

The Relationship Between Suicide Attempts and Menstrual Cycles in the Emergency Department and the Sociodemographic and Clinical Characteristics of These Patients

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Abstract

Aim: Suicidal behavior is defined as choosing death in the conflict between life and death. The aim of this study is to investigate the suspected relationship between suicide attempts and menstrual cycles and to evaluate the sociodemographic and clinical characteristics of the non-pregnant female patients of reproductive age who have presented to our hospital after attempting suicide.

Materials and Methods: In this study, 102 female patients (aging 16–45 years) of reproductive age with regular menstrual cycles who presented to the emergency department because of suicide attempts were enrolled. The study was designed as prospective, cross-sectional, and descriptive. The patients' sociodemographic, clinical, and laboratory biochemical parameters were recorded. For the purposes of this study, 100 healthy women who fulfilled the criteria formed the control group and underwent the same procedures as the patient group.

Results: Among the patients who presented to the hospital after attempting suicide, 64 (62.7%) were in their menstrual period, six (5.9%) were outside their menstrual period during the follicular phase, five (4.9%) were at the mid-cycle peak, and 27 (26.4%) were at the luteal phase, as determined on the basis of the date of their last menstrual period and their blood hormone levels.

Conclusion: The majority of suicide attempts by women occurred during their menstrual period when the estradiol and progesterone levels are at their lowest.
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Keywords: Emergency department, suicide attempt, menstrual cycle

Introduction

Suicidal behavior is defined as choosing death in the conflict between life and death. Describing the causes leading to suicide and taking the necessary precautions against them may reduce the number of attempted suicides and improve the quality of life of the individuals (1). Although there are various suicide methods, toxic materials are commonly used by the patients who present to the emergency department.

In all the studies, the ratio of suicide attempts was found to be 1.5 times higher among females compared with that among males

(2). This condition is attributed to the menstrual cycle and gonadal hormones (3). In addition, the menstrual cycle has been shown to be associated with the premenstrual syndrome, postpartum psychosis, and depression (4). Few studies have focused on the influence of the gonadal hormone levels on suicide attempts (5, 6). However, whether the menstrual cycle is associated with suicide attempts and the phase that makes women more susceptible to them are still under controversy (7, 8).

The aim of this study is to investigate the suspected relationship between suicide attempts and the menstrual cycle and to evaluate the sociodemographic and clinical characteristics of the non-preg-

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nant female patients of reproductive age who have presented to our hospital due to an attempted suicide.

Materials and Methods

This study was conducted at Dışkapı Yıldırım Beyazıt Training and Research Hospital from May 5, 2010 to March 15, 2011 at the emergency department after the consent of the ethics committee was obtained (2010/02). This study involved 102 female patients with regular menstrual cycles, who were not pregnant and not using contraceptives, presented because of a suicide attempt, and were of reproductive age (aging 16–45 years). The patients filled out their information and consent forms.

The study was designed as prospective, cross-sectional, and descriptive. For the purposes of this study, 100 healthy women who fulfilled the criteria formed the control group and underwent the same procedures as the patient group.

Female patients outside their reproductive age (their menstrual cycle had not started or they were menopausal), pregnant women, patients who were dead at the time of arrival to the hospital, and patients on oral contraceptives were excluded from the study.

Following the patients' first treatment in the emergency department, the following factors were recorded: the time of presentation to the hospital, age, profession, educational status, marital status, number of children, place of residence, manner of presentation to the medical facility, patient history, history of smoking and alcohol or substance abuse, cause of suicide, method of suicide, active ingredient used and its dose, lethal danger, duration of follow-up, date of the last menstrual period, menstrual data (age of menarche, cycle regularity, frequency, and duration), and use of contraception. In addition, the blood beta human chorionic gonadotropin, follicle-stimulating hormone (FSH), luteinizing hormone (LH), estradiol, and progesterone levels were measured using the Siemens Immulite hormone assay device by the chemiluminescence immunoassay (LEIA) method. The patients' biochemical parameters (glucose, urea, creatinine, alanine transaminase, aspartate aminotransferase, sodium, potassium, chloride, and calcium levels) were also recorded.

Regarding the hormone measurements, to detect the menstrual phase for patients and control group, serum LH, FSH, progesterone, and estradiol levels were measured within 24 h of the attempt, as defined in the previous studies (5, 9). Menstrual phase was determined using the following algorithm (6, 9): those with progesterone levels >2.3 ng/mL were classified as being in the luteal phase; those with FSH levels between 5.7 and 20 mIU/mL, LH levels between 15 and 62 mIU/mL, and progesterone levels (62.3 ng/mL) were classified as being in mid-cycle; and those with low levels of FSH (3.4–10 mIU/mL), LH (1.6–8.3 mIU/mL), and progesterone (0–1.5 ng/mL) were classified as being in the follicular phase.

Among the patients included in this study, their menstrual cycle was determined on the basis of the date of their last menstrual period and their blood hormone levels. The patients and control groups were divided in four subgroups for menstrual phases.

Statistical analysis

The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 18.0 software. The normality of the distribution of continuous variables was investigated using the independent samples t-test.

The descriptive statistics are presented as mean ± standard deviation or median (minimum–maximum) for the continuous variables and number and percentage of cases for nominal variables. Because the numeric variables did not show a normal distribution, the Mann-Whitney U test was used and statistical significance was based on a value of $p<0.05$.

Results

The sociodemographic and clinical characteristics of the patients in this study are presented in Table 1. Depending on the active ingredient and its dose and according to the follow-up periods recommended by toxicology, 14 patients (13.7%) were followed up for 12 h, 72 patients (70.6%) for 24 h, 14 patients (13.7%) for 48 h, and two patients (2.0%) for 72 h.

In terms of the length of the follow-ups in the emergency department observation unit, among 67 patients (65.6%), the minimum length of their hospital stay was 1 day, the maximum was 8 days, and the mean was 2.1 days. Although some of the patients had severe toxic findings and symptoms, all the patients were discharged and made a complete recovery.

The hormone levels (FSH, LH, estradiol, and progesterone) of the patients according to their menstrual cycle are presented in Table 2.

In this study, 64 (62.7%) patients were in their menstrual phase, six (5.9%) were outside their menstrual phase during the follicular phase, five (4.9%) were at the mid-cycle phase, and 27 (26.4%) were in the luteal phase of the menstrual cycle determined on the basis of the date of their last menstrual period and their blood hormone levels. The days of the patients' menstrual cycle were four (3.9%) on their first day, 23 (22.3%) on their second day, 23 (22.3%) on their third day, seven (6.8%) on their fourth day, two (1.9%) on their fifth day, four (3.9%) on their sixth day, and one (1%) on the seventh day.

The estrogen and progesterone levels in the phases of the menstrual cycle were statistically different between the patients and the controls (estrogen, $p<0.001$; progesterone, $p=0.016$; Table 2).

Discussion

Suicide—a major problem faced by all societies—is among the top 10 causes of death in the world and suicide rates vary among countries (10, 11). However, there were no major differences in our study concerning the clinical and sociodemographic characteristics of the patients in previous studies. There was a significant relationship between suicide attempts and the menstrual cycle, and the majority of patients who attempted suicide were in their menstrual phase of the menstrual cycle.

Ozdel et al. (12) reported that the suicides were attempted between 6:00 p.m. and midnight in 47.5% of the cases, whereas they were attempted between 12:00 p.m. and 6:00 p.m. in 37.5% of the cases. Similarly, Guloglu et al. (13) reported that the majority of the suicide attempts (26.6%) occurred between 6:00 p.m. and midnight in a study comprising 1,281 patients. In our study, the majority of the patients admitted to the emergency department had attempted suicide between 6:00 p.m. and midnight. We consider that these situations are associated with this timing with the aim of attracting the attention of the people nearby and to receive their help.

Studies from our country reported that suicide attempts were more common among housewives and students (14, 15). Neverthe-

Table 1. Sociodemographic and clinical features of patients according to the menstrual cycle phases

	Total (n=102)	Follicular phase (n=70)		Mid cyclic phase (n=5)	Luteal phase (n=27)
		Menstrual phase (n=64)	Non-menstrual phase (n=6)		
Age (years, mean±SD)	25.56±8.19	25.95±8.39	30±9.85	22.8±4.96	24.03±7.60
First menstruation age (years, mean±SD)	12.17±0.61	12.10±0.64	12±0.63	12.6±0.54	12.29±0.54
Marital status, n (%)					
Married	41 (40.1)	28 (43.7)	4 (66.6)	4 (80)	5 (18.5)
Single	57 (55.8)	33 (51.5)	2 (33.3)	1 (20)	21 (77.8)
Other	4 (4.1)	3 (4.8)	0 (0)	0 (0)	1 (3.7)
Having children, n (%)	37 (36.2)	27 (42.1)	3 (50)	2 (40)	5 (18.5)
Number of children (mean±SD)	0.7±1.0	0.8±1.1	1.0±1.2	0.8±0.8	0.4±0.9
Occupation, n (%)					
Housewife	63 (61.7)	39 (60.9)	4 (66.6)	4 (80)	16 (59.2)
Student	27 (26.4)	18 (28.1)	0 (0)	1 (20)	8 (29.6)
Worker	12 (11.9)	7 (11.0)	2 (33.3)	0 (0)	3 (11.2)
Education levels, n (%)					
First school	16 (15.6)	12 (18.7)	2 (33.3)	0 (0)	2 (7.4)
Secondary school	17 (16.6)	6 (9.3)	0 (0)	3 (60)	8 (29.6)
High school	61 (59.8)	41 (64.1)	2 (33.3)	2 (40)	16 (59.3)
University	8 (8.0)	5 (7.9)	2 (33.3)	0 (0)	1 (3.7)
Time of ED admission, n (%)					
00:00–06:00	23 (22.5)	14 (21.8)	3 (50)	1 (20)	5 (18.5)
06:00–12:00	14 (13.7)	8 (12.5)	1 (16.6)	1 (20)	4 (14.8)
12:00–18:00	26 (25.4)	18 (28.1)	0 (0)	1 (20)	7 (25.9)
18:00–24:00	39 (38.4)	24 (37.6)	2 (33.4)	2 (40)	11 (40.8)
Medical history, n (%)					
HT	1 (0.9)	1 (1.5)	0 (0)	0 (0)	0 (0)
DM	1 (0.9)	0 (0)	0 (0)	0 (0)	1 (3.7)
CAD	1 (0.9)	1 (1.5)	0 (0)	0 (0)	0 (0)
COPD	1 (0.9)	1 (1.5)	0 (0)	0 (0)	0 (0)
Epilepsy	9 (8.8)	4 (6.2)	1 (16.6)	0 (0)	4 (14.8)
Other	1 (0.9)	0 (0)	0 (0)	0 (0)	1 (3.7)
Psychiatry history, n (%)					
Depression	18 (17.6)	10 (15.6)	2 (33.3)	1 (20)	5 (18.5)
Adjustment disorders	7 (6.8)	4 (6.2)	0 (0)	0 (0)	3 (11.2)
Anxiety	3 (2.9)	2 (3.1)	0 (0)	0 (0)	1 (3.7)
Schizophrenia	3 (2.9)	2 (3.1)	0 (0)	0 (0)	1 (3.7)
Bipolar disorders	2 (1.9)	1 (1.5)	0 (0)	0 (0)	1 (3.7)
Other	3 (2.9)	2 (3.1)	0 (0)	0 (0)	1 (3.7)

Table 1 (Continue). Sociodemographic and clinical features of patients according to the menstrual cycle phases

	Total (n=102)	Follicular phase (n=70)		Mid cyclic phase (n=5)	Luteal phase (n=27)
		Menstrual phase (n=64)	Non-menstrual phase (n=6)		
Substances used in suicide Attempts, n (%)					
Multidrug	30 (29.4)	20 (31.2)	0 (0)	1 (20)	9 (33.4)
Analgesics	28 (27.5)	21 (32.9)	2 (33.3)	1 (20)	4 (14.8)
Psychiatric drugs	24 (23.5)	14 (21.9)	1 (16.6)	3 (60)	6 (22.2)
Diabetic drugs	5 (4.9)	2 (3.1)	1 (16.6)	0 (0)	2 (7.4)
Antibiotics	4 (3.9)	1 (1.5)	1 (16.6)	0 (0)	2 (7.4)
Cardiac drugs	2 (1.9)	0 (0)	0 (0)	0 (0)	2 (7.4)
Other	9 (8.9)	6 (9.4)	1 (16.6)	0 (0)	2 (7.4)
Substance use, n (%)					
Cigarette	71 (69.6)	46 (71.8)	6 (100)	4 (80)	15 (55.5)
Alcohol	12 (11.9)	10 (15.6)	1 (16.6)	0 (0)	1 (3.7)
Previous suicide attempt, n (%)	15 (14.7)	12 (18.7)	0 (0)	1 (20)	2 (7.4)
Suicidal reasons, n (%)					
Mental depression	48 (46.9)	31 (48.4)	4 (66.8)	2 (40)	11 (40.7)
Emotional affairs	30 (29.4)	18 (28.1)	1 (16.6)	0 (0)	11 (40.7)
Economic causes	11 (10.7)	8 (12.5)	0 (0)	3 (60)	0 (0)
Domestic violence	8 (8.0)	5 (7.9)	1 (16.6)	0 (0)	2 (7.4)
Failure of education	4 (4.1)	2 (3.1)	0 (0)	0 (0)	2 (7.4)
Health problems	1 (0.9)	0 (0)	0 (0)	0 (0)	1 (3.7)
Hormone levels (mean±SD)					
FSH (mIU/mL)	7.8±10.9	8.1±10.5	21.6±25.6	7.8±3.6	4.0±1.7
LH (mIU/mL)	8.9±9.6	8.9±7.5	12.9±9.6	32.5±18.1	3.6±2.6
Estradiol (pg/mL)	175.4±81.7	73.5±65.7	35.8±15.3	230.1±73.5	104.8±74.2
Progesterone (ng/mL)	2.7±2.6	0.8±0.5	1.08±0.8	1.5±0.7	6.4±2.8

SD: standard deviation; ED: emergency department; HT: hypertension; DM: Diabetes mellitus; CAD: coronary artery disease; COPD: chronic obstructive pulmonary disease; FSH: follicle-stimulating hormone; LH: luteinizing hormone

less, Senol et al. (10) observed that 54% of the patients were single. In our study, the majority of the patients who attempted suicide were individuals without financial independence, such as housewives or students, and their marital status was single. We therefore suggest that marriage has a strong protective effect against suicide attempts.

A history of psychiatric disorders, particularly depression, among patients who have attempted suicide, has been reported to be a factor paving the way for suicide (16, 17). In a study by Bekaroglu et al. (18), 36% of the patients who attempted suicide were found to have a history of psychiatric disorders. In the study by Cheng et al. (19), depressive disorders were diagnosed as the most frequent psychiatric condition, with a 48.3% ratio among the patients who attempted suicide. In our study, approximately one-third of the patients had psychiatric disorders and nearly half of them had depressive disorders. Therefore, we believe that patients with depression should be treated and followed up closely by their families and relevant officials.

Table 2. The hormone levels of suicide patients and control group

Parameters (mean±SD)	Control group (n=100)	Suicide patients (n=102)	p*
FSH (mIU/mL)	8.28±3.49	7.84±10.90	<0.001
LH (mIU/mL)	20.15±15.17	8.93±9.68	<0.001
Estradiol (pg/mL)	175.44±81.70	87.28±75.57	<0.001
Progesteron (ng/mL)	2.77±2.65	2.36±2.90	0.016

*Mann-Whitney U test, SD: standard deviation; FSH: follicle-stimulating hormone, LH: luteinizing hormone

Sogut et al. (20) reported that the most common causes for suicide are depression (45.3%), domestic violence (24.2%), and emotional relationships. In our study, the most commonly observed cause was depression, followed by emotional relationships, and

this result may be associated with the characteristics of the patient group.

In the study by Andersen et al. (21), the most commonly used active ingredients in suicide attempts were analgesics, antidepressants, antipsychotics, and cardiovascular drugs. In a study conducted on 2,388 patients in the Cukurova region between January 1, 1997 and December 31, 2002, 426 of the patients (32.4%) had taken multiple drugs (22). In our study, the majority of the patients had taken multiple drugs, followed by analgesics and antipsychotics for their suicide attempts. We believe that obtaining these drugs is easy in our country and therefore drug overdoses should be prevented.

In the study conducted by Cayköylü et al. (7) in 2004, 42.3% of the 52 attempted suicide patients with regular menstrual cycles made their suicide attempts during their menstrual period, followed by 25% who attempted their suicides during the luteal phase. In a later study by Baca-Garcia et al. (8), 72 of the 281 patients (26%) reportedly attempted suicide during their menstrual period. Although the menstrual phase comprises 6-7 days of the 28-day menstrual cycle, in our study, the great majority of the patients were in the menstrual phase of their cycle. Hence, we suggested that the menstrual cycle may trigger suicide attempts.

Estradiol enhances the serotonin synthesis and may increase the serotonin levels by changing the serotonin receptor balance and decreasing the serotonin metabolism through the inhibition of monoamine oxidase A (8). In a study, estradiol was found to increase the expression of serotonin transporter mRNA in the brain (23). Moreover, in a postmortem study on suicide victims, the serotonin transporter ligands in the dorsal raphe nucleus were observed as having been modified. Based on these results, researchers have suggested that the low estradiol levels contributed to a reduction in the serotonergic nerve conduction, and this may be the underlying cause of the relationship between menstruation and suicidal behavior (6). We believe that the majority of patients with low estrogen levels are in their menstrual phase, which suggests that their suicide attempts are related to their menstrual cycle.

Studd et al. (24) have demonstrated in their study that low progesterone levels are associated with higher rates of suicidal thoughts in adult women. Because the majority of the patients in our study were in their menstrual period phase and had their lowest estradiol and progesterone levels compared with the other time points in their menstrual cycle, we believe that there is a significant relationship between suicide attempts and the menstrual cycle. However, this relationship may not just be hormonal and may also be associated with the physical limitations women experience during their periods and their social and psychological impact. This study may support wider patient and physician awareness of this high-risk term for suicide attempts and finally reduce the morbidity and mortality related to these attempts.

Study limitations

The limitation of our study is that it is a single-center study.

Conclusion

The majority of suicide attempts by women occur during their menstrual period when their estradiol and progesterone levels are the lowest. Therefore, a kinder approach to women during this time may reduce their rate of suicide attempts.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Dışkapı Yıldırım Beyazıt Training and Research Hospital.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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