

## Suicide attempts in acute psychiatric referrals with substance use disorders

### *Il tentativo di suicidio in pazienti psichiatrici abusatori di sostanze ammessi in pronto soccorso*

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**SUMMARY. Aims.** The aim of the present study was to investigate suicidal risk in psychiatric referrals admitted to a University Hospital Emergency Department (ED) who had a substance use disorder. **Methods.** The participants were 135 psychiatric referrals (84 men and 51 women) admitted to the ED of the Sant'Andrea Hospital of Rome (Italy) between January 2006 and February 2007. The data were collected for the purpose of this research via electronic medical records of ED patients. **Results.** Attempters with substance use disorders were more likely to have higher burden of major affective disorders, and psychiatric history than substance use disorder referrals without recent suicide attempt; and they were at higher risk of suicide (higher rates of suicidal ideation reported during the psychiatric interview). **Conclusions.** When evaluating suicide attempters with substance use disorders, health professionals working in the ED settings have to assess not only somatic emergencies that can undermine patient's life but also the chance of repetition of suicidal behavior.

**KEY WORDS:** substance abuse, suicide, emergency department.

**RIASSUNTO. Scopo.** Lo scopo di questo studio è di valutare il rischio di suicidio nei pazienti con un disturbo da uso di sostanze che entrano nel Pronto Soccorso (DEA) di un Ospedale Universitario e per i quali viene richiesta una consulenza psichiatrica. **Metodi.** I partecipanti sono 135 pazienti per cui è stata richiesta una consulenza psichiatrica (84 uomini e 51 donne) che sono stati visitati presso il DEA dell'Ospedale Sant'Andrea di Roma (Italia) tra il gennaio 2006 e il febbraio 2007. Le informazioni sono state raccolte tramite le cartelle cliniche elettroniche dei pazienti. **Risultati.** I pazienti con un disturbo da uso di sostanze che hanno tentato il suicidio recentemente hanno più frequentemente disturbi affettivi maggiori e una storia psichiatrica precedente rispetto ai pazienti con disturbo da uso di sostanze ma senza un recente tentativo di suicidio; essi sono anche a più elevato rischio di suicidio (durante la consulenza psichiatrica riferiscono più frequentemente ideazione suicidaria). **Conclusioni.** Quando si valutano i pazienti con un disturbo da uso di sostanze e un recente tentativo di suicidio, il personale sanitario che lavora nei DEA deve valutare non solo le patologie organiche che possono mettere a rischio la vita del paziente ma anche il rischio che il paziente tenti nuovamente di togliersi la vita.

**PAROLE CHIAVE:** tentativi di suicidio, Pronto Soccorso, abuso di sostanze.

### INTRODUCTION

Drug use is a major public health problem; use of drugs for recreational purpose has achieved a "firm footing" in society (1); a phenomenon that is the result of the normalization of drug use in Europe and in oth-

er western countries. In 2007, an estimated 19.9 million Americans aged 12 or older (8.0%) were current (past month) illicit drug users. Furthermore, an estimated 19.9 million Americans aged 12 or older (23.3%) reported engaging in binge drinking (having five or more drinks on the same occasion on at least 1 day in the 30

days prior to the survey), and 17.0 million people (6.9%) reported heavy drinking (i.e., binge drinking on at least 5 days in the past 30 days) (2). In Europe, it is estimated that at least 65 million European adults used cannabis at least once in their lifetime (one in five European adults), and 22.5 million European adults used cannabis in the last year. At least 10 million European adults used cocaine, and about 8.5 million used ecstasy during their lifetime (2). Furthermore, it is recognized that the European Region has the highest alcohol consumption in the world, and it has the highest rates of alcohol-related harm. The consumption of alcoholic beverages is estimated to be responsible for some 9% of the total disease burden within the European Region (3).

Drug and alcohol use disorders may be associated with increased rates of health problems, public health expenditures (4), and mental illness (5-11). For example, Havassy, Alvidrez and Owen (12) found that between 49% and 60% of a sample of patients in the public mental health system and the substance abuse treatment system met criteria for comorbidity. As it is observed in drug/alcohol addiction, drug/alcohol misuse may be associated with high rates of psychopathology and conduct disorders as well (13).

Substance use disorders may also be related to self-injurious and suicidal behavior (14-18), although there are discordant results (19). For example, diagnoses of substance use disorders are common in psychological autopsy studies of completed suicides (20-22). Figures from the Emergency Department (ED) setting indicate similar rates (11,23). Veranic and Pregelj investigated suicidal behavior in patients with substance misuse admitted to a psychiatric emergency clinic in Ljubljana (Slovenia) (23). The authors reported higher rates of suicidal behavior (35.4% vs 28.0%), and suicide attempts (9.5% vs 3.5%) in substance users than in nonusers. Alaja et al. (11) investigated psychoactive substance use disorder in 1222 psychiatric referrals in six general hospitals in Finland. The authors reported that attempted suicide was the primary reason for referral in 32% of all consultation patients, and that it was more frequently related to psychoactive substance use disorders in male consultation patients compared with female consultation patients (51% vs 39%).

Thus, patients with substance use disorders show severe psychopathology and high suicidal risk.

## AIM

The aim of the present study was to investigate suicidal risk among psychiatric referrals who had a sub-

stance use disorder admitted to an University Hospital ED. We hypothesized that suicide attempters with substance use disorders form a population characterized by a greater disease burden than users without current suicide behavior. Substance use disorders frequently overlap with personality disorders, especially DSM-IV cluster B personality disorders, with impulsivity and aggression, and inhibitory-control issues (24,25). We hypothesize that suicide attempters with substance use disorders may have greater burden of psychopathology and less affective control than nonsuicidal patients, perhaps as an expression of different abnormalities in the central nervous system (26). In order to control that difference between attempters and nonattempters are not associated *per se* to suicidality (a variable common to all patients who attempted suicide, independent of substance use), we also assessed differences among suicide attempters with and without substance use disorders.

## MATERIALS AND METHODS

### Participants

The participants were 135 consecutive psychiatric referrals (84 men and 51 women) admitted to the ED of the Sant'Andrea Hospital (Rome, Italy) between January 2006 and February 2007 who had a substance use disorder. The mean age of participants was 40.49 (SD=12.85). In 62% of subjects, the disorder was associated with alcohol use; 3% of the referrals abused psychotropic medications, mainly benzodiazepines, and the remaining 34.8% abused either injected heroine or cocaine. Most referrals with illicit drug use also reported concurrent alcohol abuse. All patients were 18 years or older. Controls were 104 suicide attempters without substance use disorders (30 men; 74 women) admitted to the ED during the same index period. The mean age of controls was 42.83 years (SD=13.45). Almost 40% of controls were diagnosed as major depressive disorder, 12.5% bipolar disorder, 9% schizophrenia and other psychosis, and others with other DSM-IV specified disorders (more than 38%).

### Procedure and measures

The data were collected for the purpose of this research via electronic medical records of ED patients, as approved by the hospital's Institutional Review Board.

In the ED of the Sant'Andrea hospital, nurses on duty assess urgency of medical assistance and assign a triage code, then the physician evaluates physical and mental state of the patient, checks abuse of substance or drugs, and may ask for biochemical analyses to confirm the presence of substance of abuse. If this is confirmed and in the presence of mental and behavioural problems as well as

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when self-injurious behaviour is assessed, a psychiatric consultation is requested.

Because psychiatrists on duty in the ED must provide a full mental status examination of patients, missing data are most rare.

Data were coded for gender, age, triage codes (triage refers to the evaluation and categorization of the sick or wounded when there are insufficient resources for medical care of everyone at once, and is commonly used in crowded EDs to determine which patients should be seen and treated immediately), psychopathological evaluation during the psychiatric consultation, discharge diagnosis, and recommendation for psychiatric hospitalization. As well, we assessed for previous psychiatric treatments and psychiatric hospitalizations, and previous suicide attempts. Hallucinations, delusions, thought disorders, agitation or motor restlessness, and insomnia were also recorded. A positive attitude toward the psychiatric interview, and disorientation were also noted. Suicidal ideation was defined as the presence of passive thoughts about wanting to be dead or active thoughts about killing oneself, not accompanied by preparatory behavior reported during the clinical interview or elsewhere during the stay in the ED (27), psychiatrist-evaluated current suicidal ideation (any question was referred to the present time; for example, "In this few hours after you attempted to kill yourself, did you had some thoughts about taking your life?, and now, right at this moment, do you still have the same thoughts?"). Patients who were classified as suicidal ideators were those who still thought that suicide was a good option for their problems, wished that they were dead or were disappointed that they were rescued.

Although all patients reported significant physical injuries, the methods used to attempt suicide are diverse in terms of lethality. We dichotomized suicide methods as violent methods (jumping from a height, drowning, cutting except wrist and arm cutting, gunshot wounds or hanging) versus non-violent methods (suffocation, poisoning, superficial wrist and arm cutting) (28-33). Furthermore, we dichotomized the triage codes into a critical/urgent group which included both patients who could not survive without immediate treatment and those who were not in immediate danger of death and a moderate group which included those with nonurgent triage codes, including both "walking wounded" who would need medical care at some point, after more critical injuries have been treated, and those with minor injuries for whom a doctor's care was not required.

*Statistical analysis*

Chi-square tests with Yates's correction, one-way Fisher exact tests and t-tests were used to perform bivariate analyses. Logistic regression analysis was employed to assess the multivariate association among variables with suicide attempt (yes/no) as the dependent variable and variables statistically significant at the bivariate analysis

( $p < 0.05$ ) as the independent variables. Odds ratios (OR) and their 95% confidence intervals (95% CI) were calculated.

All statistical analyses were performed using the SPSS 13.0 statistical software package.

**RESULTS**

*Differences between referrals with substance use disorders who attempted suicide and those who did not*

We analyzed differences among referrals with substance use disorders who were admitted to the ED for a suicide attempt ( $n=24$ ) and those who were admitted to the ED for other psychiatric reasons ( $n=111$ ). Attempters with substance use disorders differed from their nonattempter controls on 6 of 17 variables (**Table 1**). Substance use disorders referrals with recent suicide attempt were more likely to have critical/urgent triage codes (79.2% vs 38.7%;  $p < 0.001$ ), major affective disorders (33.3% vs 15.3%;  $p < 0.05$ ), suicidal ideation (37.5% vs 5.4%;  $p < 0.001$ ), previous psychopharmacotherapy (66.7% vs 43.2%;  $p < 0.05$ ), and as expected, were more frequently referred for psychiatric hospitalization (83.3% vs 28.8%;  $p < 0.001$ ) than nonattempter controls. Attempters with substance use disorders were also less likely to report insomnia (0.0% vs 17.1%;  $p < 0.05$ ) than their nonattempter controls. Attempters and nonattempters did not differ in terms of number of previous hospitalizations, age, type of substance abuse, disorientation, attitude toward the psychiatric interview, hallucinations and delusions, thought disorder, agitation. More importantly, the groups did not differ in terms of sex or history of previous suicide attempts. However, the rates of previous suicide attempts were low for both categories of referrals.

All significant variables were included as independent predictors in a logistic regression analysis, modeling current suicidal status (attempters vs nonattempters) in the substance abusers ( $n=135$ ). The resulting multivariate model explained 58% of the variance of the data (Nagelkerke  $R^2 = 0.58$ ). The analysis resulted in 4 significant variables. Attempters with substance use disorders were almost 15 times more likely to have critical/urgent triage codes (OR=14.88 [95% CI: 3.13/70.75];  $p < 0.001$ ), 7 times more likely to report suicide ideation at the psychiatric interview (OR=7.11 [95% CI: 1.07/47.04];  $p < 0.05$ ), 5 times more likely to have previous psychopharmacotherapy (OR=4.77 [95% CI: 1.25/18.18];  $p < 0.05$ ), and around 12 times more likely to have a request for a hospitalization

**Table 1. Differences between attempters with substance use disorders and nonsuicidal abuse/dependent psychiatric referrals**

Variables	Substance use disorder nonattempters (n=111)	Attempters with substance use disorders (n=24)	Test (df)	P	Logistic regression <sup>†</sup>	
					OR (95%CI)	P
Age (Years) – M ± SD	41.95 ± 13.18	35.21 ± 10.28	t= 1.77 (67)	0.08		
Men - %	64.0	54.2		0.25		
Critical/Urgent triage codes - %	38.7	79.2		<b>&lt;0.001</b>	14.88 (3.13/70.75)	<0.001
Substance abuse			χ <sup>2</sup> =0.93 (2)	0.63		
Alcohol	62.2	62.5				
Illicit drugs	34.2	37.5				
Psychoactive drugs	3.6	0.0				
Major affective disorders	15.3	33.3		<b>&lt;0.05</b>	1.44 (0.31/6.65)	0.64
Disorientation - %	19.2	21.7		0.49		
Positive attitude toward psychiatric interview - %	75.5	76.2		0.60		
Hallucinations - %	8.1	12.5		0.36		
Delusions - %	18.2	22.2		0.46		
Insomnia - %	17.1	0.0		<b>&lt;0.05</b>	0.00 (0.00/-)	1.00
Thought disorders - %	22.6	6.3		0.12		
Suicidal ideation - %	5.4	37.5		<b>&lt;0.001</b>	7.11 (1.07/47.04)	<0.05
Previous suicide attempts - %	1.8	0.0		0.68		
Agitation or motor restlessness - %	38.7	33.3		0.40		
Previous psychopharmacotherapy - %	43.2	66.7		<b>&lt;0.05</b>	4.77 (1.25/18.18)	<0.05
Previous hospitalizations - %	37.8	58.3		0.053		
Hospitalization request - %	28.8	83.3		<b>&lt;0.001</b>	11.86 (2.84/49.55)	<0.001

One-way Fisher exact tests where not otherwise specified.

**Abbreviations:** OR: Odds ratio; df: degree of freedom; 95%CI: 95% confidence intervals.

<sup>†</sup> multivariate model fit indices: χ<sup>2</sup> = 58.79 (df=6); p<0.001. -2 Log likelihood= 67.58; Nagelkerke R<sup>2</sup>= 0.58

(OR=11.86 [95% CI: 2.84/49.55]; p<0.001) than their nonattempter controls.

Thus, attempters with substance use disorders were more likely to have higher burden of major affective disorders, and psychiatric history than substance use disorder referrals without recent suicide attempt; and they were at higher risk of suicide (higher rates of suicidal ideation reported during the psychiatric interview).

Most importantly, these features are not characteristics of suicide attempters as a whole; in fact, attempters with substance use disorders differ from attempters without any substance use disorder on some

variables (not listed in the tables); for example, the former reported less insomnia (0.0% vs 19.2%; p<0.05), more previous hospitalizations in psychiatric settings (58.3% vs 29.8%; p<0.01), and more requests for hospitalization (83.3% vs 60.6%; p<0.05) than attempters without any substance use disorder; furthermore, more attempters with substance use disorders reported suicidal ideation at the psychiatric interview than attempters without any substance use disorder, although this difference is not significant (37.5% vs 29.8%; p<0.31). Interestingly, attempters with substance use disorders and those without any substance use disorder differ in terms of sex (p<0.05): most attempters



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with substance use disorders were men (54.2%), while the contrary is true for attempters without any substance use disorder (71.2% of attempters without any substance use disorder are women).

## DISCUSSION

This study sought: to investigate the suicidal risk of psychiatric referrals who had a substance use disorder. We aimed to test the hypothesis that attempters with substance use disorders and their nonattempter counterparts constitute two different groups in terms of clinical features; the former having greater burden of psychopathology, and less affective control than substance use disorder referrals without recent suicide attempt; to control that difference between attempters and nonattempters are not associated *per se* with suicidality (a variable common to all patients who attempted suicide, independent of substance use).

More than one third of recent suicide attempters with substance use disorders report suicidal ideation in the few hours after the attempt while in the ED. Suicidal ideation is of paramount importance as a risk factor for suicidal behavior. The persistence of suicidal ideation after a suicide attempt points to a persistent wish to die in attempters with substance use disorders while in the ED, and is incompatible with what has been called the cathartic effect of suicide attempts (34,35). Thus, the present results are discordant with Matsuishi et al. (36) who interviewed suicide attempters to determine whether there were any changes in suicidal ideation just before and after a suicide attempt and to identify factors that may affect this. The decrease of suicidal ideation after the suicide attempt was thought to be a cathartic effect because most subjects were not treated by either psychotherapy or psychotropic medication at the time of the interview.

ED patients with substance use disorders with recent suicide attempt also differ from their nonattempter counterparts because they have higher rates of major affective disorders, despite the fact that in our sample, ED patients with substance use disorders as a whole have lower rates of mood and anxiety disorders than ED psychiatric patients without substance use disorders. In addition, ED patients with substance use disorders with recent suicide attempt report a more prolonged psychiatric clinical history (substance use disorder referrals with recent suicide attempt have higher rates of previous psychopharmacotherapy and hospitalizations in a psychiatric setting, while substance use disorder patients as a whole have lower rates of previous psychopharmacological treatments).

Thus, our results are consistent with the stress/diathesis model of Mann et al. and point to the fact that vulnerable individuals, such as those with personality traits or specific biological characteristics, may be more prone to develop suicide risk if a stressor such as substance abuse comes into play (37).

Surprisingly, while most reports note higher rates of nonlethal suicide attempts in women than in men, this figure appears to be consistent only among attempters without substance use disorders. Our results are in line with those of Alaja et al. (11), who also reported that among substance use disorder attempters, the male-to-female ratio is inverted, with more men reporting suicide attempts.

This study has a number of limitations. First, the relatively small sample sizes may affect the generalizability of results. Second, the study did not examine the effect of the number and lethality of previous suicide attempts. Although all patients reported injuries of various degrees as a result of their suicide attempts, accurate measures of lethality could not be obtained. All clinicians performed a shared clinical assessment and discussed the cases with colleagues; nevertheless there is some heterogeneity between different psychiatrists on duty in our hospital. The lack of a validated psychometric measure for suicidal ideation and psychiatric diagnosis involved in the assessment of patients in the ED is a further limitation of this investigation. Lastly, in acutely intoxicated patients, it may be particularly challenging to assess psychiatric diagnosis.

Nevertheless, this study adds consistent emphasis to some controversial key factors in the understanding of suicide behavior in substance use disorder patients admitted to an ED. As our results indicate, when categorizing suicide attempters with substance use disorders, health professionals working in the ED settings have to assess not only somatic emergencies that can undermine the patient's life but also the chance of repetition of suicidal behavior. Arguing against the concept that a suicide attempt may have a cathartic effect, many attempters with substance use disorders admitted to the ED report suicidal ideation while staying in the department. This fact points to the need to implement suicide prevention strategies even inside the emergency room and make sure that suicide risk is handled correctly soon after the attempt.

In conclusion, there is the need to deliver proper and efficacious health care for substance use disorder patients admitted to an ED. In the emergency departments, staff are often not properly trained to deal both with substance use disorders and suicide risk. These are two important topics that, with correct management, may improve outcomes for suicidal substance

abuse/dependence patients. Nonetheless our understanding of suicidal risk among substance users/abusers remains limited and warrants further exploration.

## REFERENCES

1. Van Vliet H. Separation of drug markets and the normalisation of drug problems in the Netherlands: an example for other nations. *J Drug Issues* 1990; 20: 463-71.
2. Substance Abuse and Mental Health Services Administration. Results from the 2007 National Survey on Drug Use and Health: National Findings. Studies OoA, editor. Rockville: Substance Abuse and Mental Health Services Administration, 2008.
3. Rehn N, Room R, Edwards G. Alcohol in the European Region: consumption, harm and policies. Copenhagen: World Health Organization Regional Office for Europe, 2001.
4. Kertesz SG, Pletcher MJ, Safford M, et al. Illicit drug use in young adults and subsequent decline in general health: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Drug Alcohol Depend* 2007; 88: 224-33.
5. Cuffel BJ. Comorbid substance use disorder: prevalence, patterns of use, and course. *New Dir Ment Health Serv* 1996; 70: 93-106.
6. Regier DA, Farmer ME, Rae DS, et al. Comorbidity of mental disorders with alcohol and other drug abuse. Results from the Epidemiologic Catchment Area (ECA) Study. *JAMA* 1990; 264: 2511-8.
7. RachBeisel J, Scott J, Dixon L. Co-occurring severe mental illness and substance use disorders: a review of recent research. *Psychiatr Serv* 1999; 50: 1427-34.
8. Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Arch Gen Psychiatry* 1994; 51: 8-19.
9. SAMHSA. Co-Occurring Major Depressive Episode (MDE) and Alcohol Use Disorder among Adults. The NSDUH Report; 2007 Feb. 16 Contract No.: Document Number.
10. Deas D. Adolescent substance abuse and psychiatric comorbidities. *J Clin Psychiatry* 2006; 67 suppl 7: 18-23.
11. Alaja R, Seppa K, Sillanaukee P, et al. Psychiatric referrals associated with substance use disorders: prevalence and gender differences. European Consultation-Liaison Workgroup. *Alcohol Clin Exp Res* 1997; 21: 620-6.
12. Havassy BE, Alvidrez J, Owen KK. Comparisons of patients with comorbid psychiatric and substance use disorders: implications for treatment and service delivery. *Am J Psychiatry* 2004; 161: 139-45.
13. Shrier LA, Harris SK, Kurland M, Knight JR. Substance use problems and associated psychiatric symptoms among adolescents in primary care. *Pediatrics* 2003; 111: e699-705.
14. Dervaux A, Laqueille X, Bourdel MC, et al. Cannabis et schizophrénie: données cliniques et socio-démographiques. *Encephale* 2003; 29: 11-7.
15. Office of Applied Studies. Suicidal Thoughts, suicide attempts, major depressive episode, and substance use among adults. OAS Report; 2006. Report No.: 34 Contract No.: Document Number.
16. Landheim AS, Bakken K, Vaglum P. What characterizes substance abusers who commit suicide attempts? Factors related to Axis I disorders and patterns of substance use disorders. A study of treatment-seeking substance abusers in Norway. *Eur Addict Res* 2006; 12: 102-8.
17. Evren C, Kural S, Cakmak D. Clinical correlates of self-mutilation in Turkish male substance-dependent inpatients. *Psychopathology* 2006; 39: 248-54.
18. Evren C, Evren B. Self-mutilation in substance-dependent patients and relationship with childhood abuse and neglect, alexithymia and temperament and character dimensions of personality. *Drug Alcohol Depend* 2005; 80: 15-22.
19. Fowler IL, Carr VJ, Carter NT, Lewin TJ. Patterns of current and lifetime substance use in schizophrenia. *Schizophr Bull* 1998; 24: 443-55.
20. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. *Psychol Med* 2003; 33: 395-405.
21. Appleby L, Cooper J, Amos T, Faragher B. Psychological autopsy study of suicides by people aged under 35. *Br J Psychiatry* 1999; 175: 168-74.
22. Fowler RC, Rich CL, Young D. San Diego Suicide Study. II. Substance abuse in young cases. *Arch Gen Psychiatry* 1986; 43: 962-5.
23. Veranic LZ, Pregelj P. Alcohol abuse and suicidal behaviour. *Psychiatr Danub* 2008; 20: 236-8.
24. Rubio G, Jimenez M, Rodriguez-Jimenez R, et al. Varieties of impulsivity in males with alcohol dependence: the role of Cluster-B personality disorder. *Alcohol Clin Exp Res* 2007; 31: 1826-32.
25. Pompili M, Innamorati M, Lester D, et al. Substance abuse, temperament and suicide risk: evidence from a case-control study. *J Addict Dis* 2009; 28: 13-20.
26. Underwood MD, Mann JJ, Arango V. Serotonergic and noradrenergic neurobiology of alcoholic suicide. *Alcohol Clin Exp Res* 2004; 28: 57S-69S.
27. Posner K, Oquendo MA, Gould M, Stanley B, Davies M. Columbia Classification Algorithm of Suicide Assessment (C-CASA): classification of suicidal events in the FDA's pediatric suicidal risk analysis of antidepressants. *Am J Psychiatry* 2007; 164: 1035-43.
28. Rich CL, Ricketts JE, Fowler RC, Young D. Some differences between men and women who commit suicide. *Am J Psychiatry* 1988; 145: 718-22.
29. Beautrais AL, Joyce PR, Mulder RT, Fergusson DM, Deavoll BJ, Nightingale SK. Prevalence and comorbidity of mental disorders in persons making serious suicide attempts: a case-control study. *Am J Psychiatry* 1996; 153: 1009-14.
30. Beautrais AL. Suicides and serious suicide attempts: two populations or one? *Psychol Med* 2001; 31: 837-45.
31. Bradvik L. Violent and nonviolent methods of suicide: different patterns may be found in men and women with severe depression. *Arch Suicide Res* 2007; 11: 255-64.
32. McAndrew FT, Garrison AJ. Beliefs about gender differences in methods and causes of suicide. *Arch Suicide Res* 2007; 11: 271-9.
33. Nordentoft M, Branner J. Gender differences in suicidal intent and choice of method among suicide attempters. *Crisis* 2008; 29: 209-12.
34. Slorach J. Suicide as catharsis. *Lancet* 1972; 2: 971.
35. van Praag H, Plutchik R. An empirical study on the "cathartic effect" of attempted suicide. *Psychiatry Res* 1985; 16: 123-30.
36. Matsushita K, Kitamura N, Sato M, et al. Change of suicidal ideation induced by suicide attempt. *Psychiatry Clin Neurosci* 2005; 59: 599-604.
37. Mann JJ, Waternaux C, Haas GL, Malone KM. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry* 1999; 156: 181-9.