Journal of Pharmaceutical Research International

33(60B): 1920-1927, 2021; Article no.JPRI.78818
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Awareness of Blood Pressure Changes during Menstrual Cycle

Joshitha [a], A. Jothi Priya [b*≡] and R. Gayatri Devi [b≡]

[a] Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India.
[b] Department of Physiology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author Joshitha did the Literature collection, framing the manuscript. Author JP managed the statistical approval, approval of manuscript. Author GD did the final approval of manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i60B34826

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/78818

Original Research Article

Received 14 October 2021
Accepted 17 December 2021
Published 24 December 2021

ABSTRACT

Introduction: Blood pressure is not constant at different days of the month and even throughout the day. Variation in BP during different phases in the menstrual cycle can also be attributed to the effect of the female hormones on cardiovascular systems. The purpose of the study was to evaluate the awareness of blood pressure changes during the menstrual cycle.
Aim: To Assess the Awareness of Blood Pressure Changes during Menstrual Cycle.
Materials and Methods: The sample size used for the study is 100. A self structured questionnaire was prepared and uploaded on google forms. This standard questionnaire in google forms was circulated. After which all the data was collected and the data was analysed using Chi square analysis. The Chi square analysis was done using SPSS software.
Result: We were able to establish a fair awareness about blood pressure changes during the menstrual cycle among our study population. It was statistically significant with p value of 0.037 ($P<0.05$).
Discussion: Variation in BP during different phases of the menstrual cycle can also be attributed to the effect of ovarian hormones on cardiovascular function. Since hormonal changes follow a non-linear trend throughout the menstrual cycle, it may have an unpredictable effect on BP regulation
Conclusion: There is a fair amount of awareness about blood pressure changes during menstruation among both women and men but women have more awareness.

[≡] *Assistant Professor*
**Corresponding author: E-mail: jothipriya.sdc@saveetha.com;*

Keywords: Blood pressure; menstrual cycle; systolic; diastolic.

1. INTRODUCTION

Blood pressure plays an important role during the women's menstrual cycle and studies conducted till date haven't given affirmative results [1]. Clinical sign is claimed positively to threshold and tolerance during follicular phase and ovulatory phase [1,2]. Progesterone only pills aren't only used conventionally as oral contraceptives they also provide relief from menstrual pain [3]. These pills are currently being prescribed at a high rate [4]. Women that take external origin progesterone have repercussions associated with the pills like cardiovascular diseases and an increase in vital signs [5]. There is a little acute rise in systolic and diastolic sign around the onset of menstruation [6] at the time of follicular phase oestradiol concentration is high [7]. However during the luteal phase when both oestradiol and progesterone level is high there is an increase in blood pressure [8]. The above information tells us the impact of female sex hormones on pheripheral blood flow and vascular tone [6,9].

Menstruation alongside periodic bleeding from the blood vessels at the time of the uterine mucosa shedding features a direct reference to the ECG and vital sign changes during different phases of a women's cycle [10,11]. Variations in vital sign at different phases of cycle is caused by many reasons one among them being the effect of ovarian hormone on cardiovascular function,[12] however the hormonal changes follow a nonlinear pattern throughout the cycle it's hit or miss or non standard effect on the women's blood pressure [6,9,13]. Heart rate variations analysis has been extensively done to examine the mechanism involved in autonomic control of the guts [14] . HRV analysis can assess the general cardiac health and therefore balance sympathetic and parasympathetic regulation on cardiac activity [15].

Gonadotropic hormones are known to affect this balance [16]. Guastic et al, sato et al, and et al suggested an enhanced sympathetic activity within the luteal compared to the follicular phase of a woman's cycle [17] the above mentioned points bring us to the conclusion that there are certain affirmative changes within the pulse variation during different phases of the cycle [6,9,13,18]. If vital signs change cyclically it can warrant a rise or decrease within the dose of the antihypertensive medication in hypertensive women of reproductive age bracket [19]. Estrogen has beneficial effects on (cardiovascular system) by decreasing LDL cholesterol and increasing HDL cholesterol protest on blood vessels causing vasodilation through an endothelial nitric oxide synthase [20] Menstruation is merely one manifestation of the ovarian cycle which is itself related to quite 200 physical and psychological and behavioural changes [21]. The cycle is an integral part of a serious portion of a woman's life ovarian hormones major portion of a woman's life [10,13] ovarian hormones alteration along the cycle are related to corresponding significant changes in multiple neurohormonal homeostatic mechanisms regulating the circulatory system. [22] Gonadal hormones influence the circulatory system both directly and indirectly [23]. Ventricular arrhythmias are more common in women and appear to be related to cycle and also exhibit variations in reference to the cycle [23,24]. variety of research articles have thrown light o the influence of cycle on heart and respiration [13] A study examining vital sign and pulse responses to a mental arithmetic task during a sample of 16 regularly menstruating women during the follicular and secretory phase of their cycle the findings said that hormonal variations characteristic of the luteal and follicular phases don't assert an influence on common and assessment of cardiovascular stress reactivity [15]. Gonadal hormones not only influence the reproductive function but also oestrogen and progesterone a marked effect on the circulatory system some behavioural and neurological symptoms like headache, painful enlargement of breast, weight gain, increased vital sign, decreased concentration, nervous irritability emotional instability poor judgement depression tension are seen in women during premenstrual phase [22]. The aim of the study is to spread awareness about blood pressure during the menstrual cycle.

2. MATERIALS AND METHODS

A cross-sectional survey was conducted among the adolescent population with a sample size of 100. A self administered structured questionnaire was prepared based on visual pollution and consisted of 15 questions. It was circulated to participants through an online platform (google form). The statistics were done using SPSS software, chi-square test was used to check the association and p value of 0.05 was said to be

statistically significant.The pros of the survey is that the adolescents of different lifestyles and cultures were surveyed . Children and adults were excluded from the survey. Simple random sampling method was the sampling method used to minimise the sampling bias. All those who were willing to participate in the survey were included in the study. Those who were not willing and those that had language barriers in answering the english version of the questionnaire were excluded from the study.

3. RESULTS

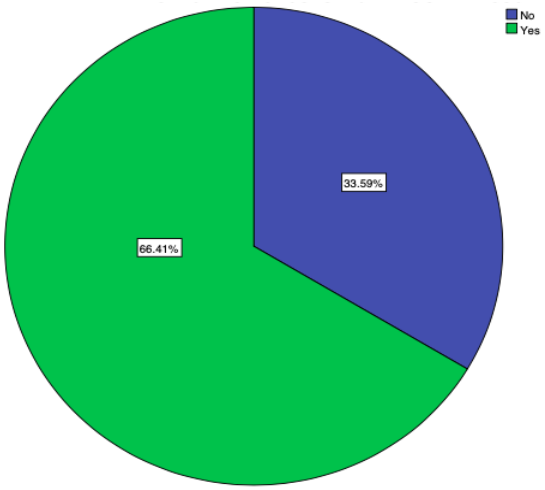

Fig. 1. Piechart showing percentage distribution on the awareness about blood pressure changes during menstruation. Whereas 66.4 % (green) of the participants are aware about the blood pressure changes and 33.59 % (blue) of the participants are not aware about the blood pressure changes during the menstrual cycle

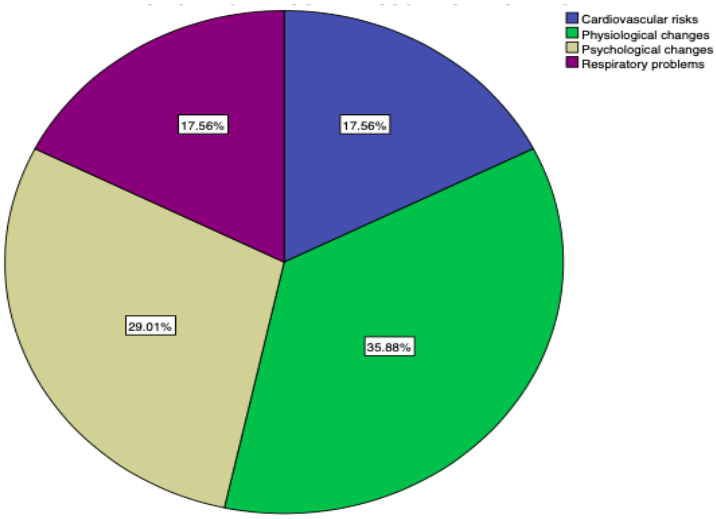

Fig. 2. Pie chart showing the percentage distribution about the risk factors during the menstrual cycle. In which 17.56 % (blue) of the participants responded that there will be high risk of cardiovascular system, 35.88 % (green) of the participants said that there will be severe physiological changes, 29.01 % (beige) of the participants said that they will be having psychological changes and 17.56 % (purple) of the participants responded for respiratory problems

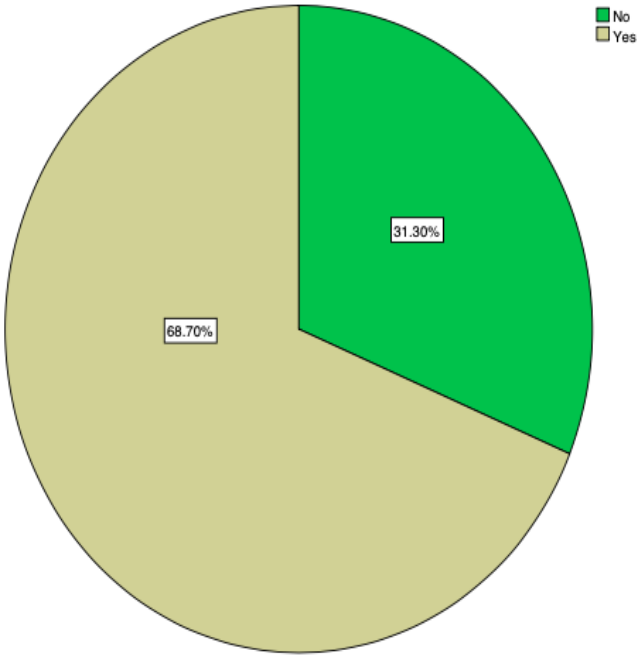

Fig. 3. Pie chart showing the percentage distribution about the effect of blood pressure changes during menstrual cycle. In which 31.30 % (green) of the participants doesn't know the effect of blood pressure during the menstrual cycle and 66.70 % (beige) of the participants knows the effect of blood pressure during menstrual cycle

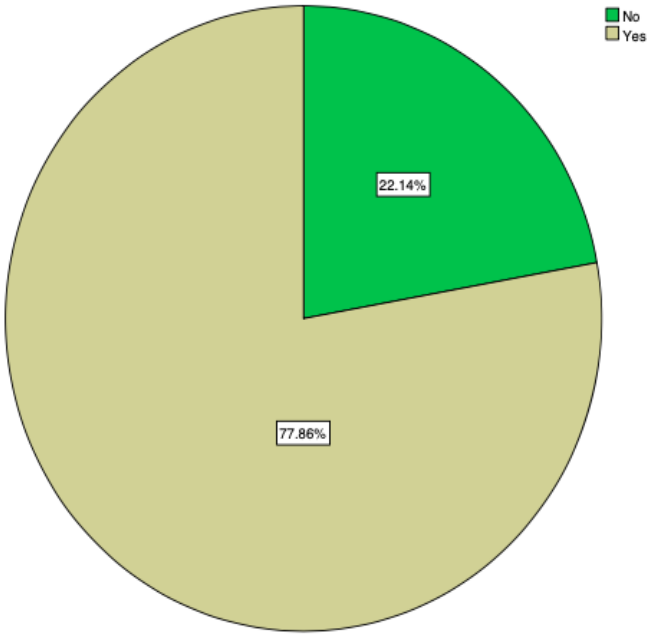

Fig. 4. Pie chart showing the percentage distribution about the awareness of decrease in blood pressure during menstrual cycle. In which 22.41 % (green) of the participants are not aware about the drop of blood pressure during the menstrual cycle and 77.86 % (beige) of the participants are aware that the blood pressure will decrease during the menstrual cycle

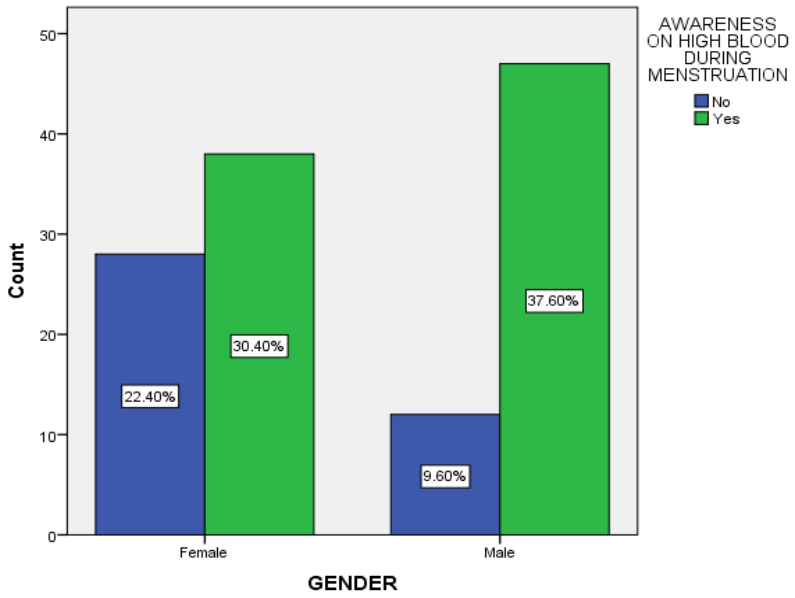

Fig. 5. Bar graph represents the association between Gender and the Awareness of high blood pressure during menstrual cycle. X axis represents the Gender and the Y axis represents the number of participants. Among females 30.40 % (green) are aware about the increase in blood pressure during the menstrual cycle whereas 22.40 % (blue) of the participants are not aware. Among Males, 37.60 % (green) are aware and 9.60 % (blue) of the participants are not aware about the increase in blood pressure during the menstrual cycle. Chi square test was used for statistical significance. Chi square value was found to be 0.004 ($p<0.05$). Hence proving the statistical significance, provided Males are more aware about the increase in BP during menstruation

4. DISCUSSION

66.4 % (green) of the participants are aware about the blood pressure changes (Fig. 1), 35.88 % (green) of the participants said that there will be severe physiological changes (Fig. 2), 66.70 % (beige) of the participants knows the effect of blood pressure during menstrual cycle (Fig. 3), 77.86 % (beige) of the participants are aware that the blood pressure will decrease during the menstrual cycle (Fig. 4), Among Males, 37.60 % (green) are aware of the increase in blood pressure during the menstrual cycle (Fig. 5).

Previous literature have explained the influence of endogenous cyclic changes in female sex hormones during menstrual cycle [25,26]. Influence of daily life activity on pulse rate and blood pressure changes during menstrual cycle[27,28]. Another such study demonstrates that the female hormone status does not affect the BP response to sodium in young normotensive women.

However, in contrast with systemic haemodynamics, the renal response to salt varies during the normal menstrual cycle,[29] suggesting that female sex hormones play a vital role in the regulation of renal heamodynamics [30] there are gender associated differences in blood pressure in humans, with men having high BP than age matched pre menopausal women and being at greater risk for cardiovascular and renal diseases [31]. In another study women had significantly greater a1-adrenergic vasoconstriction during the luteal phase than during the follicular phase [32]. This effect cannot be attributed to changes in plasma norepinephrine levels, which did not vary across the menstrual cycle,[33] or to elevations in blood pressure, because diastolic blood pressure was actually lower in the luteal phase [34] This finding supported the hypothesis that endogenous progestogen might have a hypertensive effect, as does exogenous progestogen [35]. However, a second study designed to confirm this finding failed to do so, showing no cyclical change in the level of blood pressure [36]. The sample size of the study was small and limited to the people of Tamil Nadu. In future studies a larger sample size including wider regions of India can be done [37].

5. CONCLUSION

Changes in blood pressure during the normal menstrual cycle are not well documented and previous studies have given conflicting results, however there is fine awareness about these blood pressure changes in dental students. Among dental students females have greater knowledge about blood pressure changes during menstrual cycle in comparison to males. The dental students belonging to the study population believe psychological, physiological, cardiovascular and respiratory changes influence the sympathovagal balance in normally menstruating females. Further studies should be done in a larger sample size to establish the results and to improve the clinical interpretation which may further improve the quality of life.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors**.**

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Dunne FP, Barry DG, Ferriss JB, Grealy G, Murphy D. Changes in blood pressure during the normal menstrual cycle. Clin Sci . 1991Oct;81(4):515–8.
2. Pfleeger M, Straneva PA, Fillingim RB, Maixner W, Girdler SS. Menstrual cycle, blood pressure and ischemic pain sensitivity in women: A preliminary investigation. Int J Psychophysiol. 1997 Sep;27(2):161–6.
3. Zonderman J, Shader L, Triggle DJ, Pharmaceutical Sciences Staff, State University of New York at Buffalo Staff. Birth Control Pills. Infobase Publishing. 2006:95.
4. Barabadi H, Mojab F, Vahidi H, Marashi B, Talank N, Hosseini O, et al. Green synthesis, characterization, antibacterial and biofilm inhibitory activity of silver nanoparticles compared to commercial silver nanoparticles [Internet]., Inorganic Chemistry Communications. 20211;29:108647. Available:http://dx.doi.org/10.1016/j.inoche.2021.108647
5. Barlow J. Estrogen secretion, biosynthesis and metabolism: Their relationship to the menstrual cycle [Internet]. Steroids. 1966;7:309–20. Available: http://dx.doi.org/10.1016/0039-128x(66)90102-4
6. Kelleher C, Joyce C, Kelly G, Ferriss JB. Blood pressure alters during the normal menstrual cycle. Br J Obstet Gynaecol. 1986 May;93(5):523–6.
7. Bharath B, Perinbam K, Devanesan S, AlSalhi MS, Saravanan M. Evaluation of the anticancer potential of Hexadecanoic acid from brown algae Turbinaria ornata on HT–29 colon cancer cells [Internet]. Journal of Molecular Structure. 2021;1235:130229. Available:http://dx.doi.org/10.1016/j.molstruc.2021.130229
8. Clarizia G, Bernardo P. Diverse Applications of Organic-Inorganic Nanocomposites: Emerging Research and Opportunities: Emerging Research and Opportunities. IGI Global. 2019:237.
9. Hassan AA, Carter G, Tooke JE. Postural vasoconstriction in women during the normal menstrual cycle. Clin Sci . 1990 Jan;78(1):39–47.
10. Keates JS, Fitzgerald DE, Keates JS. Limb Volume and Blood Flow Changes During the Menstrual Cycle [Internet]. Vol., Angiology. 1969;20:624–7. Available:http://dx.doi.org/10.1177/000331976902001009
11. Egbuna C, Mishra AP, Goyal MR. Preparation of phytopharmaceuticals for the management of disorders: The development of nutraceuticals and

traditional medicine. Academic Press; 2020;574.

12. Ezhilarasan D. Critical role of estrogen in the progression of chronic liver diseases. Hepatobiliary Pancreat Dis Int. 2020 Oct;19(5):429–34.
13. Khan S, Departments of Physiology, Government Medical College, Kannau. To Study the Effect of Different Phases of Menstrual Cycle on ECG & Blood Pressure in Healthy Young Adult Females [Internet]. Journal of Medical Science And clinical Research; 2016. Available:http://dx.doi.org/10.18535/jmscr/v4i5.07
14. Gowhari Shabgah A, Ezzatifar F, Aravindhan S, Olegovna Zekiy A, Ahmadi M, Gheibihayat SM, et al. Shedding more light on the role of Midkine in hepatocellular carcinoma: New perspectives on diagnosis and therapy. IUBMB Life. 2021 Apr;73(4):659–69.
15. Weidner G, Helmig L. Cardiovascular stress reactivity and mood during the menstrual cycle. Women Health. 1990;16(3-4):5–21.
16. J PC, Pradeep CJ, Marimuthu T, Krithika C, Devadoss P, Kumar SM. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study [Internet]. Vol. 20, Clinical Implant Dentistry and Related Research. 2018:531–4. Available:http://dx.doi.org/10.1111/cid.12609
17. Kamath SM, Manjunath Kamath S, Jaison D, Rao SK, Sridhar K, Kasthuri N, et al. In vitro augmentation of chondrogenesis by Epigallocatechin gallate in primary Human chondrocytes - Sustained release model for cartilage regeneration [Internet]. Vol. 60, Journal of Drug Delivery Science and Technology. 2020:101992. Available:http://dx.doi.org/10.1016/j.jddst.2020.101992
18. G V, Venkatesh G, S URY. Comparative study of heart rate variability, heart rate and blood pressure in different phases of menstrual cycle in healthy young women aged 22-40 years [Internet]. Vol. 7, Indian Journal of Clinical Anatomy and Physiology. 2020:8–11. Available:http://dx.doi.org/10.18231/j.ijcap.2020.002
19. Mudigonda SK, Murugan S, Velavan K, Thulasiraman S, Krishna Kumar Raja V. Non-suturing microvascular anastomosis in maxillofacial reconstruction- a comparative study [Internet]. Vol. 48, Journal of Cranio-Maxillofacial Surgery. 2020:599–606. Available:http://dx.doi.org/10.1016/j.jcms.2020.04.005
20. Mishra A, Kamal RB. Variations serum electrolyte level during different phases of menstrual cycle in healthy female medical students [Internet]. Vol. 6, International Journal of Biomedical Research. 2015:504. Available:http://dx.doi.org/10.7439/ijbr.v6i7.2285
21. Nambi G, Kamal W, Es S, Joshi S, Trivedi P. Spinal manipulation plus laser therapy versus laser therapy alone in the treatment of chronic non-specific low back pain: a randomized controlled study. Eur J Phys Rehabil Med. 2018 Dec;54(6):880–9.
22. Kisan R, Mufti M, Kumar S, Deshpande DV. A Study of Influence of Menstrual Cycle on Cardiac Autonomic Function [Internet]. Vol. 2, International Journal of Physiology. 2014:71. Available: http://dx.doi.org/10.5958/j.2320-608x.2.1.016
23. Prakash AKS, Devaraj E. Cytotoxic potentials of S. cumini methanolic seed kernel extract in human hepatoma HepG2 cells [Internet]. Vol. 34, Environmental Toxicology. 2019:1313–9. Available: http://dx.doi.org/10.1002/tox.22832
24. Rajakumari R, Volova T, Oluwafemi OS, Rajesh Kumar S, Thomas S, Kalarikkal N. Grape seed extract-soluplus dispersion and its antioxidant activity. Drug Dev Ind Pharm. 2020 Aug;46(8):1219–29.
25. Santhakumar P, Roy A, Mohanraj KG, Jayaraman S, Durairaj R. Ethanolic Extract of Capparis decidua Fruit Ameliorates Methotrexate-Induced Hepatotoxicity by Activating Nrf2/HO-1 and PPARγ Mediated Pathways [Internet]. Vol. 55, Indian Journal of Pharmaceutical Education and Research. 2021. p. s265–74. Available:http://dx.doi.org/10.5530/ijper.55.1s.59
26. Saraswathi I, Saikarthik J, Senthil Kumar K, Srinivasan KM, Ardhanaari M, Gunapriya R. Impact of COVID-19 outbreak on the mental health status of undergraduate medical students in a COVID-19 treating medical college: a prospective longitudinal study [Internet]. PeerJ. 2020;8:e10164. Available:http://dx.doi.org/10.7717/peerj.10164

27. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. J Oral Pathol Med. 2019 Apr;48(4):299–306.
28. Tahmasebi S, Qasim MT, Krivenkova MV, Zekiy AO, Thangavelu L, Aravindhan S, et al. The effects of oxygen-ozone therapy on regulatory T-cell responses in multiple sclerosis patients. Cell Biol Int. 2021 Jul;45(7):1498–509.
29. Vivekanandhan K, Shanmugam P, Barabadi H, Arumugam V, Daniel Raj Daniel Paul Raj D, Sivasubramanian M, et al. Emerging Therapeutic Approaches to Combat COVID-19: Present Status and Future Perspectives. Front Mol Biosci. 2021 Mar 8;8:604447.
30. Moyer JH, Handley CA. Blood pressure and renal hemodynamic responses to Aramine and the alterations of these responses by adrenergic blockade with dibenzyline [Internet]. Vol. 48, American Heart Journal. 1954:173–84. Available: http://dx.doi.org/10.1016/0002-8703(54)90170-2
31. Pecherebertschi A, Burnier M. Female sex hormones, salt, and blood pressure regulation [Internet]. Vol. 17, American Journal of Hypertension. 2004. p. 994–1001. Available:http://dx.doi.org/10.1016/j.amjhyper.2004.08.009
32. Freedman RR, Girgis R. Effects of menstrual cycle and race on peripheral vascular alpha-adrenergic responsiveness. Hypertension. 2000 Mar;35(3):795–9.
33. Wadhwa R, Paudel KR, Chin LH, Hon CM, Madheswaran T, Gupta G, et al. Anti-inflammatory and anticancer activities of Naringenin-loaded liquid crystalline nanoparticles in vitro. J Food Biochem. 2021 Jan;45(1):e13572.
34. Blum I, Lerman M, Misrachi I, Nordenberg Y, Grosskopf I, Weizman A, et al. Lack of plasma norepinephrine cyclicity, increased estradiol during the follicular phase, and of progesterone and gonadotrophins at ovulation in women with premenstrual syndrome. Neuropsychobiology. 2004;50(1):10–5.
35. Does progesterone fluctuation across the menstrual cycle predispose to gastroesophageal reflux? [Internet]. Vol. 23, Gastroenterology Nursing. 2000:130. Available:http://dx.doi.org/10.1097/00001610-200005000-00008
36. Kreitmanngimbal B. Patterns of estrogen and progesterone receptors in monkey endometrium during the normal menstrual cycle [Internet]. Vol. 35, Steroids. 1980:471–9. Available: http://dx.doi.org/10.1016/0039-128x(80)90147-6
37. Wahab PUA, Madhulaxmi M, Senthilnathan P, Muthusekhar MR, Vohra Y, Abhinav RP. Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study. J Oral Maxillofac Surg. 2018;76(6):1160–4.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/78818