

Impact of stress on menstrual cycle: A comparison between medical and non medical students

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ABSTRACT

Introduction: In the wake of fast paced life and cut throat competitions, students are under high academic pressure. Neuroendocrine system plays a vital role not only in supporting normal physiological function but also during stress. It influences the endocrine and reproductive system to help in adaptation and maintains homeostasis in response to stressors. **Material and Methods:** Study was done on 100 female college students (50 medical and 50 non-medicals). Based on the questionnaires each participant was evaluated for level of stress and variations in menstrual patterns like length, duration, dysmenorrhoea, premenstrual tension etc. **Result:** Significant association was observed between the level of stress and presence of premenstrual symptoms ($P = 0.002$). Higher stress was associated with passage of clots ($P = 0.01$), painful periods ($P = 0.012$) and the presence of premenstrual symptoms ($P = 0.002$). Higher number of medicos suffered from premenstrual symptoms compared to non-medical students (60%, 40%, $P = 0.046$). **Conclusion:** A strong association was observed between stress and premenstrual symptoms. There is no difference in medical and non-medical students either in the stress level perceived or in any of the menstrual complaints except for premenstrual tension ($P = 0.046$) which may be as 62% of medical students perceived above average or higher level of stress compared to 50% non-medicos.

Key words: Dysmenorrhoea, medical students, premenstrual tension, stress

INTRODUCTION

In recent years, the field of education has witnessed cut throat competition, across all disciplines, as the quality educational opportunities have failed to cater the increasing number of students every year. Concerns and uncertainties for future create a high academic pressure even in excellent performers leading to stress among college students.^[1,2] Stress can be a eustress which is a 'good stress' acting as a motivation for an individual for completion of a particular work or distress, the 'bad stress' with which one finds difficult to cope and leads to conditions like depression, anxiety or other personality disorders.^[2] Though college life is an enjoyable phase, it also imposes inevitable stresses due to academic demands, competitions, family expectations and

responsibilities. Medical students, in particular, are known to suffer from greater levels of stress due to their heavier academic burden.^[3-6] In addition, females have been shown to experience more stress than males and consistently report more physical as well as somatoform symptoms.^[7-9]

Neuroendocrine system plays a vital role not only in supporting normal physiological function but also during stress. It influences the endocrine and the reproductive system to help in adaptation to the increased demands and maintains homeostasis in response to environmental stressors.^[10,11] However, elevated levels of the end product i. e. cortisol, has a range of side effects including disruption of normal luteinizing hormone (LH) rhythm, hence affecting the menstrual cycle.^[12,13] College-going young females, frequently experience a variety of menstrual-related complaints, including dysmenorrhoea, menorrhagia, irregular menses, and menstrual-related mood changes. A common complaint is Pre-Menstrual Syndrome (PMS) which is a cluster of troublesome symptoms like backache, fatigue and irritability that develops 7–14 days before the onset of menstruation and subsides when menstruation starts.

A regular menstrual cycle is one of the indicators of a female's overall good health. Abnormal cycles, with irregular and

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Website:
www.saudijhealthsci.org

DOI:
10.4103/2278-0521.157886

Quick Response Code



heavy bleeding, not only disrupt one's professional and personal life but also require evaluation as they may have a major deleterious impact on future reproductive and general health.^[14,15] Several studies have identified stress as one of the key factors responsible for menstrual irregularities.^[16,17] Studies on Indian medical students have suggested a higher level of stress among them.^[18] Some studies have also evaluated the association of stress with menstrual cycle.^[19] However, very few have compared the level of stress and associated changes in menstrual cycle in medical students with that of non-medical students. Hence, in this study, we endeavored to compare the level of perceived stress and its effect on the menstrual cycle in Indian medical and non-medical students.

MATERIALS AND METHODS

Hundred female college students of age 17–25 years were enrolled in the study after obtaining a written, and informed consent. Half of the enrolled students were medical students while the rest 50 were either engineering students or commerce students. Their anonymity was maintained throughout the study. Exclusion criteria included subjects having history of neurological or psychiatric disorders, taking drugs affecting emotional status or endocrinological profile and those addicted to tobacco or alcohol. The study protocol was duly approved by the Institutional Ethics Committee.

The students were asked to fill questionnaires related to stress and menstrual history. The stress questionnaire consisted of 75 questions elucidating the frequency at which they experienced symptoms like heart pounding or racing, headaches, excessive sweating of palms etc. Each option corresponded to a number, the sum of which provided the 'stress score' and hence classified under the category of >91 (very high stress level), 71–90 (above average), 46–70 (average), 21–45 (below average) or 0–20 (unlikely) stress levels.

The questionnaire on menstrual history enquired about the menstrual regularity, cycle length, blood loss per cycle, history of passage of clots, missed periods, pre menstrual symptoms, painful periods and use of painkillers (to assess the severity of pain). A normal cycle was defined as one occurring at an interval of 21–35 days, with an average flow of 30–80 ml and lasting for 2–7 days. A gap of more than 3 months duration between two cycles was labeled as one missed cycle.^[20]

Statistical analysis

Statistical analysis was performed by SPSS version 16.0 (SPSS Inc, Chicago, IL, USA) and the results were expressed as mean \pm standard deviation (SD). The normality of data was tested using Shapiro-Wilk test. The groups were compared for various parameters using students t-test and Chi-square test. Correlation analysis was performed using Spearman rank correlation coefficient. A two-tailed $P \leq 0.05$ was considered as significant for all statistical tests.

RESULTS

Students were comparable in their baseline characteristics with a mean age of 19.84 ± 1.68 and 19.36 ± 1.58 yrs for medical and non-medical respectively [Table 1]. All the students considered together revealed that usually 87% had regular cycles and 88% had normal quantity of flow but 26% complained of passage of clots which signifies abnormally increased flow. Abnormalities in menstrual flow were manifested as decreased flow in 8% and increased in 4% of students. Though there was no difference in the stress level of those having normal (74.6 ± 35.38) and increased (74.25 ± 24.83) flow but the stress level reported by those having decreased flow was significantly high (99.5 ± 36.47 , $P = 0.06$) [Table 2].

Frequency of other ailments occurring commonly during menstrual cycle included pain, present in 52% of students for which only 20% students took painkillers. Spotting in between periods was reported by 13% students, 29% complained of missed periods while 61% suffered from premenstrual syndrome [Table 2]. Rising level of stress showed a significant association with passage of clots ($P = 0.01$), painful periods ($P = 0.012$) and the presence of premenstrual symptoms ($P = 0.002$) [Table 2].

On comparing the students as medical and non-medicals, it was seen that there were no major differences in their level of stress ($P = 0.439$). But a higher percentage of medical students (62%) perceived more than the average level of stress, as compared to non-medicos (50%) [Table 3].

There were no significant difference in any of the menstrual complaints except for premenstrual tension which was significantly higher in medical students ($P = 0.046$) [Table 4]. On symptom wise analysis of premenstrual symptoms, it was observed that 50% of medicos had complaints of heaviness, irritability and nausea before the onset of periods as compared to only 26% of non-medicos ($P = 0.013$) [Table 5].

DISCUSSION

In this study, we tried to elucidate the differences between the medical and non medical students regarding their perception of stress and manifestations of premenstrual symptoms and other menstrual irregularities. All the students

Table 1: Baseline characteristics of the two groups

Variable	Medicos (n=50)	Non medicos (n=50)	P
Age	19.84 \pm 1.68	19.36 \pm 1.58	0.146
Height	159 \pm 6.5	158.8 \pm 6.41	0.926
Weight	56.1 \pm 8.5	53.4 \pm 8.76	0.121
BMI	22.19 \pm 2.99	21.2 \pm 3.5	0.135
Stress level	79.34 \pm 35.17	73.82 \pm 35.92	0.439

Data presented as mean \pm SD. $P < 0.05$ was considered statistically significant

Table 2: Relationship between Stress score and Menstrual health problems among 100 college students (medical and non-medical)

Menstrual health problems	N (yes/no) (total=100)	Stress score, mean (SD)	P
Irregular periods	13/87	87.00 (49.08), 75.02 (33.08)	0.258
Clots	28/72	95.03 (39.73), 69.40 (31.12)	0.01**
Painful periods	52/48	85.05 (36.73), 67.39 (31.96)	0.012**
Spotting	13/87	86.46 (31.38), 75.1±35.98	0.284
Missed period	29/71	84.34±38.75, 73.40±33.83	0.163
Premenstrual symptoms	61/39	85.36±34.46, 62.84±32.9	0.002**
Flow			
Normal (88%)		74.6±35.38	
Decreased (8%)		99.5±36.47	0.06
Increased (4%)		74.25±24.83	0.984

N: Number of subjects

Table 3: Comparison of level of stress among medical and non-medical students

Stress	Medical students	Non-medical students	P
Total stress scores (Mean±SD)	79.34±35.1	73.82±35.1	0.439
Stress score >71 (above average and high) n (%)	31 (62%)	25 (50%)	
Stress score 46-70 (average)	11 (22%)	15 (30%)	
Stress score 21-45 (below average)	7 (14%)	5 (10%)	
Stress score 0-20 (unlikely)	1 (2%)	5 (10%)	

Table 4: Comparison of medical and non-medical students regarding the menstrual symptoms

Variables	Medicos (n=50) (%)	Non medicos (n=50) (%)	P
Regularity	42 (84)	45 (90)	0.372
Quantity (normal)	46 (92)	42 (84)	0.439
Passage of clots	16 (32)	10 (20)	0.171
Medications	4 (8)	1 (2)	0.362
Painful periods	22 (44)	21 (42)	0.840
Spotting in b/w periods	3 (6)	10 (20)	0.071
Missed periods	14 (28)	13 (26)	0.822
Pre menstrual tension	30 (60)	20 (40)	0.046*

Data presented as Numbers of subjects (%); Chi-square test was used to find the significant difference among groups. $P < 0.05$ was considered statistically significant

who participated were college going, young females with comparable baseline characteristics.

A significant association of increased stress scores with painful periods, premenstrual period and passage of clots was observed [Table 2]. Nepomnaschy *et al.*, have suggested that stress causes activation of the hypothalamic-pituitary-adrenal (HPA) axis which inhibits hypothalamic-pituitary-gonadal (HPG) axis.^[21] In addition, over secretion of corticotropin-releasing hormone (CRH), vasopressin, and endogenous opioid peptides further complicates the derangements. Researchers have shown that psychological stress produces physiologic responses, such as activation of the CRH which are likely to affect menstrual function, apart from other ill effects.^[22]

Stress, has consistently been associated with variation in the length and duration of the menstrual cycle,^[16] anovulation^[10] and amount of menstrual bleeding.^[23] Yamamoto *et al.*, have shown that psychosocial stress is strongly associated with women's menstrual function and may be a factor responsible for the derangements of menstrual cycles, thereby predisposing women under psychosocial stress to long-term disease risks.^[24] Our study has also demonstrated a significantly positive association of stress with premenstrual symptoms as well as decreased flow [Table 2]. 13% students having irregular cycles reported higher stress scores of 87.00 ± 49.08 [Table 2].

Dysmenorrhoea (pain during periods) was reported to be the commonest menstrual problem and premenstrual symptoms as the most distressing problem associated with menstrual cycle.^[25,26] Various studies have reported a wide variation in the incidence of dysmenorrhoea, in a range between 28% and 89.5%.^[27,28] In the present study, 52% of enrolled subjects complained of dysmenorrhoea (44% of medical students and 42% of non-medical students). Singh *et al.*, reported a prevalence of 73.83% in Indian medical students.^[29]

Occupational stress significantly influences the function of endocrine and reproductive health.^[10,11] Various studies performed across the globe have found that medical students suffer from greater level of distress, as compared to their colleagues in other professions. Among various causes, academic pressure,^[30] work load,^[4] sleep deprivation^[4] and exposure to patient's suffering and deaths^[5] have been

Table 5: Frequency distribution of various symptoms of pre menstrual tension among medical and non medical students

Variables of premenstrual syndrome	Medicos (50) (%)	Non medicos (50) (%)	P
Feeling of heaviness, irritability and nausea before the onset of periods	25 (50)	13 (26)	0.013
Breast Tenderness	3 (6)	2 (4)	0.500
Unintentional weight gain	2 (4)	5 (10)	0.218
Unintentional weight loss	0	2 (4)	–
Facial hair growth	4 (8)	2 (4)	0.339

Data presented as Numbers of subjects (%); chi-square test/fischer's exact test used to find the significant difference among groups. $P < 0.05$ was considered statistically significant

hypothesised as the main contributory factors to the mental health of medicos. Present study also hypothesised that medical students suffer from higher level of stress as compared to students from other different professions. However, contrary to the belief, it was found that there was no difference in the stress scores of medicos and non-medicos. Further, there was no difference in the menstrual related health problems of the two groups of students except for a significantly higher percentage of medicos (60%) suffering from premenstrual tension [Table 4]. Singh *et al.*, have also reported premenstrual symptoms in 60.74% of Indian medical students.^[29] Stress may be a causal factor for pre-menstrual tensions in the present study, as high number of medicos suffered from more than average or high levels of stress (62%) as compared to non-medical students (50%) [Table 3]. Studies have shown that stress not only increases the level of cortisol but also progesterone and its metabolites allopregnanolone.^[31] Evidences from animal studies have shown that progesterone and allopregnanolone both are stress-responsive (i. e., increase in stress) as well as stress-reducing (that is down regulates stress and anxiety).^[31] Progesterone is responsible for ovulation and as premenstrual syndrome occurs in ovulatory cycles, progesterone is probably the underlying cause for premenstrual symptoms in susceptible females.^[32]

Evidence from literature is conflicting on the association of stress with incidence of menstrual abnormalities. Clarvit, in a cross-sectional study on medical students, found no evidence that a high level of stress is associated with a change in any of the measures of menstrual function.^[33] Sood *et al.*, also could not find any association between stress and menstrual irregularities.^[14] In contrast, Sharma *et al.*, reported a high incidence of premenstrual syndrome and dysmenorrhoea.^[19] Though the present study has demonstrated a strong association of stress with premenstrual symptoms and dysmenorrhoea but we did not observe any difference in the level of perceived stress among medicos and non-medicos. Except for the premenstrual symptoms which were significantly more in medical students no other difference was recorded among the two groups of students.

Like other cross-sectional studies, the present study too was not without its limitations. As it was based on one time subjective questionnaire, its reliability totally depended

on the recall power of the enrolled subjects. Secondly, as only stress questionnaires were used, we could not see the association of other mood parameters including anxiety and depression with premenstrual symptoms and menstrual irregularities, as mood changes itself are one of the common manifestations of premenstrual syndrome. To overcome these lacunae, we propose to carry out larger, prospective studies enrolling subjects from varied profession and also incorporating various other mood parameters.

CONCLUSION

In the wake of fast paced life, full of challenges, this study was a small step to assess the problems suffered by young females regarding their reproductive cycle. With the rapid development and advancement comes the disease burden created by psychological stress, anxiety and depression which is engulfing our society. It not only effects the quality of life but can also lead to infertility, endometrial hyperplasia etc. Early detection and elevation of the causal factors may have a preventive role.

ACKNOWLEDGEMENT

The authors would like to thank Ex-Professor and Head of Department of Physiology, VMMC and Safdarjung Hospital, New Delhi, Dr. Shobha Das for her valuable comments and suggestions. We also thank Dr. B. Srinivas Professor, Dept. of Physiology, VMMC and Safdarjung Hospital, New Delhi, for his support which led us to final completion of the project.

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How to cite this article: Singh R, Sharma R, Rajani H. Impact of stress on menstrual cycle: A comparison between medical and non medical students. *Saudi J Health Sci* 2015;4:115-9.

Source of Support: It was an Indian council of medical research STS funded project, **Conflict of Interest:** None declared.