

## Changes in Female Sex Hormones in Patients with Intentional Drug and Chemical Poisoning

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### ABSTRACT

**Background:** Hormonal changes as a factor influencing the emotional state of women have an important role in the incidence of suicide. The aim of this study is to investigate changes in FSH-LH, Estrogen, and Progesterone hormones in women attempting suicide by drugs and chemicals.

**Methods:** In this cross-sectional study, women of reproductive diagnosed with drug and chemical poisoning who were hospitalized in Farshchian Hospital, Hamadan, Iran, were assessed regarding LH, FSH estrogen and progesterone hormones over a period of six months in 2011. Overall, 80 patients were studied with regard to the inclusion and exclusion criteria.

**Results:** The highest rate of suicide was in the age range of 14-25 years (47 patients, 60.1%). A significant relationship was observed among the blood levels of hormones FSH, LH, progesterone, and estrogen. The association of hormone levels and LMP and attempted suicide was significant. The LH level was significantly lower in patients with substance abuse. The estrogen level was significantly lower in patients with the history of self-injury. Most patients (67.5%) were in the follicular phase which was statistically significant.

**Conclusion:** According to the obtained results, there was a significant relationship between the levels of different hormones. The significant relationship was positive in some cases but negative in other.

**Keywords:** Hamadan, Menstrual Phases, Sex Hormones, Suicide.

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### INTRODUCTION

Every year many persons attempt suicide by different methods and this number has been increasing yearly. According to WHO, suicide was the cause of 1.8% of all diseases in 1998 and it will be the cause of 2.4% of all diseases in 2020 (1). Self-injury relates to various factors, such as sex, age, culture, socioeconomics, religion, geographical region, and biological parameters (2).

The records of suicide are different in terms of sex, so that the rate of attempted suicide is more common in women than men in some studies, but it is

more common in men than women in some other studies, although successful suicide is more common in men. The method used most often in women is using drugs and sometimes potential toxic substances and solutions which are available at home (3-6). Hormonal changes in women, as one of the factors affecting their emotional state, can play an important role in suicide among women.

The aim of this study was to investigate the serum level of FSH, LH, estrogen, and progesterone in female suicide attempters with drugs and chemicals referring to Farshchian Hospital, Hamadan, Iran.

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## MATERIALS AND METHODS

In this cross-sectional and descriptive study, all female suicide attempters with drugs and chemical who were admitted to the poisoning ward of Farshchian Hospital, Hamadan, Iran, during six months in 2011, participated in the study. After obtaining written informed consent and recording demographic data, the serum level of hormones FSH, LH, estrogen, and progesterone were measured by ELISA. According to the inclusion and exclusion criteria, all women of reproductive age with consent could participate in the study. Participants who used contraceptive drugs or had any kind of gynecologic diseases affecting the hormone levels were excluded. This project was approved by research Center for behavioral disorders and substance abuse of Hamadan University of Medical Sciences and patients' names and confidentiality were considered. The collected data were analyzed using SPSS software.

## RESULTS

According to the inclusion and exclusion criteria, 80 patients were evaluated. The mean age of cases was  $25.49 \pm 9.82$ . The minimum and maximum ages of patients were 12 and 48 years,

respectively. The highest rate of suicide attempt was in the age range of 25-14 years (47 persons, 60.1%). Demographic data are presented in Table 1.

The most commonly used substances were drugs (67 cases, 83.8%) and other used substances included pesticides (8 cases, 10%), detergents (4 cases, 5%), and opium (1 case, 1.3%), respectively. The minimum and maximum ages of puberty were 9 and 18 years, respectively, with mean of 12.99 years. Menarche age was 13 years in most patients. The mean duration of the menstrual cycle was  $27.49 \pm 5.36$  days. Most cycles (58 cases, 72.5%) were regular. Minimum and maximum duration of menstrual bleeding were 3 and 12 days respectively with an average of 6.12 days.

Overall, 54 patients (67.5%) were in the follicular phase and 26 patients (32.5%) were in the luteal phase. The frequency of suicide in different phases of menstrual cycle had statistically significant difference according to Chi-square test ( $P=0.02$ ). FSH concentrations in the follicular and luteal phases presented statistically significant differences according to t-test ( $P=0.009$ ). Significant differences were also observed in progesterone concentrations ( $P<0.001$ ). The mean hormone concentrations of the patients are presented in Table 2.

**Table 1.** Demographic data of the patients.

Demographic Specifications		
Marital Status	Married	53.8(43)
	Single	32(40)
Occupation	Divorced	5(6.2)
	Housewife	44(55)
	Student	25(31.25)
	Unemployed	9(11.3)
	Employed	2(2.5)
Education	Diploma	35(43.8)
	Primary school	32(40)
	College student	9(11.3)
	University graduate	1(1.3)
Drug abuse	Positive	3(3.8)
	Negative	77(96.2)
Self Injury	Positive	8(10)
	Negative	72(90)
Past Suicidal History	Positive	11(13.8)
	Negative	69(86.2)

**Table 2.** The mean hormone concentrations of the patients.

	Mean	Min	Max	Follicular	luteal
<b>FSH</b>	6.31(IU/L)	0.60	76.10	7.75	3.31
<b>LH</b>	8.19(Pg/ml)	0.10	37.60	8.42	7.73
<b>Estrogen</b>	91.94	7.20	325.80	86.83	102.55
<b>Progesterone</b>	5.07(ng/ml)	0.10	29.70	3.16	9.03

The associations of various hormone blood levels were evaluated by the use of Spearman correlations as follows:

There was a significant positive correlation between blood levels of FSH and LH ( $P=0.007$ ,  $r=0.3$ ).

There was a positive (but not significant) correlation between blood levels of FSH and Estrogen ( $P=0.4$ ,  $r=0.08$ ).

There was a negative significant correlation between blood levels of FSH and Progesterone ( $P=0.002$ ,  $r=0.34$ ).

There was a positive (but not significant) correlation between blood levels of LH and Estrogen ( $P=0.1$ ,  $r=0.18$ ). The correlation between LH and progesterone was negative and significant ( $P=0.05$ ,  $r=-0.21$ ).

The relationship between blood levels of all hormones, LMP interval, and attempted suicide was positive and significant, so that the relationship of FSH, LH, Estrogen and progesterone were ( $P=0.004$ ,  $r=0.32$ ), ( $P=0.04$ ,  $r=0.22$ ), ( $P=0.003$ ,  $r=0.33$ ), ( $P<0.001$ ,  $r=0.42$ ), respectively.

In order to study the blood levels of various hormones in the different groups in terms of marital status, Kruskal–Wallis statistical test was used. Only the blood concentration of LH was significantly higher in divorced patients ( $P=0.005$ ).

The blood levels of LH was significantly lower in patients with substance abuse according to Mann–Whitney U test results ( $P=0.04$ ).

The blood level of estrogen was significantly lower in patients with the

history of self- injury according to Mann–Whitney U test ( $P=0.04$ ).

## DISCUSSION

This study was done on women who referred to Farshchian Hospital, Hamadan, Iran, with suicidal poisoning by drugs and chemicals in a 6-month period in 2011. There are statistically significant differences were observed between hormone blood levels in different phases of menstrual cycle. The highest rate of suicide attempts was observed at ages 14 to 25 years. This is consistent with other studies in other countries and of WHO's study in 1991 in Iran (7).

The highest rate of suicide in our study was in the group of married, single, and divorced women, respectively. This finding is consistent with the study done by Eskin *et al.* in 2006, but it is in contrast to Measey *et al.*'s study in Australia which reported the highest suicide rate in the group of single, married, and divorced or those with deceased spouses (8,9). The reason for this finding is that most of the women in Iran are married, so it can not be concluded that married people have higher suicide rates.

The results of this study showed that married women who were housewives had the highest degree of risk for suicide while working women had the lowest degree of risk for suicide. In numerous other studies, the results were the same, so the most common jobs in suicide attempters were unemployment and housekeeping, respectively (10,11).

Regarding education, the highest frequency of suicide was in the group of women with degrees under diploma, whereas the lowest frequency was in the

group with no education and a bachelor's degree or higher. This finding is partly in contrast to the studies done in Western countries. In these countries, the number of suicide attempts and successful suicide cases is higher in people with academic degrees (12).

The present study indicated that most of the participants did not mention the history of suicide attempt, substance abuse, and self-injury, although the positive history was a risk factor for suicide (12).

Most materials used for committing suicide were drugs, pesticides, detergents, and one case of opium, respectively. The studies done by Mousavi, Memari, and Pearson also revealed the same results (13-15). Regarding the different phases of menstrual cycle (follicular and luteal phases), most patients were in the follicular phase. This finding was indicated by Baca Garcia and colleagues' study (16).

In a study at the Erzurum University, Turkey, on 52 women of childbearing age with regular menstrual cycles that had committed suicide, most cases were in the follicular phase (17).

Leenaars and colleagues studied 56 suicidal women who subsequently died and 44 non-suicidal women who died. The autopsy and histopathological examination of the uterus showed that 25% of first group and only 4.5% of those in the second group were in the follicular phase (18).

Some studies have not found any significant relationships between the menstrual cycle and suicide attempt in women (19-21). Koocheky and colleagues have shown that most patients who had attempted suicide were in the luteal phases of the menstrual cycle (13). In another study, Baca Garcia showed that suicide rate was higher in phases in which estrogen and progesterone levels were low (22). Jermain *et al.* showed serotonergic brain activity dysregulations could occur in the luteal phase of the menstrual cycle that might be due to hormonal changes in women (23).

## CONCLUSION

Low levels of sex hormones may have a role in the pathogenesis of behavioral disorders and suicide in women. The study of behavioral disorders, particularly in women with PMS, can largely prevent the incidence of suicides.

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