Suicide in the Israeli Military: Case-Controlled, Prospective and Retrospective Study

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ABSTRACT

Background: Suicide is the third most common cause of death between ages 15-24, and a major cause for concern and research. The purpose of the current study was to deepen the understanding of the psychological state preceding suicide, attempting to identify characteristics that may contribute to suicide prevention in non-treatment seekers in the general population.

Method: The current study is based on a cohort of Israeli soldiers who completed suicide between 1997 and 2008. The analysis included 227 consecutive suicide cases in Israeli Defense Force (IDF) soldiers, aged 18-22. A subgroup of 70 soldiers who had been treated in mental health clinics during their military service, and who completed suicide, was compared to a control group of 214 living control subjects. Psychological autopsies, based on combination of prospective and retrospective data, were performed, using qualitative and quantitative analysis.

Results: The vast majority (93.4%) of the soldiers who completed suicide were men and 89.9% used firearms. Among suicide completers, 55% did not meet Axis I DSM-IV criteria. The most common Axis II personality traits were Narcissistic (14.1%) and Avoidant (8.4%). Approximately 33% left suicide notes, and 43.6% expressed suicidal thoughts to a friend. Most of the suicide completers were not receiving mental health care in the period preceding death.

Conclusion: The findings of the current study indicate that suicide is a rare, random and unpredictable event. As in other complex human behaviors, there is no significant factor or combination of factors that can predict completed suicide. Clinical implications of these findings are discussed.

INTRODUCTION

Suicide epidemiology and trends are affected by numerous factors, such as age, period, country and birth cohort (1). In recent decades there has been an increase in rates of suicide among adolescents and young adults aged 15-24, with studies showing that suicide rates in this age group have tripled since 1950 (2, 3). As of today, suicide is the third most common cause of death in this age group in Western countries (4), and therefore is a major cause for concern and research.

Over the years, many attempts have been made to predict suicidality in the general population, including genetic research, clinical characteristics, personality and behavioral traits (5-8). Previous studies have found various factors associated with suicide, such as psychiatric comorbidity, drug and alcohol abuse, physical illness, signs of psychological distress, such as insomnia and difficulty concentrating, social isolation, as well as suicidal threats and previous attempts. In addition, interpersonal difficulties, such as lack of social support and impaired relationships with parents were reported (2, 7, 9). Family factors, such as parental psychopathology, family history of suicide attempts, loss of parents to death or divorce,

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poor parent-child relationship and maltreatment, are associated with increased risk of suicide (10).

A recent literature review showed that risk factors for suicide, specific to young men, include psychiatric illness, substance misuse, ethnic origin, lower socioeconomic status, rural residence and absence of romantic relationships. Population-level risk factors for suicide in young men include unemployment, social deprivation and reports of suicide cases in the media (3). Special attention is dedicated to suicide in military settings. Recent findings from the U.S. Army STARRS project indicate higher fatality rates among suicide attempts in the army, compared to civilians (11). The STARRS project data show that suicide risk is independently associated with male sex and mental disorders, as one third of suicide cases had mental disorders prior to enlistment (11, 12).

The aforementioned research showed heterogeneous findings, and, unfortunately, was not effective in predicting and/or preventing suicide in the general population (2, 4, 13). Many of these studies had methodological limitations, including retrospective designs and samples of convenience. In addition, most studies on the topic have focused on previously treated patients and little is known about suicide among people without psychiatric diagnoses and without previous mental health treatment.

In the current study, we performed a systematic, prospective and retrospective, case-controlled investigation of consecutive suicide cases completed in the Israeli army between the years 1997 and 2008. We utilized a unique source of data generated by the Israeli Defense Force (IDF). In the IDF, every suicide completed by a soldier during his/her years of mandatory service undergoes an in-depth investigation by the military police, including extensive interviews with family members, commanding officers, and close friends. Such psychological autopsies are considered one of the most valuable and informative tools of research on completed suicide (14).

The aim of the current study was to deepen our understanding of the behavioral and symptomatic state in the weeks and months preceding suicide, in an attempt to identify characteristics that may contribute to suicide prevention in non-treatment seekers in the general population.

METHOD

POPULATION

This study is based on a cohort of Israeli soldiers who completed suicide between the years 1997 and 2008. As the military police performs investigations only of suicide cases of soldiers in mandatory military service, out of the 360 suicide cases that occurred in the military during this period of time, the following groups were omitted: career army personnel and reservists or civilians working for the IDF. In addition, 71 cases were excluded from the analysis due to missing data on the military police investigation. Main reasons for this data loss were technical problems with data storage and limited cooperation of the family members of the deceased subject. The final study sample consisted of 227 cases of soldiers aged 18-22. Seventy soldiers from this group (30.83%) were treated prior to suicide in the military mental health clinics. These "treatment-seekers" who completed suicide were compared to 214 living control subjects, who received mental health treatment during military service. Cases and controls were matched by gender and assignment to combat or non-combat units.

MILITARY POLICE INVESTIGATION

Every case of non-accidental and unnatural death in the military undergoes an in-depth investigation by the military police. This investigation includes interviews with family members, commanding officers, and close friends, both in and outside of the military. The military police investigators are trained to assess functioning and detect changes in it and in social adaptation over time, with emphasis on life events within and outside the military. The investigation reports include rich descriptions of the events and emotional states, with multiple citations of the deceased.

DRAFT BOARD ASSESSMENT

According to Israeli law, all adolescents between the ages of 16 and 17 are required to undergo a compulsory pre-induction assessment to determine their intellectual, medical and psychiatric eligibility for military service. The draft board assessment consists of 1) a physical examination conducted by a physician; 2) assessment of language ability; 3) a battery of tests measuring intellectual functioning; and 4) a structured interview assessing personality and behavioral traits (15). The assessments of intellectual abilities, language and behavior are conducted by college-age individuals who are trained in a 4-month course on administration of draft board tests. The assessment and its validation are described in detail elsewhere (16).

The intellectual assessment includes four tests (17): 1) the Otis-R, a modified, Otis-type verbal intelligence test adapted from the U.S. Army Alpha Instructions Test, which measures the ability to understand and carry out

verbal instructions (score range=0–21); 2) Similarities-R, a revised version of the "similarities" subtest of the Wechsler Adult Intelligence Scale that assesses verbal abstraction and categorization (range=0–30); 3) Arithmetic-R, which measures mathematical reasoning, concentration and concept manipulation (range=0–25); and 4) Raven's Progressive Matrices-R, a modified version of Raven's Progressive Matrices that measures nonverbal abstract reasoning and visual-spatial problem-solving abilities (range=0–30). The sum of the scores for the four tests forms a validated measure of general intelligence highly correlated with IQ scores.

DATA COLLECTION AND ANALYSIS

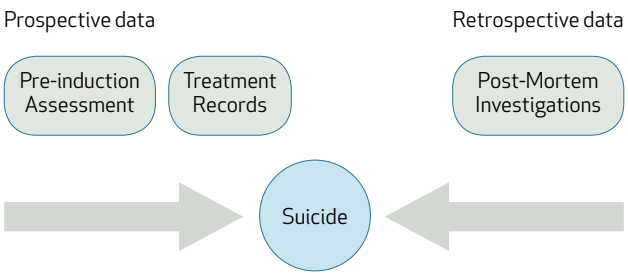
After receiving approval of the IDF Institutional Review Board, the following data were obtained for each subject:

1. Results of pre-induction assessments, including written summaries of the pre-induction interviews. For officers, results of special assessments preceding the officer course were collected, in addition to the general pre-induction data.
2. For soldiers who underwent mental health treatment in the military, treatment records were collected.
3. Written reports of post-mortem military police investigations (for suicide completers).

The subjects' data were studied independently by two board-certified psychiatrists, with long-term experience in military psychiatry, evaluation and treatment of soldiers in crisis situations. The study data were analyzed using mixed-method analysis, starting with qualitative content analysis, and followed by the quantitative one (see example for a similar technique in [18]), in the following stages:

1. The initial reading of the files guided by the existing literature and clinical knowledge on the topic. After an open-reading of several case files, each interview transcript was read and deconstructed sentence by sentence, in order to identify key themes and assign a descriptive name for each item. Meaningful items were coded as themes (for instance, "experience of failure"). The themes that emerged from the texts included psychiatric symptoms and DSM-IV diagnoses, personality disorders/traits, use of drugs and alcohol, previous psychiatric treatment, sleep and appetite disturbances, difficulties in concentration and physical illnesses, treatment by physicians and mental health professionals, behavioral changes in the days preceding suicide. The content of the suicide notes left by the subjects was analyzed in a similar fashion, and yielded themes such as "sudden and extreme behavioral changes," "unexplained sudden improvement," "preoccupation with philosophy of life and death," etc.
2. In the second stage, themes were combined and sorted into higher level categories (for instance, "environmental factors," "depressive symptoms," etc.).
3. Afterwards, a coding system was built, organizing the aforementioned themes and categories into tables that served as a template for analyzing the whole study sample.
4. Consensus diagnoses were made in cases of disagreement between raters. Discrepancies were resolved through discussion and inter-rater reliability of 80% was reached.
5. The presence/absence of each theme was counted and between-group comparisons were performed.

Figure 1. *Description of the data collection process*



STATISTICAL ANALYSIS

Descriptive statistics were performed in order to characterize psychiatric diagnoses, personality traits and environmental stressors of the suicide completers. The scores on the military cognitive tests were transformed to an IQ equivalent score based on the population means and standard deviations. The IQ and Hebrew scores were compared to the mean scores of all recruits assessed at the draft board between 1997-2008 using one-sample T-tests. The between-group differences on themes extracted from the text were tested using Chi-Square test for independence. All statistical analyses were performed using SPSS software (ver. 15, IBM statistics).

RESULTS

CHARACTERISTICS OF SUICIDE COMPLETERS:

- ***Demographic and pre-induction data***

The majority of the suicide completers were Israeli born (64.3%), single men (93.4%). The subjects' mean age was 20.22 (SD=1.47), mean number of months in service was

14.06 (SD=12.66), and mean number of years of education was 11.76 (SD=1.45).

Using one-sample T-test, we compared IQ and Hebrew scores of the suicide completers group to the mean scores of recruits assessed at the draft board, and found that soldiers who completed suicide had lower Hebrew scores (p=0.003, ES=0.25) and a trend towards having higher IQ scores (p=0.079, ES=-0.13). Regarding psychiatric diagnoses at induction, 14 (6.2 %) were diagnosed with personality disorders, three (1.3%) had diagnoses of mood disorders, and one future suicide completer experienced a psychotic episode prior to induction.

- ***Psychiatric symptoms and diagnoses – post-mortem investigation***

Post-mortem data analysis revealed that the most common symptoms were depressed mood (n=68, 30%), suicidal thoughts (n=42, 18.5%) and decrease in social functioning (n=32, 14.1%). Thirty subjects (13.2%) experienced feelings of guilt and changes in self-esteem, 29 (12.8%) reported anhedonia, and 22 (9.7%) experienced deterioration in work or educational functioning.

The majority of suicide completers (n=126, 55.5 %) had no DSM-IV Axis I diagnosis. Forty-five soldiers (19.8%) were diagnosed with adjustment disorder and 24 (10.6%) with major depressive episode.

Similarly, no specific personality disorder or trait was prominent. The most common were narcissistic (n=32, 14.1%) and avoidant personality traits (n=19, 8.4%).

Regarding character traits, avoidance, low self-esteem, hypersensitivity and vulnerability were present in 80 (35.2%), 68 (30%) and 65 (28.6%) of suicide completers, respectively. The most common stressful life event in the period up to three months prior to suicide was an experience of failure, which occurred in 58 (25.6%) of cases, while in the period of more than three months before suicide, the most common event was a stressful situation due to financial difficulties (n=60, 26.4%).

- ***Mental health treatment***

Eighty-six soldiers (37.9%) had been in contact with mental health professionals at some point during their military service. Forty-five (19.85%) of them received treatment before military service, and 86 (37.9%) during their service. Ten subjects (4.8%) completed suicide during treatment.

- ***Suicidal behavior***

One third of the suicide completers (n=74, 32.6%) left a suicide note, and approximately a quarter (n=55, 24.2%) expressed suicidal thoughts indirectly (e.g., "there is no need to look after me any more…"). Sudden and extreme behavioral changes were present in 33 (14.5%) cases, while 26 soldiers (11.5%) were preoccupied with farewell expressions and distributions of their property. Only in nine cases (4%) was there evidence of planning and gathering means of suicide. Thirty subjects (13.2%) expressed signs of desperation and impotence, and 25 (11%) experienced extreme mental pain. There were also relatively rare feelings of lack of meaning in life (n=30, 13.2%), preoccupation with philosophy of life and death (n=24, 10.6%), and justifying suicide (n=25, 11%).

In 43.6% of cases, suicidal ideation was expressed in front of a friend. Less than 10% (n=21) of suicide completers shared their intentions with a family member, and a very small group turned to army personnel, such as a mental health officer (n=12, 5.3%) or a commanding officer (n=10, 4.4%).

Eighty-nine percent of soldiers who completed suicide used firearms (89.9%).

- ***Case-control comparisons***

As mentioned previously, we performed a comparison between a subgroup of 70 soldiers who were treated in military mental health clinics before dying by suicide, and 214 living control subjects, who also received psychiatric treatment during their service (three controls per case). Significant between-group differences were found in psychiatric diagnoses and traits, environmental conditions and characteristics of suicidal behavior. As expected, suicide completers compared to treatment-seekers reported significantly more distress factors, such as suicidal thoughts (n=14, 20% in cases, n=17, 7.9% in controls), feelings of anhedonia (n=13, 18.6% in cases, n=19, 8.9% in controls). There were significantly more soldiers who completed suicide who were diagnosed with major affective disorder (n=12, 17.1% in cases, n=10, 4.7% in controls), dysthymia (n=7, 10% in cases, n=0 in controls), psychotic disorders (n=4, 5.7% in cases vs. n=1,0.5% in controls), schizotypal personality disorder (n=4, 5.7% in cases vs. n=0, 0% in controls) and personality disorder Not Otherwise Specified (n=9, 12.9% in cases vs. n=10, 4.7% in controls).

The analysis of environmental conditions up to three months preceding suicide, or at first visit to the military mental health clinic (for controls), revealed significantly more experience of failure in suicide completers (n=18, 25.7% compared to n=22, 10.3% in controls), significantly more experiences of separation from romantic

partners (n=14, 20% for cases, n=4, 1.9% for controls), and significantly more conflict with romantic partners (n=7, 10% vs. n=3, 1.4%).

In terms of character and personality traits, suicide completers showed significantly more avoidant tendency (n=26, 37.1% vs. n=32, 15%), low or negative self-esteem (n=25, 35.7% vs. n=35, 16.4%), perfectionism (n=10, 14.3% vs. n=11, 5.1%) and attribution of negative events to self (n=9, 12.9% vs. n=6, 2.8%).

However, a reversed significant difference can be seen in functioning difficulties at work or school (n=6, 8.6% in cases vs. n=40, 18.7% in controls), in the family (n=0 in cases, vs. n=22, 10.3% in controls), sleep disturbances (n=4, 5.7% in cases vs. n=40, 18.7% in controls) and adjustment disorder (n=12, 17.1% in cases vs. n=64, 29.9% in controls).

The detailed between-group comparison can be seen in Tables 1 –4.

Table 1. *Comparison between suicide completers and control subjects on psychiatric symptoms and diagnoses*

Symptoms/ Diagnosis	Suicide completers [% (n)]	Controls [%(n)]	p-value
Depressive symptoms			
Depressive mood	35.7 (25)	28 (60)	0.223
Suicidal thoughts	20 (14)	7.9 (17)	0.005
Difficulties in social functioning	15.7 (11)	24.3 (52)	0.133
Guilt / changes in self esteem	20 (14)	12.1 (26)	0.101
Anhedonia	18.6 (13)	8.9 (19)	0.026
Work/ school functioning difficulties	8.6 (6)	18.7 (40)	0.046
Tiredness	7.1 (5)	9.8 (21)	0.501
Changes in appetite / weight	8.6 (6)	13.6 (29)	0.271
Psychomotor agitation	5.7 (4)	4.7 (10)	0.727
Sleep problems	5.7 (4)	18.7 (40)	0.009
Family functioning difficulties	0 (0)	10.3 (22)	0.005
Concentration problems	5.7 (4)	4.2 (9)	0.600
DSM-IV Axis I diagnosis			
Adjustment disorders	17.1 (12)	29.9 (64)	0.036
Major affective disorder	17.1 (12)	4.7 (10)	0.001
Dysthymic disorder	10 (7)	0 (0)	<0.001
Anxiety disorders	7.1 (5)	7.5 (16)	0.926
Schizophrenia and other psychotic disorders	5.7 (4)	0.5 (1)	0.004
Drug abuse	0 (0)	0.5 (1)	0.567
Eating disorders	1.4 (1)	1.9 (4)	0.808
Mood – bipolar affective disorder	0 (0)	0.9 (2)	0.417
DSM-IV Axis II diagnosis			
Narcissistic personality	14.3 (10)	9.8 (21)	0.298
Avoidant personality	10 (7)	7.5 (16)	0.502
Personality disorder/ traits NOS	12.9 (9)	4.7 (10)	0.017
Dependent personality	12.9 (9)	10.3 (22)	0.548
Obsessive-compulsive personality	2.9 (2)	0.5 (1)	0.090
Schizoid personality	4.3 (3)	1.9 (4)	0.258
Antisocial personality	5.7 (4)	3.3 (7)	0.358
Schizotypal personality	5.7 (4)	0 (0)	<0.001
Borderline personality	4.3 (3)	5.1 (11)	0.774
Histrionic personality	1.4 (1)	0 (0)	0.080

DISCUSSION

The current study performed prospective and retrospective investigation of consecutive suicide cases in the Israeli military, utilizing unique data from IDF archives. Soldiers who completed suicide had higher rates of mood disorders and psychotic disorders, as well as narcissistic and avoidant personality disorders/traits. As expected, all parameters of suicidal behavior were more common in suicide cases than in controls.

However, the main findings of the current study indicated that the majority of suicide completers did not have DSM-IV diagnoses. These findings are inconsistent with previous studies that were performed on treatment seekers, and found that more than 90% of suicide completers had a significant mental disorder (14). As mentioned before, our sample consists of soldiers in the Israeli military, which is based on compulsory service, thus comprising the entire population of soldiers. For this reason, the findings of the current study could be generalized to the entire population of "apparently normal" male adolescents aged 18-22, who function at a normal level and at most have mild to moderate emotional difficulties, prior to their military service. Our findings refute development of severe psychiatric disorders through the exposure to military stress as an explanation to suicide. As such, we suggest weaker correlation between suicide and mental disorder among "apparently normal" youth, unlike the common findings in the literature that rely mostly on a mental health help-seeker population. We cannot reach conclusions regarding adolescents with severe mental health issues, due to the fact that these adolescents are mostly identified during the pre-induction assessment and, in many cases, are not recruited to the military service.

Our findings partially support findings from previous psychological autopsy studies among young people who died by suicide, identifying factors such as affective disorders (13, 19). Similar to our findings, previous psychological autopsy research on suicide in the military indicated several features specific to this population, such as difficulties in adjustment to military service, emotional problems and family issues (5).

Table 2. *Comparison between suicide completers and control subjects on potential emotional stressors (DSM-IV Axis IV)**

Experience	Suicide completers [%(n)]	Controls [%(n)]	p-value
Experience of failure	25.7 (18)	10.3 (22)	0.001
Considerable financial stress	0 (0)	3.3 (7)	0.125
Disciplinary offenses	7.1 (5)	5.6 (12)	0.638
Humiliation / insult	12.9 (9)	7.9 (17)	0.216
Separation from romantic partner	20 (14)	1.9 (4)	<0.001
Conflict with commanders	8.6 (6)	8.4 (18)	0.967
Negative motivation for service	10 (7)	6.1 (13)	0.265
Conflict with parents	4.3 (3)	1.9 (4)	0.258
Parental separation / divorce	1.4 (1)	0.9 (2)	0.726
Conflict with romantic partner	10 (7)	1.4 (3)	0.001
Loss / bereavement	4.3 (3)	2.3 (5)	0.392
Conflict with friends	0 (0)	1.4 (3)	0.319
Conflict with colleagues	0 (0)	3.3 (7)	0.125
History of physical or sexual assault	0 (0)	2.8 (6)	0.249

*up to 3 months preceding suicide (cases) or first visit to mental health clinic (controls)

Table 3. *Comparison between suicide completers and control subjects on character traits*

Trait	Suicide completers [(n)]	Controls [(n)]	p-value
Avoidant tendency	37.1 (26)	15 (32)	<0.001
Low or negative self esteem	35.7 (25)	16.4 (35)	0.001
Hypersensitivity and vulnerability	28.6 (20)	22.4 (48)	0.296
Impulsivenes	17.1 (12)	19.2 (41)	0.707
Perfectionism	14.3 (10)	5.1 (11)	0.011
Ambitiousness	10 (7)	8.4 (18)	0.684
Hostility/ anger/ aggression tendency	14.3 (10)	15 (32)	0.891
Thinking rigidity	14.3 (10)	11.2 (24)	0.492
Negativism	17.1 (12)	14 (30)	0.523
Attribution of negative events to self	12.9 (9)	2.8 (6)	0.001

Table 4. *Comparison between suicide completers and control subjects on characteristics of suicidal behavior*

Type of expression	Expression	Suicides [(n)]	Controls [(n)]	p-value
Behavioral	Leaving a letter	40 (28)	2.3 (5)	<0.001
	Sudden and extreme behavioral changes	15.7 (11)	4.7 (10)	0.002
	Farewell expressions, distribution of property	11.4 (8)	0.9 (2)	<0.001
	Denial of problems while radicalization of distress signs	12.9 (9)	3.7 (8)	0.005
	Unexplained sudden improvement	11.4 (8)	0.5 (1)	<0.001
	Planning and gathering means	8.6 (6)	0.5 (1)	<0.001
Emotional	Signs of desperation and impotence	12.9 (9)	6.1 (13)	0.065
	Extreme mental pain	17.1 (12)	4.2 (9)	<0.001
Contents	Lack of meaning	14.3 (10)	3.3 (7)	0.001
	Preoccupation with philosophy of life and death	10 (7)	1.9 (4)	0.002
	Indirect expressions of suicide	24.3 (17)	15 (32)	0.073
	Justifying suicide	14.3 (10)	2.8 (6)	<0.001
	Mentioning people who died	5.7 (4)	2.8 (6)	0.251

The examination of the rates of mental health treatment given to future suicide completers showed that approximately 40% received mental health treatment during their military service and approximately 20% before military service, but only less than 5% of cases were receiving mental health treatment at the time of the suicide event. These findings are consistent with previous research, showing low rates of seeking mental health professional help in suicide completers. Adolescents aged 15-19 who died by suicide, compared with matched psychiatric controls with suicidal ideation and attempts, received significantly less treatment for mental health problems (20). Another study found that in people under age 35, only 7% to 32% contacted mental health professionals within one month prior to suicide (21), consistent with our findings. Low rates of seeking help in this population could be attributed to maladaptive coping strategies in response to depression and suicidal thoughts (22).

Interestingly, the case-control comparisons revealed higher rates of difficulties at school, work or family functioning, sleep disturbances and adjustment difficulties in control subjects, compared to suicide completers. This finding also supports weaker correlation between mental health disorders and suicidality among this population. Moreover, we suggest that among a significant part of the suicide completers the same behavioral and personal characteristics that contribute to normal and sometimes relatively high achievements in life, such as perfectionism, ambitiousness, engagement, narcissistic or obsessive personality traits, may contribute to suicidal behavior. This could happen in a context of development of an objective or subjective unfamiliar sense of failure or stress in any part of their military service, and not necessarily development of new mental health disorders.

A complementary explanation may be the fact that the recruited population consists mostly of soldiers without psychiatric diagnoses, and the main psychiatric problem encountered by military mental health services is an adjustment disorder.

In addition, there is evidence of association between suicidality and narcissistic traits found as the most common personality trait within our sample (14.1%). The Interpersonal Psychological Theory of Suicide provides a framework for understanding the association of narcissistic traits and suicidality, postulating that serious desire for suicide, in combination with the capability for suicide, are necessary to enact lethal self-harm (23, 24). Capability for suicide, comprised of a high tolerance for physical pain and fearlessness toward pain/death, may arise from repeated experiences of painful or fear inducing events (e.g., abuse, combat experiences and physical fights). Moreover, narcissistic grandiosity is associated with energetic affect and deficient self-control which may increase the likelihood of exposure to events that are fear and pain inducing, thus increasing the risk of engaging in suicidal or self-injurious behavior (25, 26). Vulnerable narcissistic traits may manifest interpersonally with low levels of warmth or friendliness (27), hindering the development of strong bonds. Individuals with high vulnerable narcissistic traits may not only believe they lack close and meaningful relationships due to distrust and hostility, but their interpersonal style may also prompt ostracization by peers, fostering sense of alienation and lack of reciprocal interpersonal connections (28). In light of the above, we suggest that as with narcissistic person, when mental stability is dependent on constant flow of positive feedback from a referenced group and its leader, negative feedback, sometimes a subjective one, together with a very high availability of weapons can "close a cycle" that might lead to lethal event. In the context of military service, where the unit's cohesion is crucial, it seems adaptive psychologically and operationally to seek peers' and commanders' emotional and instrumental support.

Assuming that mental health treatment might contribute to suicide prevention, one might conclude that it is important to preserve contact between therapists and their patients even after the need for intensive therapy has passed. On the other hand, a high incidence of suicidal messages to a friend (close to 44%) found in our sample indicated that adolescents at risk for suicide are more likely to seek help within their close social circle. This could be a potential preventive tool, far more than communicating with doctors, commanding officers and other authority figures. This might imply that psychosocial educational programs that educate the public about suicide and emphasize the importance of reporting information about suicidality in peers might be helpful to predict suicide, both for civilians as well as in the military.

The main limitation of this study is the fact that control subjects were available for only a part of the data for completed suicide cases. This is unavoidable since the IDF military police performs in-depth investigations only for cases of completed suicide. However, this study was performed in a relatively large group of most completed suicides from the Israeli military, which is based on mandatory service, and consequently reflects prevalence of suicide in the non-Arab and non-Orthodox Jewish population of adolescents.

In conclusion, the current findings, similar to previous studies, indicate that it is not possible to predict suicide, or to identify specific groups at risk, that would be exclusive enough. On the population level, suicide is a major public health issue, particularly in the young population, and for this reason it is extremely important to address identification of suicide risk and suicide prevention. Recently published findings indicate that analysis of data from electronic medical records enables more successful prediction of suicide risk, in comparison with clinical assessments (29). While clinical assessment of suicide focuses on underlying emotional distress and mental disorders, data stratification techniques take into consideration additional factors associated with suicide risk, such as access to means, coping strategies and availability of social support. These techniques could serve as potential tools for enhancing the validity of suicide risk assessment.

Regarding suicide prevention, without having reliable tools for identifying a really resilient population, the authors had implemented an approach within the military service that addresses suicide prevention efforts to the entire population of soldiers. This approach included strengthening commanders' skills in support of soldiers' morale, increasing their knowledge in management of mental stress, improving social support and cohesiveness in the units, and reducing availability of weapons in leisure hours, as much as possible. This attitude had already correlated with a significant reduction in suicide rates in the IDF following a plan that was based on previously published findings (30). This principle of targeting the whole population as a group at risk has also been found effective in general medical settings, such as prevention of hypertension, cancer screening and tobacco control

(31).The authors suggest that this approach might be applicable in preventing suicide, both in military and non-military settings.

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