Section: Miscellaneous

Original Research Article

ASSOCIATION OF MENSTRUAL CYCLE PHASES WITH SUICIDE INCIDENTS AMONG WOMEN OF REPRODUCTIVE AGE: A CROSS-SECTIONAL STUDY IN ODISHA, INDIA

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ABSTRACT

Background: Suicide is a leading cause of unnatural death worldwide, with gender-specific factors influencing its prevalence. Women are particularly vulnerable, with social and physiological factors, including hormonal changes during the menstrual cycle, potentially contributing to suicidal ideation and behavior. Previous studies have shown mixed results on the association between menstrual cycle phases and suicide attempts. **Aim:** This study aims to examine the relationship between menstrual cycle phases and suicide among women of reproductive age, specifically focusing on variations in age, marital status, time of attempt, and method used.

Materials and Methods: This cross-sectional observational study was conducted at MKCG Medical College and Hospital, Berhampur, Odisha, India, involving 140 female suicide victims aged 15 to 45 years. Data were collected from police requisitions, inquest reports, and interviews with close associates, including demographic details, marital status, and menstrual history. Histological examination of endometrial tissue was used to determine menstrual phase at the time of death. Statistical analysis was performed using R software, with a Chi-square test applied for variable comparisons, considering $p < 0.05$ as significant.

Results: Among the victims, the age group 18-30 years (51.4%) had the highest suicide rate. Married women constituted 60% of cases. The primary methods of suicide included burns (48.6%), poisoning (28.6%), and hanging (22.9%), with 60.7% occurring between 6 a.m. and 6 p.m. Histologically, 64.2% of women were in the secretory phase, especially the late secretory phase, at the time of suicide. Marital status showed a significant association with menstrual phase ($p < 0.001$), as did age ($p = 0.012$), though time of attempt was not statistically significant.

Discussion: The findings suggest a significant association between the secretory phase of the menstrual cycle and suicide, particularly among married women. Hormonal fluctuations during this phase may exacerbate depressive symptoms, possibly leading to an increased risk of suicidal behavior. Although this study aligns with previous findings, it contrasts with research that links suicidal behavior with the proliferative phase.

Conclusion: This study supports an association between suicide attempts and the late secretory phase of the menstrual cycle, with significant links to marital status and age. Further research is essential to explore hormonal and biological influences on suicide among young adult married women and the timing of attempts in relation to menstrual phases.

Keywords: Suicide, menstrual cycle, reproductive age, secretory phase, marital status, hormonal influence, Odisha.

INTRODUCTION

According to the World Health Organization, nearly 800,000 individuals die by suicide each year (WHO, 2019). The global prevalence of suicidal ideation among women is estimated to be between 2.2% and 2.4%.[1] Additionally, over the past two decades, the suicide rate has increased 4.12 times for women and 3.44 times for men.[2] Several studies suggest that factors unique to women, such as marital status, feelings of hopelessness,[3] and depression,[4] contribute to these rising rates. Furthermore, subjective happiness and economic conditions have been found to influence suicidal thoughts among Korean women.[5] Research has also explored how the menstrual cycle may affect suicidal behavior, with numerous studies examining the relationship between menstrual phases and incidents of suicide attempts or completions, though results have been mixed. Some studies have reported no significant links between menstrual cycle phases and suicidal behavior. For example, Holding and Minkoff (1973),[6] conducted a prospective study involving 74 cases of non-suicidal self-injury treated at a Regional Poisoning Treatment Centre and found no correlation with specific menstrual cycle phases. Similarly, Birtchnell and Floyd (1974),[7] studied 76 patients who attempted suicide through self-poisoning or self-injury and found no association between menstrual cycle phases and their suicide attempts.

Luggin et al. (1984),[8] investigated the relationship between menstrual cycle phases and psychiatric admissions related to premenstrual syndrome and suicidal behavior, concluding that while admissions were more frequent during the menstrual period compared to the intermenstrual period, no significant differences were observed among the attempted suicide group and other patients. Ekeberg et al. (1986),[9] studied 156 women who had suicidal or non-suicidal attempts upon admission and also found no statistically significant relationship between these attempts and menstrual cycle phases.

The present study aims to examine the association between the menstrual cycle and suicide in women of reproductive age.

MATERIALS AND METHODS

This cross-sectional observational study was carried out over a one-year period in the MKCG Medical college and Hospital, Berhampur, Ganjam, Odisha, India. The sample size was determined to be 140. The study focused on individuals who had died by suicide and were within the reproductive age range of 15 to 45 years. Information about the victims—including age, address, marital status, date and time of the suicidal act, and menstrual history was gathered through police requisitions, inquest reports, and interviews with close associates of the deceased. Prior to tissue collection, consent was obtained from the next of kin. Only unnatural deaths determined to be suicides were included, while decomposed bodies and pathological samples from the uterus were excluded from the study. Tissue samples were collected and preserved in 10% formol saline for 24 hours. These samples then underwent a series of laboratory processes, including dehydration, clearing, impregnation, block formation, microtome sectioning, and staining with haematoxylin and eosin. Microscopic examination of the stained slides was conducted to determine the histological appearance of the endometrium, enabling identification of the specific phase of the menstrual cycle at the time of death. Various phases of the menstrual cycle were analyzed based on these histological findings.[10,11]

The data collected was entered into Microsoft Excel (Office 365). Statistical analysis was performed using R software. Categorical data were presented as frequencies or percentages. Comparisons between variables were carried out using the Chi-square test, with a p-value of less than 0.05 considered statistically significant.

RESULTS

Most of the victims were between 18 to 30 years age group 72 (51.4%) followed by 30 to 45 years 44 (31.4%) and 15 to 18 years age group 24 (17.1%). Prevalence of suicide was more among married women 84 (60%) than unmarried ones 56 (40%). Among various methods of commission of suicide, burn was the commonest one 68 (48.6%) followed by poisoning 40 (28.6%) and hanging 32 (22.9%). Suicide was committed in different time of the day. Approximately 2/3rd of the victims committed suicide in the day time i.e. between 6am to 6 pm whereas it was little more than 1/3rd between 6 pm to 6 am. Considering histological appearance of endometrium, it has been observed that most of the women 90 (64.2%) committed suicide in secretory phase of their cycle. Late secretory phase was more frequently chosen time than early secretory phase. [Table 1]

Among 84 married women, 63 (75%) committed suicide in secretory phase whereas among unmarried women prevalence of suicide in secretory and proliferative phase is more or less same 14 and 20 (25 % and 35.7% respectively). 22 (39.3%) of unmarried women committed suicide during their menstruation. Association between phase of menstrual cycle according to histology of endometrium and marital status of the women was significant statistically (p value < 0.001). [Table 2]

Almost 85 of the subjects who committed suicide between 6am to 6 pm were in secretory phase of menstrual cycle, 22 (25.88%) were in menstrual phase and 5 (5.88%) were in proliferative phase. Out of 55 women who committed suicide between 6 pm and 6am, 33 (60%) were in secretory phase, 8 (14.55%) were menstruating and 14(25.45%) were

in proliferative phase. P value was 0.697 and was not statistically significant. [Table 3]

Those who committed suicide in secretory phase, most were in the age group of 18 to 30 years followed by 30 to 45 years and 15 to 18 years. Similar frequency was also observed among women who committed suicide during proliferative phase. Association between phase of menstrual cycle according to histology of endometrium and age group of the women was significant statistically (p value = 0.012). [Table 4]

Table 1: Percentage distribution study population according to different parameters

Age in years	Number	Percentage
15-18	24	17.1
18-30	72	51.4
30-45	44	31.4
Marital status		
Married	84	60
Unmarried	56	40
Method of suicide		
Burn	68	48.6
Hanging	32	22.9
Poisoning	40	28.6
Total	**140**	
Time of attempt		
6amto6pm	85	60.7
6pmto6am	55	39.3
Phase of menstrual cycle		
Early secretory	24	17.1
Late secretory	66	47.1
Proliferative	18	12.9
Menstrual	32	22.9
Total	140	100

Table 2: Relation between Marital status and phase of menstrual cycle according to histology of endometrium

Phase of menstrual cycle	Married	Percentage	Unmarried	Percentage
Early secretory	21	25.0	6	10.7
Late secretory	42	50.0	8	14.3
Proliferative	6	7.2	20	35.7
Menstrual	15	17.8	22	39.3
Total	84	100	56	100

Table 3: Relation between Time of attempt and phase of menstrual cycle according to Histology of endometrium

Phase of menstrual cycle	6 am to 6 pm	6 pm to 6 am
Early secretory	20 (23.53)	9 (16.36)
Late secretory	38 (44.71)	24 (43.64)
Proliferative	5 (5.88)	14 (25.45)
Menstrual	22 (25.88)	8 (14.55)
Total	85 (100)	55 (100)

Table 4: Relation between Age of individual and phase of menstrual cycle according to Histology of endometrium

Age (Years)	Early secretory phase	Late secretory phase	Menstrual phase	Proliferative phase
15-18	6(25)	8 (12.12)	3 (16.66)	4 (12.5)
18-30	16(66.66)	32 (48.48)	10(55.55)	22 (68.75)
30-45	2 (08.33)	26 (39.39)	5(27.77)	06 (18.75)
Total	24 (100)	66 (100)	18 (100)	32 (100)

DISCUSSION

Suicide refers to the act of intentionally ending one's own life. Although both males and females fall victim to this unnatural cause of death, there are notable gender differences in suicidal behavior and outcomes. Research by Jennifer Langhinrichsen,[12] and Ahuja N.,[13] highlights that females attempt suicide three times more often than males; however, males are three times more likely to die by suicide. In recent years, there has been a concerning rise in suicide attempts among young and middle-aged females—both married and unmarried. This increase may be attributed to several factors, including mental health issues like depression, familial or social conflicts, or certain triggers, either individually or in combination. Throughout the menstrual cycle, hormonal fluctuations take place during both the proliferative phase (from the first day of menstruation to ovulation) and the secretory phase (from ovulation until the onset of the next menstrual period). These hormonal changes can contribute to mood swings and depression, potentially influencing suicidal thoughts. A systematic review by Wetzel RD and McClure JN,[14] found that suicidal deaths were more

frequently reported during the secretory phase in five studies, while six studies indicated a higher occurrence during the proliferative phase.

Globally, the incidence of suicidal deaths among women varies based on factors such as age (particularly between 15 to 45 years), marital status, religion, method of suicide, timing of the attempt, and different phases of the menstrual cycle. These variations can be attributed to socioeconomic, psychological, educational, cultural, and geographical differences. The majority of victims were aged between 18 to 30 years 72 (51.4%), followed by those aged 30 to 45 years 44 (31.4%), and 15 to 18 years 24 (17.1%). Additionally, the prevalence of suicide was high among married women 84 (60%) compared to unmarried women 56 (40%). Among the various methods of suicide, burns were the most common 68 (48.6%), followed by poisoning 40 (28.6%) and hanging 32 (22.9%). Suicides occurred at different times throughout the day, with approximately two-thirds of the victims ending their lives during daylight hours (between 6 a.m. and 6 p.m.) and a little over one-third during nighttime (between 6 p.m. and 6 a.m.).

Based on the histological examination of the endometrium, it was found that most women 90 (64.2%) died by suicide during the secretory phase of their menstrual cycle, with the late secretory phase being more frequently associated with these events than the early secretory phase. A statistically significant association was observed between the menstrual phase (as determined by endometrial histology) and the marital status of the women ($p < 0.001$). The current findings align with those reported by Patel V. in The Lancet (2012), where it was concluded that marriage is a significant risk factor for depression—a condition strongly linked to suicide.[15] Similarly, the observations of Randy A. Sansone et al. (2007) are consistent with the results of this study.[16] However, Caykoylu A. et al. found that suicides and suicide attempts were more common during the proliferative or preovulatory phase, which contrasts with the findings of this study.[17] Premenstrual syndrome (PMS) typically occurs during the second half of the menstrual cycle, known as the secretory phase, and is characterized by symptoms such as anxiety, irritability, mood swings, and insomnia. These symptoms generally persist until the onset of menstruation or up to 1–2 days afterward. As the secretory phase advances, the severity of these symptoms may increase. In some cases, the symptoms become intense enough to be classified as Premenstrual Dysphoric Disorder (PMDD). When such symptoms combine with various social, cultural and socio- economic factors may aggravate suicidal ideation.

85 of the women who died by suicide between 6 a.m. and 6 p.m. were in the secretory phase of their menstrual cycle, while 32 (22.9%) were in the menstrual phase, and 18 (12.9%) were in the proliferative phase. Among the 55 women who committed suicide between 6 p.m. and 6 a.m., 33 (60%) were in the secretory phase, 8 (14.55%) were in the menstrual phase, and 14 (25.45%) were in the proliferative phase. The p-value was 0.697, indicating no statistically significant difference. Among women who died by suicide during the secretory phase, the majority were in the 18 to 30 years age group, followed by those aged 30 to 45 years, and then 15 to 18 years. A similar distribution was observed for suicides during the proliferative phase. A statistically significant association was found between the menstrual phase (based on endometrial histology) and the age group of the women ($p = 0.012$). Using the Chi-square test, significant associations were identified between menstrual phases and both marital status and age ($p < 0.05$ for both). However, no significant associations were found between menstrual phases and other variables in the study.

CONCLUSION

The present study identified a positive relationship between suicide attempts and the secretory phase of the menstrual cycle, particularly the late secretory phase. Chi-square test results also revealed significant associations between the menstrual phase and both marital status and age. Further research is required to explore potential hormonal or biological factors influencing young adult married women. Additionally, studies are needed to investigate how different times of day or night, in relation to menstrual phases, contribute to mood swings, depression, and the increased likelihood of suicide attempts.

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