.38; NNT = 7.9, 95% CI 6.10–11.5), suicide attempt (RRR = 0.42, 95% CI 0.11–0.63; NNT = 46.1, 95% CI 26.0–203.7) and number of suicide attempt events per person (IRR = 0.64, 95% CI 0.42–0.97) (Tables 2 and 3; see online Table DS1 for a more detailed version of Table 2 including subgroup analysis). There was no significant reduction in self-cutting (RRR = 0.14, 95% CI –0.29 to 0.42; NNT = 154, 95% CI –89 to 41) or self-cutting events per person (IRR = 1.03, 95% CI 0.76 to 1.39).

Extreme case sensitivity analysis showed: suicide ideation best case (RRR = 0.32, 95% CI 0.24 to 0.4; NNT = 8.0, 95% CI 6.1 to 11.5); suicide ideation worst case (RRR = 0.22, 95% CI 0.14 to 0.30; NNT = 9.8, 95% CI 7.1 to 16.2); suicide attempt best case (RRR = 0.44, 95% CI 0.13 to 0.63; NNT = 47.9 95% CI 27.5 to 185.7); and suicide attempt worst case (RRR = –0.02 95% CI –0.28 to 0.18; NNH = 383.3 95% CI 34.3 to ∞).

The graphical sensitivity results are shown in Fig 2. The bold cross bars indicate the values from the actual results of the trial and their intersection falls within the darkly shaded area to the right side of the figure, the statistically significant zone in favour of intervention. The dark shaded areas (to the right of each figure) indicate a combination of the range of missing values from each

arm of the trial, which would be statistically significant and the lightly shaded areas indicate a combination of missing values, which would make the results non-significant. The *x*- and *y*-axes show the percentage of missing participants allocated to good outcome for each arm of the trial. Further details on the interpretation of the graphical sensitivity plots have been reported elsewhere.¹⁷

Inspection of Fig. 2a (see lightly shaded area at top left-hand corner) indicates that suicidal ideation would remain statistically significant for almost the entire range of possible outcomes for the missing participants. For the suicidal ideation result to become non-significant, it would require almost all the missing participants in the intervention group to have had suicidal ideation, whereas the control group had almost none. However, inspection of Fig. 2b (see lightly shaded band in the middle of the figure and dark band at top left-hand corner) indicates that a small shift in the percentage of missing individuals in the intervention or control groups with a good outcome would be sufficient to render the results non-significant. Moreover, the dark shaded area at the left top corner of the figure indicates that a combination of a low proportion of missing intervention participants with a good outcome (no suicide attempt) combined with a high percentage of the controls with a good outcome would result in the trial showing a statistically significant result in favour of the controls.

Table 2 12-month follow-up of binary outcomes (difference in proportions) for intervention group v. control group.^a

Primary outcomes	n (%)		Relative risk reduction (95% CI)	Number needed to treat (95% CI)
	Intervention group (n = 1043)	Control group (n = 1070)		
Any suicidal ideation			0.31 (0.22 to 0.38)	7.9 (6.0 to 11.5)
Yes	302 (29.0)	446 (41.7)		
No	741 (71.0)	624 (58.3)		
Any suicide attempt			0.42 (0.11 to 0.63)	46.1 (26 to 203.7)
Yes	31 (3.0)	55 (5.1)		
No	1012 (97.0)	1015 (94.9)		
Any self-cutting (mutilation)			0.14 (–0.29 to 0.42)	NA
Yes	42 (4.0)	50 (4.7)		
No	1001 (96.0)	1020 (95.3)		

NA, not applicable.

a. For a more detailed version of this table that includes subgroup analysis see online Table DS1.

Table 3 12-month follow-up of event-rate outcomes for intervention group v. control group

Primary outcomes	Intervention group			Control group			Incidence rate ratio ^a (95% CI)
	n	Count	Mean (s.d.)	n	Count	Mean (s.d.)	
Total sample	1043			1070			
Suicide attempt		34	0.03 (0.21)		58	0.05 (0.24)	0.64 (0.42–0.97)
Self-cutting		83	0.08 (0.45)		83	0.08 (0.41)	1.03 (0.76–1.39)
<i>Subgroup analyses</i>							
Females	696			706			
Suicide attempt		18	0.03 (0.18)		39	0.06 (0.24)	0.47 (0.27–0.82)
Self-cutting		38	0.05 (0.30)		34	0.05 (0.30)	1.13 (0.71–1.80)
Males	347			364			
Suicide attempt		18	0.05 (0.26)		19	0.05 (0.23)	0.99 (0.52–1.89)
Self-cutting		45	0.13 (0.65)		49	0.13 (0.56)	0.96 (0.64–1.44)
Previous suicide attempt at baseline	367			356			
Suicide attempt		22	0.06 (0.29)		43	0.12 (0.35)	0.49 (0.30–0.83)
Self-cutting		53	0.14 (0.56)		53	0.14 (0.61)	0.97 (0.66–1.4)
No previous suicide attempt at baseline	676			714			
Suicide attempt		14	0.02 (0.15)		15	0.02 (0.14)	0.99 (0.48–2.04)
Self-cutting		30	0.04 (0.37)		30	0.04 (0.25)	1.06 (0.64–1.75)

a. All incidence rate ratios are derived from Poisson regression.

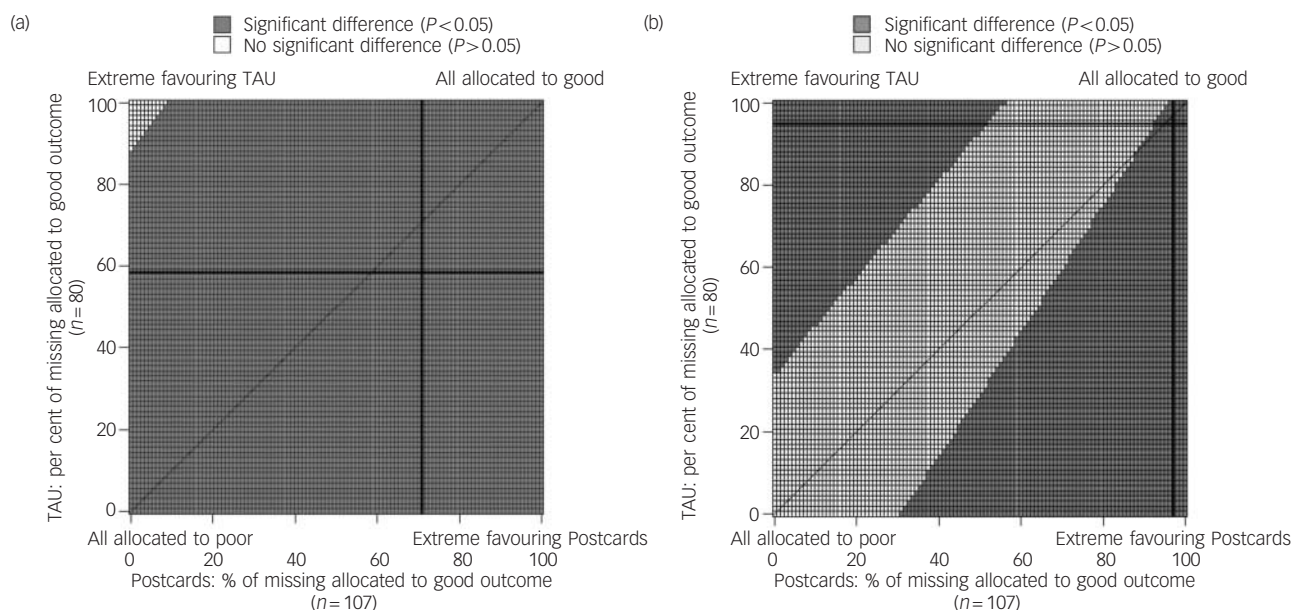


Fig. 2 Graphical sensitivity analyses for (a) suicidal ideation and (b) suicide attempts.

TAU, treatment as usual.

Subgroup analyses

Gender

There was a significant reduction in suicidal ideation in both genders. There was a significant reduction in suicide attempts for females but not for males. There was a significant reduction in number of suicide attempts for females but not for males.

There were no significant reductions in self-cutting event rates for female or males.

History of suicide attempt at baseline

There was a significant reduction in suicidal ideation for those with a previous suicide attempt and no previous suicide attempt. There was a significant reduction in suicide attempts for those with a previous suicide attempt but not for those with no previous suicide attempt. There was a significant reduction in number of suicide attempts for females but not for males. There were no significant reductions in self-cutting event rates for females or males.

Other outcomes

In total, 16 participants reported a suicide attempt which resulted in treatment at Loghman-Hakim Poison Hospital (9 in intervention group *v.* 7 in the control group), with hospital records exactly concordant for these. Six deaths were recorded from informant data, whereas official death data recorded nine deaths (seven in the intervention group *v.* two in the control group). The difference in deaths was not significant.

Treatment as usual

In total, 1529 participants reported no out-patient follow-up (750 intervention *v.* 779 control group), 123 did not answer and 461 reported contact as follows: psychiatrist (99 intervention *v.* 91 control group), physician (65 intervention *v.* 61 control group), neurologist (27 intervention *v.* 27 control group), cardiologist (11 intervention *v.* 14 control group), general practitioner (2 intervention *v.* 4 control group) and psychologist (4 intervention *v.* 1 control group). For the 460 that provided details of the

number of contacts, the range was 1–10, mean 2.82 (s.e. = 0.08) and median 2 (s.d. = 1.78) for 1298 total episodes.

Comparison of study group and those missing from follow-up

There were no significant differences for gender, age, employment status or previous suicide attempt. There was a small, significant difference for marital status overall: never married (45.5% *v.* 55.3%), engaged (9.1% *v.* 9.3%), married (40.1% *v.* 30.8%) and divorced or widowed (5.3% *v.* 4.6%), for missing versus study group respectively.

Post hoc analyses

There was no relationship between the recall of number of postcards received and suicidal ideation (OR = 1.02, 95% CI 0.95–1.10) or suicide attempt (OR = 0.97 95% CI 0.79–1.18) for each additional card.

There was a significant association for number of postcards received and the belief that the postcards were 'helpful in the prevention of suicide': believed they were helpful (mean 6.32 (s.d. = 1.53) postcards received, *n* = 825), some belief (mean 5.08 (s.d. = 2.06) postcards received, *n* = 181) and no belief they were helpful (mean 3.73 (s.d. = 2.53) postcards received, *n* = 37), *F* = 76.07, *P* < 0.001, with Scheffe test significant for each comparison.

There was a significant association overall (*P* < 0.001) for the belief that the postcards were 'helpful in the prevention of suicide' and suicidal ideation, some belief (OR = 2.70, 95% CI 1.94–3.77) and no belief (OR = 4.68, 95% CI 2.38–9.19); and for suicide attempt, some belief (OR = 4.74, 95% CI 1.86–12.13) and no belief (OR = 49.11 95% CI 19.15–125.96), than the referent group (belief that the postcards were helpful).

Discussion

Strengths and limitations

The overall design of the study was strong with few threats to internal validity. It was adequately powered, with the largest

sample size of any RCT conducted on suicide attempts, (randomisation of the individual), with an over 90% retention rate and nearly equal rates of loss to follow-up in both groups. Randomisation was not carried out by a third party; however, the recruiting toxicologist was masked to allocation until eligibility was determined. Randomisation was by random digit table in blocks of 100. This older form of randomisation is potentially liable to interference, however, no imbalances at baseline suggest that the randomisation was likely to have been successful. The research psychologist was not masked to allocation and may have inadvertently influenced responses at follow-up. Participants may have guessed the study end-points from questions asked of them, however their reports of the hospital-treated suicide attempts were found to be accurate. No cross-validation was available for suicidal ideation, self-cutting outcomes or suicide attempts without hospital treatment. There was no differential death rate that would potentially affect the internal validity of the results. Significant differences in primary outcomes were examined with two sensitivity analyses.

Recruitment came from the regional toxicology referral centre and so is likely to be representative of the overall population of individuals who self-poisoned and were treated as in-patients, unless the 4-month recruitment window introduced an unexpected ascertainment bias. The study recruited 2300 participants from an initial group of 2416 hospital-treated individuals that were eligible for the study, so the external validity for the entire in-patient treatment subgroup of the population of the Loughman-Hakim Poison Hospital is expected to be strong. It is unknown whether these results would be generalisable to individuals who were not admitted in the referral area or to other hospital-treated populations.

Rates of suicidal behaviour

The rate of suicide attempts in the control group was 5.1% and the overall hospital-treated suicide attempt rate was only 0.8%, much lower than the median of 16% for self-harm repetition in Western countries.² The baseline rates of self-reported previous suicide attempts were 34%, double the rate of previous hospital-treated self-poisoning of 17%¹⁴ but lower than the 'history of deliberate self harm' of 60% from the UK.¹¹ Direct comparison is difficult because of the heterogeneity of definitions, participant selection criteria and because so little is known about the rates of suicidal behaviours in non-Western countries. Similarly, all-cause mortality in this study was 0.5%, much lower than the median for suicide of 2% reported in Western studies.²

Reduction in suicidal ideation and suicide attempt

A clinically and statistically significant reduction in suicidal ideation (absolute reduction of 12.7%) and suicide attempt (absolute reduction of 2.1%) was shown. A UK study of self-poisoning reported a reduction of suicidal ideation using a continuous outcome, mean Beck Suicidal Ideation scores (8.0 v. 1.5),¹¹ with which comparison is difficult. The Postcards from the EDge study¹⁴ did not examine suicidal ideation as an outcome and used repetition of hospital-treated self-poisoning rather than self-reported suicide attempt, and showed a non-significant absolute reduction of 2%.

The current study also showed a significant difference in suicide attempt event rate (IRR=0.64, 95% CI 0.42–0.97), a similar magnitude to the Postcards from the EDge for repetition of hospital-treated self-poisoning events (IRR=0.55, 95% CI 0.35–0.87).¹⁴ However, the current study had far fewer multiple repetitions of suicide attempt events (79 with one event, 6 with

two events and 1 with three events), which means that the reduction in suicide attempt events cannot be attributed to a contribution by a small number of high frequency repeaters, as occurred in the Postcards from the EDge study.

Beneficial effects by gender

In the Postcards from the EDge study the benefits for event rates in self-poisoning were only seen in females.¹⁴ The current study showed benefits only in females for the binary outcomes and the event rate for suicide attempts, with an NNT of 33 individuals for one less person attempting suicide. However, it also showed a reduction in the binary outcome of suicidal ideation for both females and males, an outcome not examined in the original Postcards study.¹⁴ For suicidal ideation in females the NNT was nine and for males the NNT was seven for one less person with suicidal ideation. The current study was not powered to examine gender subgroups and a differential effect for males and females was not a planned *a priori* analysis, so caution should be used in interpreting these gender-based analyses.

Beneficial effects by history of previous suicide attempt at baseline

In the Postcards from the EDge study there was no subgroup analysis based on history of previous suicide attempt at baseline.¹⁴ The current study showed benefit only in the subgroup with a previous history of suicide attempt for the binary outcome and event rate for suicide attempt, with an NNT of 16 individuals for one less person attempting suicide. However, it also showed a reduction in the binary outcome of any suicidal ideation for both subgroups: an NNT of 4 for those with a previous history of suicide attempt and an NNT of 14 for those without a history of previous suicide attempt. The current study was not powered to examine these subgroups and it was not a planned *a priori* analysis, so caution should be used in interpreting these analyses based on previous suicide attempt.

No effect on self-cutting (or self-mutilation)

The absence of any effect on these clinically important behaviours suggests that the postcards might have a differential effect on various 'suicidal' behaviours and that the positive effect on suicidal ideation and suicide attempt cannot be simply explained by socially desirable response biases by the participants. Moreover, if the postcard intervention works by increasing 'social connectedness'¹⁹ it may be that self-cutting behaviours are less influenced by this factor. However, the inception rule for this study was restricted to self-poisoning episodes and did not include self-cutting or self-mutilation behaviour unless it occurred concurrently with an episode of self-poisoning. The generalisability of the study to a population defined by an inception rule of self-cutting or some other form of self-harm would not be warranted.

'Dose' of postcards received

Although there was no significant relationship between the recall of the number of cards received and any suicidal ideation or any suicide attempt, there was an association between the number of cards received and the belief that the postcards might be 'helpful in the prevention of suicide'. Furthermore, there was a relationship between the belief that the cards might be 'helpful in the prevention of suicide' and the risk of suicidal ideation and suicide attempt. These relationships may have been confounded by the participants' attributions rather than a causal

effect, however it would seem prudent that the number of postcards sent or the sustained duration of mailings (12 months) should not be uncritically reduced in future studies. However, it might also be reasonable to give consideration to inclusion of a 'dosing' component in future studies.

Alteration to the postcard intervention

The current study altered the physical appearance and the wording of the eight postcards and included an additional potential ninth postcard on each participant's birthday. This alteration was done by two of the authors (H.H.-M. and S.S.) to adapt the intervention to be a more culturally relevant intervention. In a review of the study of the process of diffusion of innovation in healthcare practices, it has been suggested that 'early adopters' of innovation will modify innovations to be compatible with the values, beliefs, past history and current needs of local systems and individuals.²⁰ This study used an intervention with different messages in each postcard, advice and inspirational messages, which was quite different from the American¹⁹ and Australian¹⁴ versions. This study also found an effect for male suicidal ideation, which raises the possibility that variation in the content and format of the intervention might have differential influences on population subgroups, for example those defined by gender, age or history of previous suicide; or differential effects on different forms of suicidal behaviour such as ideation, attempts or self-cutting.

In this study, several of the postcards contained an offer to contact the treating toxicologists and the initial card included a stamped addressed envelope to facilitate contact, whereas the Australian study contained the invitation to 'drop us a note' in each card, so the offer of contact with the hospital treatment team if required may be an important part of the intervention.

Direct response to the postcard contents

In the current study, 1150 participants were sent postcards, which generated 113 letters in reply (91 single letters, 6 sent two, 1 sent four and 1 sent six letters) as well as 204 telephone calls (120 single calls, 24 rang twice, 9 rang three times, 1 rang four times and 1 rang five times). This was a modest increase in workload for the treating toxicologist, spread over more than 1000 patients in the 12 months of follow-up. The response of participants to the invitation to 'stay in touch'²¹ suggests that at least some individuals are open to the offer to communicate, but not in a way which would overwhelm clinical services. There were also 26 (2.3%) participants who withdrew from the postcard intervention, which suggests that a small minority do not wish to be involved in this type of intervention. The reasons for withdrawal were not assessed.

Future directions

These results suggest that a postcard-based intervention (plus TAU) sustained over a 12-month period, which included the expression of ongoing concern and the offer of contact if needed, was successful in reducing subsequent suicidal ideation and suicide attempt in a population of hospital-treated self-poisoning individuals in a cultural setting very different to where the original intervention was developed and evaluated.

There has been a recent report of a replication of a postcard intervention, using six postcards over 12 months for individuals who self-harm recruited from a psychiatric admission centre in New Zealand.²² The results from this study are difficult to interpret but might be best seen as equivocal. The trial was powered to recruit 700 participants, but was stopped early (with a sample size of only 327 participants) because the event rates

for further psychiatric emergency services visits was strongly in favour of the postcard intervention ($P < 0.001$). This inadvertently resulted in the trial being substantially underpowered for the subsequent unplanned analyses. A review of imbalances at baseline suggested an imbalance in favour of the intervention group for number of self-harm events in the 12 months before recruitment. The authors then undertook a *post hoc* analysis adjusting for the number of self-harm events before the study as a covariate and found that the significance level for this event-rate outcome (contact with psychiatric emergency services) was substantially reduced ($P = 0.04$).

However, postcard interventions have now been demonstrated to have beneficial effects on different suicidal behaviours in different populations in three RCTs^{14,19} (including the current study) and the possibility of a low-cost intervention available to large-scale clinical populations at risk of suicidal behaviour warrants further development and evaluation in replication studies of efficacy as well as implementation in real-life effectiveness trials. Future RCTs might usefully consider designs that incorporate stratification on gender and history of self-harm, self-poisoning or suicide attempt since these variables have a differential effect on repetition rates and may have differential responses to postcard-type interventions.

Hossein Hassanian-Moghaddam, MD, Department of Internal Medicine, Division of Clinical Toxicology, Faculty of Medicine, Shahid Beheshti University MC, Tehran, Iran; **Saeedeh Sarjami**, MD, Private Clinic, Tehran, Iran; **Ali-Asghar Kolahi**, MD, Department of Community Medicine, Faculty of Medicine, Shahid Beheshti University MC, Tehran, Iran; **Gregory L. Carter**, MB, BS, FRANZCP, Cert Child Psych, PhD, Centre for Brain and Mental Health Research, Faculty of Health, University of Newcastle, Australia

Correspondence: Hossein Hassanian-Moghaddam, MD, Department of Internal Medicine, Division of Clinical Toxicology, Lohman-Hakim Poison Hospital, Kamali Avenue, South Karegar, Tehran, Iran. Email: Hassanian@sbmu.ac.ir

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References

- House A, Owens D, Patchett L. Deliberate self-harm. *Eff Health Care* 1998; **4**: 1–12.
- Owens D, Horrocks J, House A. Fatal and non-fatal repetition of self-harm. Systematic review. *Br J Psychiatry* 2002; **181**: 193–9.
- Owens D, House A. General hospital services for deliberate self-harm. Haphazard clinical provision, little research, no central strategy. *J R Coll Physicians Lond* 1994; **28**: 370–1.
- Liu KY. Suicide rates in the world: 1950–2004. *Suicide Life Threat Behav* 2009; **39**: 204–13.
- Fleischmann A, Bertolote JM, Wasserman D, De Leo D, Bolhari J, Botega NJ, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ* 2008; **86**: 703–9.
- Bateman A, Fonagy P. Effectiveness of partial hospitalization in the treatment of borderline personality disorder: a randomized controlled trial. *Am J Psychiatry* 1999; **156**: 1563–9.

- 7 Bateman A, Fonagy P. Randomized controlled trial of outpatient mentalization-based treatment versus structured clinical management for borderline personality disorder. *Am J Psychiatry* 2009; **166**: 1355–64.
- 8 Linehan MM, Armstrong HE, Suarez A, Allmon D, Heard HL. Cognitive-behavioral treatment of chronically parasuicidal borderline patients. *Arch Gen Psychiatry* 1991; **48**: 1060–4.
- 9 Linehan MM, Comtois KA, Murray AM, Brown MZ, Gallop RJ, Heard HL, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry* 2006; **63**: 757–66.
- 10 Wood A, Trainor G, Rothwell J, Moore A, Harrington R. Randomized trial of group therapy for repeated deliberate self-harm in adolescents. *J Am Acad Child Adolesc Psychiatry* 2001; **40**: 1246–53.
- 11 Guthrie E, Kapur N, Mackway-Jones K, Chew-Graham C, Moorey J, Mendel E, et al. Randomised controlled trial of brief psychological intervention after deliberate self poisoning. *BMJ* 2001; **323**: 135–8.
- 12 Brown GK, Ten H, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA* 2005; **294**: 563–70.
- 13 Slee N, Garnefski N, van der Leeden R, Arensman E, Spinhoven P. Cognitive-behavioural intervention for self-harm: randomised controlled trial. *Br J Psychiatry* 2008; **192**: 202–11.
- 14 Carter GL, Clover K, Whyte IM, Dawson AH, D'Este C. Postcards from the EDge project: randomised controlled trial of an intervention using postcards to reduce repetition of hospital treated deliberate self poisoning. *BMJ* 2005; **331**: 805–7.
- 15 Carter GL, Clover K, Whyte IM, Dawson AH, D'Este C. Postcards from the EDge: 24-month outcomes of a randomised controlled trial for hospital-treated self-poisoning. *Br J Psychiatry* 2007; **191**: 548–53.
- 16 Shadnia S, Esmaily H, Sasanian G, Pajoumand A, Hassanian-Moghaddam H, Abdollahi M. Pattern of acute poisoning in Tehran-Iran in 2003. *Hum Exp Toxicol* 2007; **26**: 753–6.
- 17 Hollis S. A graphical sensitivity analysis for clinical trials with non-ignorable missing binary outcome. *Stat Med* 2002; **21**: 3823–34.
- 18 Mackinnon A. A spreadsheet for the calculation of comprehensive statistics for the assessment of diagnostic tests and inter-rater agreement. *Comput Biol Med* 2000; **30**: 127–34.
- 19 Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv* 2001; **52**: 828–33.
- 20 Berwick DM. Disseminating innovations in health care. *JAMA* 2003; **289**: 1969–75.
- 21 Hatcher S, Owens D. Do get in touch. *BMJ* 2005; **331**: 788–9.
- 22 Beautrais AL, Gibb SJ, Faulkner A, Fergusson DM, Mulder RT. Postcard intervention for repeat self-harm: randomised controlled trial. *Br J Psychiatry* 2010; **197**: 55–60.

